MONEY SUPPLY, EXCHANGE RATE AND OUTPUT GROWTH VOLATILITY IN NIGERIA

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ABSTRACT
The supply of money and the rate at which one currency is exchanged for another can be an important determinant of output growth volatility. The paper used money supply, exchange rate and output growth variables in its analysis. The study used time series data from 1987-2023. After establishing the existence of Autoreggressive Conditional Heteroscedasticity (ARCH) and Generalised Autoreggressive Conditional Heteroscedasticity (GARCH), Generalised Linear Model (GLM) was used to analyse the data. The result shows that the exchange rate has a higher impact on output growth volatility than the money supply. It was recommended that currency sterilization which advocates for slow growth of money supply by keeping the monetary base from expanding when the central bank's intervention in the foreign exchange market leads to greater holding of international reserves can be a viable policy option.

Keywords: currency sterilization, money supply, exchange rate, volatility, output growth.

JEL: E51, E32, F01.

1. INTRODUCTION

The economic performance of any country is not unconnected with money supply, exchange rate and output growth volatility within the economy including the impact of external chocks. The interrelationship between these variables has been an area of interest among researchers (Adeyemi & Akinbayo, 2019). Long-term development cannot be formulated without the proper understanding of the dynamics of money supply, exchange rate and output growth volatility. Several studies have been conducted on the effect of exchange rate and its impact on output growth volatility (Ravindran & Soroush, 2015; Nsofor, et al 2017; Okeowo, 2023). Literature on the specific impact of money supply concerning the inflationary trend as it relates to exchange rate and output growth volatility is scanty. Recent economic trend shows that Nigeria's naira faces serious challenges, including instability in its foreign exchange market, characterised by a very high rate of output growth volatility. Research has also shown that a financial system combined with significant volatility can stifle economic expansion. This may result in unstable currency rates, which may then generate volatility in growth (Perazzi & Romero, 2022). According to Olofsson (2019) countries with the fastest economic growth also tend to have the highest levels of exchange rate volatility. This is because lower exchange rate volatility facilitates budget deficit reduction and economic growth stimulation. Long-term economic growth is predicted by a more stable exchange rate. Olofsson further postulated that economic growth is correlated with a more volatile exchange rate. Considering the volatile nature of exchange rate and output growth with

the unavoidable impact of money supply, the study is situated on the need for constant updates of this volatile variables in economic literature.

One of the most important objectives of macro macroeconomic policy is rapid economic growth (Amah, 2019; Aladejana, et al., 2021; Okeowo, 2023; Abidemi, et al., 2023). Economic growth is the increase in goods and services produced in a country which raises its national income. Hence, it is a process whereby the per capita income of a country increases over a long period. Volatility means easily changing, that is, undependable and expressed in economic terms, fluctuations. When variables that determine macroeconomic growth have zigzag and wave-like pattern then output growth fluctuate. The study's main objective is to analyze the impact of money supply and exchange rate on output growth volatility. The supply of money at any moment is the total amount of money in the economy. There are three alternative views regarding the definition or measure of money. The most common view is associated with traditional and kynesian thinking which stresses the medium of exchange function of money. The second is associated with the modern quantity theorists headed by Friedman. The third definition is associated with Gurley and Shaw. They included the supply of money M_2 plus deposits of savings banks, building societies, loan associations and deposits of other credits and financial institutions. Jhigan (2010) defines exchange rate as the price of one currency in terms of another currency, that is, the rate at which one currency is exchanged for another

In Nigeria, virtually all economic variables fluctuate both the micro and the macroeconomic variables. What determines this fluctuation in the Nigerian economy? Can money supply and exchange explain this cyclical phenomenon, can there be any macroeconomic policy measures to reduce this unwanted pattern of growth to the barest minimum if not eradicated in Nigeria? Interestingly when there is a considerable increase in output growth which can be tagged as a boom, the economy flourishes; conversely or otherwise the economy dwindles and thus, there is a drastic reduction in economic growth which is often referred to as depression. Undoubtedly, output growth volatility and the theory of business cycle are synonymous in nature but distinct in analysis. However one cannot but use some relevant variables as established in the business cycle theory. The pandemic led to a negative growth in Nigeria's economy in 2020 with -1.79%. The same period recorded a 5% naira devaluation. Although there was an increase in economic growth in 2021. It stood at 3.65%. 2022 recorded 3.25%, indicating a fall of 0.4%, and 2023 recorded 2.74% indicating a fall of 0.9% when compared to 2021 growth rate. Similarly, naira devaluation coupled with the failure of expansionary monetary policy necessitated a quest for further studies. The major objective of the paper is to analyase the impact of money supply and exchange rate on output growth volatility. The paper is structured into five segments: introduction, literature review, methodology, result and discussion of findings, and policy recommendations.

2. LITERATURE REVIEW

2.1.Theoretical literature

Two major theories often surface in money supply analyses (Anyanwu, 1993). The classical and the liquidity preference theory. The classical derives monetary theory from Say's law. The classical maintains that supply creates its own demand. Walras' law posits that aggregate excess demand must equal zero in every market. The Keynesian theory quarry the framework of the quantity theory on the grounds of rigidity of analysis, the effect of changes in the money supply on aggregate expenditure, and the price level. Three important determinants of exchange rate theories surface in economic literature. They are: the mint parity theory, where the exchange rate

is associated with the international gold standard, the purchasing power parity theory where exchange rate equilibrium is determined by the equality of relative prices in two countries and the balance of payment theory, where the exchange rate is determined by the balance of payments (Jihngan 2010). In the business cycle, there are volatile fluctuations in output, prices, income and employment. Jhingan recognised eleven major theories of business cycle. They are Hawtrey's monetary theory, Hayek's monetary over-investment theory, Shumpeter's investment theory and the psychological theory. Others include Cobweb, Keynes, Samuelsson, Hicks, Godwin, Friedman and Kaldor's theories. All these theories give their versions of the alternation of periods of prosperity and depression of good trade and bad trade in an economy

2.2 Empirical literature

Ehikioya (2019) did an empirical investigation of the impact of exchange rate volatility on Nigeria's economic growth. The study used Philips-perron and Augmented Dickey-fuller tests to determine the stationarity of the variables used in the model. Generallised Autoregressive Conditional Heteroscedasticity (GARCH) model and Generalised Method of Moments were used to analyse the time series data. Negative and significant relationship was established between economic growth and volatility in the exchange rate. Tule, et al (2020) query the extent to which exchange rate volatility affects economic growth in Nigeria. Granger causality test, GARCH and Vector Error Correction (VEC) model, block exogeniety Wald tests and impulse–response functions of the analysis suggest that volatility exhibits a short-term unidirectional causality for economic growth. Tule et al's findings support Ehikioya's study of a highly significant negative volatility effect on Nigeria's GDP. The study further reported that the semi-official Forex Window and the Interbank Exchange Rate had little effect on Nigeria's economic growth. The findings further suggest that a high portion of the productive sector lacks access to this Forex platform. Olure, et al (2015) illustrates exchange rate volatility using the Johansson Error Correction model (ECM) and GARCH. Greater policy sensitivity was recommended to generate an increase in foreign direct investment. Tukur et al. (2023) used time series analysis to investigate the impact of exchange rate, energy price, and security on price volatility which often causes growth volatility. The paper found that the exchange rate has a unidirectional relationship with inflation. For growth to be sustained, the paper recommended investment in the non-oil sector and the implementation of the Marshallian action plan. Asuzu (2023) adopted the Toda Yamamoto Vector Autoregressive and Granger Causality approach to analyse money supply, inflation, and economic growth volatility. The paper found evidence of joint causality between money supply and exchange rate. The imposed response functions also revealed that an increase in money supply increases the rate of inflation. The paper quarries the efficacy of expansionary monetary policy, insisting that increasing money supply does not necessarily translate to an increase in real GDP growth while Terence (2023) found an inverse relationship between output growth volatility and economic growth at the aggregate level.

3. METHODOLOGY

3.1 Theoretical framework

The paper is anchored on Hawtrey's theory of output growth volatility. The theory states that trade cycles are an offshoot of output growth volatility and are a purely monetary phenomenon such that the ups and downs of economic activity are being controlled by the money flow (Pramod, 2020). In this sense, it implies that all the changes in the level of economic activities are nothing but a

reflection of changes in the flow of money. Hawtrey holds the view that the causes of output growth volatility or cyclical fluctuations were to be found in those factors that produce expansionary and contractions in the flow of money supply. The relationship between exchange rate, money supply, and economic growth volatility has been extensively studied, with some research suggesting a bidirectional causality meaning that exchange rate affects output growth volatility and exchange rate and money supply affect economic growth volatility (Olofsson, 2019). Monetary models suggest that changes in money supplies and expectations about future money supply behavior are crucial in determining exchange rate movement and growth volatility. However, the inadequate measures of money demand shift and output growth volatility mean that a substantial fraction of actual exchange rate movement will not be adequately explained by monetary models.

3.2 Model Specification

When analyzing variables with high volatility clustering, ARCH/GARCH is often the econometrics technique deployed as shown in the literature review. The study used time series data from 1987-2023. After establishing the existence of ARCH/GARCH, GLM is used to analyse the parameter of economic relationship. The specified GLM equation is given as $OGV = \varphi + \varphi 1EXR + \varphi 2MS + UI + U_i$, where OGV is the output growth volatility, EXR is the exchange rate and MS is the money supply. The money supply used in this study is the M2. That is the currency in circulation, demand deposits, time deposits, and saving deposits. The exchange rate (EXR) is the historical price (1987-2023) at which one naira exchanges for a dollar while OGV measures fluctuations in output growth over the same period.

4. RESULTS AND DISCUSSION OF FINDINGS

Table 1: ARCH/GARCH model output

Variable	Coefficient	Std. Error	z-Statistic	Prob.
RESID(1)^2	0.260672	0.029395	8.867861	0.0000
GARCH(-1)	0.608295	0.024946	24.38402	0.0000

Result extracted from E-views 9 output

The first step is to examine the characteristics of the data set. The sum of the RESID (1)^2 and GARCH (-1) coefficients determine the choice of econometrics techniques to be used (okeowo, 2022). The sum of these coefficients representing $(\alpha + \beta)$, is very close to one as shown in Table 1, indicating persistent shocks, often associated with exchange rate forecasting, and the presence of the ARCH effect, which necessitated the use of GLM.

Table 2: Generalized Linear Model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EXR	46414.15	25643.83	1.809954	0.0703
MS	0.004109	0.000643	6.391433	0.0000

Result extracted from E-views 9 output

0.004 Change in MS brings about a unit change in output growth while a very high change (46414) in EXR brings about a unit change in output growth. This finding is in line with (Eklou, 2023). Similarly, Ehikioya's (2019) Generalised Autoregressive Conditional Heteroscedasticity (GARCH) model and Generalised Method of Moments were used to analyse the time series data. Using Johansson co-integration to establish the degree of relationship in the study, the estimates of the parameter of economic relationship offer evidence that the exchange rate has a negative and significant relationship with economic growth with a high rate of volatility in the exchange rate. This finding is in contrast with Tukur et al. (2023), a unidirectional relationship was established in the analysis. An extended period of exchange rate instability will have an undesirable impact on output growth. The result equally shows a positive relationship between exchange rate, money supply and output growth volatility indicating that as money supply increases volatility in output growth also increases and expansionary monetary policy increases output growth volatility. This findings is in line with (Asuzu, 2023).

5. CONCLUSION AND POLICY RECOMMENDATIONS

The findings reveal that the persistent departure of an exchange rate from its long-run competitive level which represents a greater challenge than volatility poses a serious challenge for economic agents. Such exchange rate misalignment causes high and unprecedented output growth volatility as shown in the output result. It should be noted that policy options to be deployed depend on the prevailing and current macroeconomic circumstances in a country at a time. The policy options that worked five years ago could be obsolete in present-day economic reality. Currency sterilization which advocates for slow growth of the money supply by keeping the monetary base from expanding when the central bank's intervention in the foreign exchange market leads to greater holding of international reserves can be a viable policy option for Nigeria Central Bank. With this, any increase in international reserves can be offset with equal open market sales of domestic security to prevent the monetary base from rising to avoid output growth volatility. The expansionary or contractionary impact can be neutralised by an increase or decrease in domestic liquidity. The relative prices of imports or exports can be neutralized by such a sterilization policy.

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