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DYNAMICS OF MONETARY POLICY, FINANCIAL DEVELOPMENT, AND INCOME INEQUALITY IN NIGERIA: EMPIRICAL PERSPECTIVE

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Abstract: This study empirically investigated the nexus between monetary policy, financial development and income inequality in Nigeria. Annual time series data on monetary policy, financial development indicators and income inequality were sourced from the Central Bank of Nigeria (CBN) statistical Bulletin and the Standardized World Income Inequality Database (SWIID). The Vector Autoregression Model (VAR) model was employed as the analytical technique and the variance decomposition result revealed that monetary policy is more sensitive to shocks from the financial sector while the financial sector and income inequality are mostly driven by shocks emanating from each other. The impulse response result revealed that income inequality is positively driven by changes in monetary policy and financial development while the response of monetary policy to financial development is sensitive to the financial development indicator employed. The study recommends that to curtail income inequality, monetary and financial sector stability must be prioritized by the monetary authorities in Nigeria.

KEYWORDS: Financial Development, Income Inequality, Vector Autoregression, Variance Decomposition, Impulse Response

1.0 INTRODUCTION

Studies over time in the extant literature have examined the linkage between monetary policy and financial development (see Albanesi, 2007; Billi & Vredin, 2014; Ekpeno, Godwin & Chuku, 2017; Furceri, Loungani and Zdzienicka, 2017), monetary policy dynamics and income inequality (Auclert, 2019; Coibon, Kueng & Silvia, 2012; Nakajima, 2015; Bivens, 2015; Cloyne, Ferreira & Surico, 2016; Mumtaz & Theophilopoulou, 2016; Furceri, Loungani & Zdzienicka, 2017; Davytan, 2017; Aye, Clance & Gupta, 2019), as well as financial development and income inequality (Greenwood & Jovanovic, 1990; Banerjee & Newmann, 1993; Galor & Zeira, 1993; Beck, Kunt & Levine, 2007; Law & Tan, 2009; Jauch & Watzka, 2012; Fowowe & Abidoye, 2013; Shahbaz, Loganathan, Tiwari & Sherafatian-Jahromi, 2015; Tita & Aziakpono, 2016; Younsi & Bechtini, 2018; Brei, Ferri & Gambacorta, 2018; Baiardi & Morana, 2018). However, the empirical link between monetary policy,

financial development, and income inequality in developed and developing countries remains a gray area that is largely unexplored.

The motivation for this stems from the fact that monetary policy actions of the Central Bank have far-reaching effect on financial development, which in turn influences income inequality in the economy. For instance, an expansionary monetary policy is expected to increase the quantity of money in the economy through the reduction of interest rates (Bauer & Eric, 2022; Coibon et al. 2012; Nakajima, 2015; Mumtaz & Theophilopoulou, 2016). This action boosts household's access to loans and increases their level of wealth. It will also increase the level of investment in the stock market by households that are financial market participants, thereby enhancing financial development (Billi & Vredin, 2014; Furceri, Loungani and Zdzienicka, 2017). However, this process can also exert inflationary pressure (general price increase) on the economy, which eventually widens income inequality because of the fall in the value of money. This makes poor households poorer because they hold a large proportion of their income in cash and are mostly non-participants in the financial market (Younsi & Bechtini, 2018; Brei, Ferri & Gambacorta, 2018)

On the other hand, rich households hold a small portion of their income as cash and are mostly active participants in the financial market. This makes them less susceptible to inflationary shocks while also benefitting from the yields of their investment in the stock market, thus making them richer. The foregoing implies that monetary policy, financial development, and income inequality are interwoven, because they are connected to each other (Frost & Stralen, 2018). The implication of this is that shocks to any of these three variables can influence the performance of the other variables in developing countries (Nigeria, in this case).

As pointed out earlier, the adoption of an expansionary monetary policy enhances financial sector performance but raises income inequality; however, financial development plays a key role in the conduct of monetary policy and overall economic performance (Billi & Vredin, 2014). The question to ask here is whether policymakers should abandon financial development to lessen inequality through monetary policy or pursue financial development at the expense of widening inequality in the economy. This paper is a departure from previous studies in two ways. First, we examine the dynamic relationship among monetary policy, financial development, and income inequality in Nigeria within the framework of a dynamic time series VAR model; no known study has previously done this. Second, we adopt different measures of financial development and the monetary policy rate as a measure of monetary policy in Nigeria to obtain a more robust and reliable estimation of our model. The rest of the paper is structured as follows: section two contains the literature review, section three contains the methodology, section four presents the results and discussion while section five concludes the paper.

2.0 LITERATURE REVIEW

A review of some studies on the link between monetary policy, financial development, and income inequality is discussed as follows:

Saiki and Frost (2014) in Japan examined the distributional effects of unconventional monetary policy shocks on inequality between 2008 and 2014. With specific reference to the income composition channel, the vector autoregression analysis (VAR) technique was employed, and the result showed that expansionary monetary policy shocks increase income inequality in Japan during the study period.

Denk and Cournède (2015) investigated the financial development - income inequality linkage for OECD nations between 1974 and 2011 using a panel fixed effect (FE) regression estimation technique. The results revealed that financial development has driven higher income inequality. Greater loan availability and stock markets contribute

to unequal distribution of income. Also, the study found evidence of reverse causality from greater income inequality to household borrowing in OECD nations during the study period.

Bahmani-Oskoe and Zhang (2015) studied financial development - income inequality link in 17 emerging countries using an error correction modeling technique. The findings of the study revealed that in the short run, financial development has a stabilizing influence on income inequality in ten countries and an unequalizing effect in five countries during the study period. However, in the long run, the study found an equalizing effect in three countries: Denmark, Kenya, and Turkey.

Batabyal and Chowdhury (2015) empirically examined the financial development - income inequality linkage in thirty (30) Commonwealth countries between 1995 and 2008, while also considering the role of corruption in these countries. The study adopted the ordinary least squares (OLS) and the instrumental variable (IV) regression models to analyze the data collected. The results showed that financial development positively influences income inequality at increased levels of corruption in all countries. However, the effect is significantly higher for low and middle-income countries than for high-income countries.

Sehrawat and Giri (2016), between 1986 and 2012, probed financial development and rural - urban income inequality in six South Asian Association for Regional Cooperation (SAARC) countries, while considering the role of economic growth. Employing panel fully modified ordinary least square (FMOLS) regression analysis, a long run connection was established among the variables of interest. The main findings of the study revealed that improvements in the financial system and economic growth heighten rural - urban income inequality during the study period.

Anthanasius and Meshach (2016) empirically studied financial development and inequality for Africa between 1985 and 2007, by adopting a balanced panel 15 African nations. The study adopted the Augmented Mean Group (AMG) estimator to determine the optimal levels of financial development and inequality. The findings revealed that an asymmetric link exists between financial development and inequality in the sampled African countries, and the relationship changes from an inverted u-shape to a u-shape based on the indicator of financial development adopted.

Babu, Bhaskaran and Venakatesh (2016) examined inequality and long-run growth in 29 emerging economies between 1980 and 2010 using the system generalized method of moments (SGMM). It was revealed that by adjusting for transfers, inequality exerts an injurious impact on output eventually. Furthermore, the study found no ambiguity among re-distribution and output.

Areosa and Areosa (2016) examined the transmission channels of income inequality in Brazil. This study investigated optimum monetary policy while putting inequality into consideration by employing a DSGE model without a financial system, price inflexibility, and unskilled agents. The result showed that contractionary monetary shocks raise inequality and lower output gap and inflation. With regards to the monetary policy objectives of stabilizing inequality, including inequality stabilization, the outcome revealed that welfare declines as unskilled agents increase and monetary policy becomes ineffective when skilled agents are scarce.

Azleen and Mansur (2017) empirically studied the link between financial development and inequality in Malaysia from 1970 to 2007. This study employed autoregressive distributed lag (ARDL) bound testing and the error correction mechanism (ECM) to test the long-run relationship in the variables. In addition, the variance decomposition (VD) affirmed granger causation in the variables. The results showed that long-term connection exists among the variables and financial development insignificantly influence inequality in the sample period.

Younsi & Bechtini (2018) examined output, financial development and income inequality in Brazil, Russia, India, China and South Africa (BRICS) between 1995 and 2015. By constructing an index for financial development using principal component analysis (PCA) and employing fixed effects estimation, the study found a significant and positive link between GDP per capita growth and income inequality, but the nonlinear coefficient revealed an inverse but significant impact on inequality. However, the financial development proxy seems to be statistically significant and positively influenced inequality in the countries.

Samarina and Nguyen (2019) examined the distributional influence of monetary policy on income inequality in the Euro area between 1994 and 2014. The study explored the earnings heterogeneity and income composition distributive channels of monetary policy channels using panel vector autoregression and local projection. The main finding of the study revealed that expansionary monetary policy shocks reduce income inequality in the Euro area during the study period.

Hoeberger, Priftis and Vogel (2019) investigated the link between the distributional impact of conventional monetary policy and income inequality in the Euro area between 1999 and 2017. Earnings heterogeneity and income composition channels were explored in the case of an open-economy dynamic stochastic general equilibrium (DSGE) model during the study period. The results showed that expansionary monetary policy shocks reduce income inequality, whereas contractional monetary policy raises income inequality in the observed area.

3.0 METHODOLOGY

To determine the dynamic relationship among monetary policy, financial development, and income inequality in Nigeria, the vector autoregression technique is adopted. Thus, the vector (Z_t) of endogenous variables included in the reduced-form VAR is expressed as follows:

$$Z_t = (MP_t, FD_t, INQ_t) \qquad (1)$$

where MP_t is monetary policy, FD is financial development, and INQ_t is income inequality which is measured by the gini coefficient. In this model, all variables are assumed to be endogenous, affecting each other contemporaneously and with lags. The impulse response and variance decomposition analysis of the VAR model will be interpreted to achieve this objective. In vector form, the equation is generally specified as:

$$Z_t = k + \beta_1 Z_{t-i} + \beta_2 Z_{t-i} + \beta_3 Z_{t-i} + ... + \beta_p Z_{t-p} + \mu_{1t} \qquad (2)$$

On the basis of equation (3.14), we re-specify equation (3.13) as follows:

$$\Delta MP_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta MP_{t-i} + \sum_{i=1}^{q} \beta_i \Delta FD_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta INQ_{t-i} + \mu_{2t}$$

$$\Delta FD_t = \alpha_0 + \sum_{i=1}^{q} \beta_i \Delta FD_{t-i} + \sum_{i=1}^{p} \phi_i \Delta MP_{t-i} + \sum_{i=1}^{r} \gamma_i \Delta INQ_{t-i} + \mu_{3t}$$

$$\Delta INQ_t = \alpha_0 + \sum_{i=1}^{r} \gamma_i \Delta INQ_{t-i} + \sum_{i=1}^{p} \phi_i \Delta MP_{t-i} + \sum_{i=1}^{q} \beta_i \Delta FD_{t-i} + \mu_{4t} \qquad (3)$$

Data for this study were sourced from the central bank of Nigeria (CBN) statistical bulletin and the Standardized World Income Inequality Database (SWIID). Quarterly time series data will be used for this study.

4.0 Results and Discussion

4.1 Analysis of the Unit Root Test

Testing for the existence of unit roots is a principal concern in the study of time series models. The presence of a unit root implies that the time series under investigation is non-stationary, whereas the absence of unit roots

indicates that the stochastic process is stationary (Iyoha and Ekanem, 2002). The results of the ADF and PP tests are shown in Table 1. The decision rule adopted here is that if the absolute value of the ADF statistics or that of the PP statistics is less than the 5% critical value, then the tested variable is non-stationary. On the other hand, if the absolute value of the ADF test or that of the PP test is greater than the 5% critical value, then it is judged that the tested variable is stationary.

Based on the result of the unit root test presented in table 1, both the Augmented Dickey Fuller and Phillip Peron tests indicate that income inequality, monetary policy, and financial development are stationary in their level form i.e. I(0) though monetary policy and financial development became stationary at level after being differenced once. Thus, the outcome supports the use of the vector autoregression framework in examining the dynamic relationship among monetary policy, financial development, and income inequality in Nigeria during study period.

Table 1: Unit Root Test

Variables	Test	Level		
		T.stat	P-value	Decision
GINI	ADF	-5.2825	0.0002***	I(0)
	PP	-2.9147	0.0342***	I(0)
D(MP)	ADF	-5.7086	0.0003***	I(0)
	PP	-3.8706	0.016***	I(0)
D(FD)	ADF	-11.62	0.0002***	I(0)
	PP	-11.619	0.0001***	I(0)

Source: Author's Computation

4.2 lag length selection criteria

After verifying the unit root properties of the variables, it is imperative to select the optimal lag length for the series. The optimal number of lags was identified using the Akaike Information Criterion (AIC) and Schwartz-Bayesian Criterion (SBC). Table 2 shows that the Akaike Information Criterion and Schwartz-Bayesian Criterion (as well as other techniques in the table) indicate that the optimal lag length for the model is one. Specifically, this study follows the Akaike Information Criterion, which is employed because it is adjudged to be quite superior in its forecasting prowess in a regression model, both for in-sample and out-sample analysis (Gujarati and Porter, 2009).

Table 2: lag length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2301.763	NA	7.98e+08	37.52460	37.66178	37.58032
1	-2149.424	287.3380	1.20e+08*	35.63292*	36.59317*	36.02297*
2	-2132.75	29.82377	1.66e+08	35.94716	37.73049	36.67154
3	-2116.741	27.07177	2.31e+08	36.27222	38.87863	37.33094
4	-2078.808	60.44663	2.29e+08	36.24078	39.67027	37.63383
5	-2058.303	30.67408	3.04e+08	36.49273	40.74530	38.22012
6	-2042.113	22.64021	4.40e+08	36.81484	41.89049	38.87656
7	-2024.775	22.55312	6.39e+08	37.11829	43.01702	39.51434
8	-1966.587	70.01432*	4.90e+08	36.75752	43.47933	39.48790

Source: Author's Computation

Note: * indicates the lag order selected by the criterion; LR, FPE, AIC, SBC, and HQ indicate sequential modified LR test statistic, Final Prediction Error, Akaike Information Criterion, Schwartz Bayesian Information Criterion and, Hannan-Quinn, respectively.

4.3 Forecast error variance decomposition results

Variance decomposition measures the percentage change in the dependent variable induced by shocks to the explanatory variables in the model. The variance decomposition results are presented in tables 3, 4, and 5.

(I) Variance Decomposition of the Monetary Policy

Table 3 reveals that in the first period, financial development indicators accounted for about 9.35% of the variations in monetary policy, whereas income inequality did not contribute to the variations in monetary policy in this period. In the second period, income inequality accounted for only 0.25% of the variations in monetary policy, whereas financial development accounted for approximately 12.5%. The contributions of financial development and income inequality increased further in the third and fourth periods as they accounted for approximately 14.5% and 0.34% of the variations in monetary policy, respectively. This trend continued in the fifth, sixth, and seventh periods as financial development and income inequality accounted for an average of approximately 10% and 0.36% of the variations in monetary policy during these periods respectively.

In the eighth, ninth and tenth periods, income inequality was responsible for 0.37%, 0.40% and 0.44% of the variations in monetary policy, while financial development accounted for an average of 11% of the variations in monetary policy during these periods. The implication of the foregoing is that financial development accounted for a much larger share of the variations in monetary policy whereas income inequality accounted for only a small portion of the variations in monetary policy during the study period. Thus, in the short run (first, second and third period), middle periods (fifth, sixth and seventh periods) and the long run (eighth, ninth and tenth periods), the contributions of financial development to the variations in monetary policy are more pronounced than that of

income inequality in Nigeria. We can then say that monetary policy responded more to shocks from financial development than to income inequality shocks during the study period.

This finding is in tandem with economic theory, which stipulates a direct relationship between financial development and monetary policy, indicating that variations in monetary policy in the economy are always traceable to the performance of the financial sector. In addition, empirical literature has argued that a stable financial sector is an important requisite for the effectiveness of monetary policy in the economy (Albanesi, 2007; Ghoussoub & Reed, 2016). This finding supports the results of Mbutor and Uba (2013), Akinsola and Odhiambo (2017) and Ekpeno, Godwin and Chuku (2017)

Table 3: Forecast Error Variance Decomposition of the Monetary Policy

Period	S.E.	M2/GDP	CPS/GDP	MKTCAP/ GDP	DEBTSTOCK/ GDP	SVT/GDP	FINLIB	INTR	GINI
1	11.70639	6.573067	1.930964	0.396516	0.215274	0.113808	0.001054	90.76932	0.0000
2	11.93757	8.912592	2.312237	0.515035	0.208926	0.282000	0.217114	87.30105	0.251049
3	12.12615	8.639032	3.268517	0.530446	0.675671	1.647580	0.217795	84.67998	0.340979
4	12.24333	8.503906	3.474516	1.008579	1.081580	2.267418	0.227171	83.09745	0.339378
5	12.33925	8.461387	3.504488	1.708080	1.448786	2.432919	0.240835	81.86479	0.338719
6	12.41188	8.416821	3.464538	2.332620	1.787924	2.439959	0.254119	80.95577	0.348246
7	12.46781	8.406752	3.461415	2.731058	2.091897	2.418875	0.262820	80.26639	0.360791
8	12.51078	8.416883	3.512320	2.903011	2.371307	2.402828	0.268551	79.74556	0.379539
9	12.54395	8.435925	3.592884	2.937329	2.622728	2.390205	0.273645	79.34233	0.404958
10	12.57111	8.456714	3.670648	2.925859	2.839159	2.381264	0.279225	79.01007	0.437061

Source: Author's Computation

Note: Financial Development indicators – M2/GDP, CPS/GDP, MKTCAP/GDP, DEBTSTOCK/GDP, SVT/GDP, FINLIB, Monetary Policy – INTR, Income Inequality - GINI

(II) Variance Decomposition of Financial Development Indicators

The financial development indicators employed are broad money supply to GDP ratio (M2/GDP), credit to the private sector to GDP ratio (CPS/GDP), stock market capitalization to GDP ratio (MKTCAP/GDP), debt stock to GDP ratio (DEBTSTOCK/GDP), stock value traded to GDP ratio (SVT/GDP), and financial liberalization (FINLIB). Table 4 shows that monetary policy and income inequality did not account for the variations in M2/GDP in the first period. In the second, third, and fourth periods, monetary policy and income inequality accounted for an average of 0.58% and 0.28% of the variations in M2/GDP, respectively. The contributions of monetary policy and income inequality to the variations in M2/GDP rose in the fifth, sixth, and seventh periods to an average of approximately 0.66% and 1%, respectively. In the last three periods, their contribution to

variations in M2/GDP rose to 0.86% and 1.23%, respectively. This implies that monetary policy shocks contributed more to variations in M2/GDP in the short run whereas income inequality shocks contributed more in the medium and long run.

In the case of CPS/GDP in the first period (Table 5), monetary policy and income inequality did not account for any of its variations in the first period, but their contributions on average were 0.48% and 0.55% in the second, third and fourth periods, respectively. By the fifth, sixth, and seventh periods, the contributions of monetary policy and income inequality to variations in CPS/GDP rose to approximately 0.74% and 2.50%, respectively and it further rose to an average of 1.1% and 3.8% in the last three periods. For MKTCAP/GDP (Table 6), monetary policy and income inequality did not account for the variations in MKTCAP/GDP in the first period. In the second, third and fourth periods, monetary policy and income inequality accounted for an average of 0.22% and 0.007% of the variations in MKTCAP/GDP respectively. The contributions of monetary policy and income inequality to the variations in MKTCAP/GDP rose in the fifth, sixth, and seventh periods to an average of approximately 0.12% and 0.14%, respectively. In the last three periods, their contribution to variations in monetary policy rose to 0.09% and 0.33%, respectively.

In the case of DEBTSTOCK/GDP in the first period (Table 7), monetary policy and income inequality did not account for the variations in DEBTSTOCK/GDP in the first period, but their average contributions were 0.14% and 0.31% in the second, third, and fourth periods respectively. By the fifth, sixth and seventh periods, the contributions of monetary policy and income inequality to variations in DEBTSTOCK/GDP rose to approximately 0.32% and 1.2%, respectively and it further rose to an average of 0.64% and 1.51% in the last three periods. Furthermore, variations in SVT/GDP were not explained by monetary policy and income inequality in the first period (Table 8). In the second, third, and fourth periods, monetary policy and income inequality accounted for an average of 0.22% and 0.05% of the variations in SVT/GDP, respectively. The contributions of monetary policy and income inequality to the variations in SVT/GDP rose in the fifth, sixth, and seventh periods to an average of approximately 0.20% and 0.06%, respectively. In the last three periods, their contribution to variations in monetary policy rose to 0.15% and 0.06%, respectively.

Finally, in the case of FINLIB in the first period (Table 9), monetary policy and income inequality did not account for its variations in the first period, but their contributions increased to an average of 0.06% and 4.75% in the second, third, and fourth periods, respectively. By the fifth, sixth, and seventh periods, the contributions of monetary policy and income inequality to variations in FINLIB rose to about 0.44% and 19.3%, respectively and it further rose to an average of 0.90% and 30.92% in the last three periods, indicating that income inequality shocks exerted a greater influence on financial liberalization, both in the short and long run.

Thus, it is generally observed that for all financial development indicators except the value of stocks traded to GDP ratio, income inequality accounted for the largest share of their variations, while the influence of monetary policy on financial development indicators was quite low. This supports the a priori theoretical link of a positive relationship between financial development and income inequality because financial development indicators responded majorly to shocks from income inequality in Nigeria. One possible explanation for this is that the rich contribute more to the activities of the financial sector, while the poor contribute less in Nigeria, thereby weakening the efficiency of the financial sector in Nigeria, unlike in developed countries where all classes of people are financial market participants (since income inequality is quite low in these countries). This means that shocks to income inequality in the short and long run had a greater influence on financial development in Nigeria,

during the study period, and this supports the findings of Shahbaz et al., (2015), as well as Younsi & Bechtini (2018), while it is contrary to the findings of Tita & Aziakpono (2016) and Azleen & Mansur (2017).

Table 5.4: Variance Decomposition of M2/GDP

Period	M2/GDP	MPR	GINI
1	100	0.000000	0.000000
2	95.81592	0.005627	0.044103
3	82.96106	0.574819	0.253912
4	70.34288	0.574625	0.5605
5	60.86288	0.600802	0.809971
6	54.35102	0.66225	1.018999
7	50.01313	0.727478	1.162322
8	47.08606	0.796283	1.234192
9	45.07546	0.856707	1.240498
10	43.66243	0.900466	1.198009

Source: Author's Computation

Financial development indicator: M2/GDP

Table 5: Variance Decomposition of the CPS/GDP

Period	CPS/GDP	MPR	GINI
1	9.67169	0.000000	0.000000
2	11.11484	0.018616	0.040647
3	7.429666	0.461025	0.459717
4	6.349322	0.529792	1.165325
5	7.495412	0.628815	1.868307
6	9.514507	0.745888	2.524256
7	11.62662	0.865938	3.084353
8	13.50887	0.991034	3.528628
9	15.05483	1.106992	3.844011
10	16.26597	1.203232	4.026082

Source: Author's Computation, Financial Development indicator: CPS/GDP

Table 6: Variance Decomposition of the MKTCAP/GDP

Period	MKTCAP/GDP	MPR	GINI
1	42.23311	0.000000	0.000000
2	51.77386	0.304504	0.010337
3	52.95246	0.196173	0.007346
4	50.21857	0.163339	0.00638
5	46.82295	0.13921	0.005063
6	43.60321	0.119383	0.00794
7	40.84426	0.106377	0.031288
8	38.56604	0.098695	0.106615
9	36.68883	0.093856	0.277754
10	35.10485	0.089733	0.594424

Source: Author's Computation, Financial Development indicator: MKTCAP/GDP

Table 7: Variance Decomposition of DEBTSTOCK/GDP

Period	DEBTSTOCK/GDP	MPR	GINI
1	5.513758	0.000000	0.000000
2	4.017457	0.010823	0.041636
3	2.846959	0.134176	0.26536
4	2.202038	0.142451	0.622067
5	1.837484	0.210087	0.938951
6	1.657798	0.311662	1.200792
7	1.601869	0.421611	1.385616
8	1.629813	0.536975	1.493761
9	1.716105	0.643447	1.531431
10	1.839502	0.730258	1.511799

Source: Author's Computation, Financial Development indicator: DEBTSTOCK/GDP

Table 8: Variance Decomposition of the SVT/GDP

Period	SVT/GDP	MPR	GINI
1	29.98924	0.000000	0.000000
2	27.72148	0.083491	0.057536
3	22.04641	0.330853	0.047113
4	20.47555	0.264666	0.041835
5	21.67119	0.225076	0.043653
6	23.18695	0.191476	0.054886
7	24.14697	0.166016	0.064008
8	24.52491	0.150942	0.06393
9	24.50127	0.145577	0.059169
10	24.24266	0.145684	0.06918

Source: Author's Computation, Financial Development indicator: SVT/GDP

Table 9: Variance Decomposition of the FINLIB

Period	FINLIB	MPR	GINI
1	98.73069	0.000000	0.000000
2	96.85375	0.02639	0.96 5952
3	91.9537	0.03108	4.239097
4	85.03506	0.122435	9.039542
5	77.31427	0.270571	14.34966
6	69.68853	0.444402	19.4604
7	62.6614	0.615312	24.01349
8	56.42739	0.76929	27.893
9	51.00646	0.901598	31.11567
10	46.33854	1.011672	33.75326

Source: Author's Computation, Financial Development indicator: FINLIB

(III) Variance Decomposition of Income Inequality

Table 10 reveals that in the first period, monetary policy and financial development indicators accounted for 0.53% and 4.47% of the variations in income inequality in Nigeria, respectively. In the second period, monetary policy accounted for only 1.19% of the variations in income inequality whereas financial development indicators accounted for approximately 7.5% of the variations. The contributions of monetary policy and financial development increased further in the third period as they accounted for approximately 1.77% and 10.5% of the variations in income inequality, respectively. This trend continued until the fifth, sixth and seventh periods as monetary policy accounted for 2.12%, 2.31% and 2.41% of the variations in income inequality, respectively; while financial development accounted for approximately 16.2%, 19.4% and, 20.3% of the variations in these periods.

In the eighth, ninth and tenth periods, monetary policy was responsible for 2.60%, 2.70% and 2.80% of the variations in income inequality, while financial development accounted for an average of approximately 22% of the variations in income inequality during these periods. The implication of the foregoing is that financial development accounted for a larger share of the variations in income inequality whereas monetary policy accounted for a smaller portion of the variations in income inequality during the study period. Thus, in the short run (first, second and third period), middle periods (fifth, sixth and seventh periods) and the long run (eighth, ninth and tenth periods), the contributions of financial development to variations in income inequality are more pronounced than those of monetary policy in Nigeria. We can then say that income inequality responded more to shocks from financial development than to monetary policy shocks during the study period.

This supports the a priori theoretical link of a positive relationship between financial development and income inequality since income inequality responded majorly to shocks from financial development in Nigeria. This means that shocks to financial development in the short and long run had a greater influence on income inequality in Nigeria, during the study period. The implication of this is that a stable financial sector is required for income inequality to be curtailed in Nigeria. This explains why the growing level of income inequality in Nigeria over the years is traceable to the unsatisfactory nature of the Nigerian financial system, which is still relatively underdeveloped when compared to the financial system of advanced countries. This finding is in line with the results of Brei et al. (2018), Michael et al., (2018), and Rahman et al., (2019) but is contrary to the findings of Dinler (2015) and Denk & Cournede (2015).

Table 10: Variance Decomposition of Income Inequality

Period	S.E.	MS/GDP	CPS/GDP	MKT/CAP_GDP	DEBTSTOCK/GDP	SVT/GDP	FINLIB	MPR	GINI
1	0.655495	0.551428	0.049835	0.018667	1.201959	0.320776	1.467403	0.52413	95.8658
2	0.82578	0.866146	0.388971	0.017224	0.758456	1.031746	4.045577	1.192888	91.69899
3	0.977903	1.068826	1.17501	0.021994	0.625251	2.403528	5.71782	1.768738	87.21883
4	1.102277	1.519944	1.704008	0.048061	0.72624	3.422416	6.689081	1.931748	83.9585
5	1.206398	2.166855	1.997137	0.103863	0.990481	3.920944	7.087068	2.128469	81.60519
6	1.292995	2.911444	2.071402	0.183671	1.356119	4.043344	7.131734	2.308561	79.99373
7	1.36473	3.744375	2.000834	0.263727	1.775378	3.960988	6.96955	2.468195	78.81695
8	1.424155	4.623913	1.871806	0.320658	2.218919	3.797983	6.701766	2.601148	77.86381
9	1.473271	5.505826	1.749507	0.345947	2.661329	3.621717	6.399545	2.698978	77.01715
10	1.513676	6.350735	1.66958	0.345485	3.079118	3.462071	6.109142	2.762674	76.2212

Source: Author's Computation

Note: Financial Development indicators – M2/GDP, CPS/GDP, MKTCAP/GDP, DEBTSTOCK/GDP, SVT/GDP, FINLIB,

Monetary Policy – MPR, Income Inequality - GINI

4.4 Forecast Error Impulse Response Results

The basic purpose of the variance decomposition analysis carried out earlier, is to provide information on the percentage of variations in one variable that is explained by the other variables in the system. However, variance decomposition does not tell us whether the impact of the shock is positive or negative, and the persistence of the shock to the system in the short run and long run. The impulse response analysis, on the other hand, caters to the identified issues in the variance decomposition analysis stated above. This means that the impulse response provides information and analyzes the behavior of a variable to a random innovation or shock to other variables, and how this shock permeates the entire VAR system.

(I) Forecast Error Impulse Response of Monetary Policy

The impulse response function estimated over ten quarters is presented in figure 1, which is essentially an 8x8 matrix of a panel of 64 impulse response functions. The extreme top left corner is impulse 1,1, which is the response of M2/GDP to a shock from itself, while impulse 8,8 is the response of income inequality to a standard deviation shock from itself. The result showed that a standard deviation shock originating from monetary policy positively influenced itself (impulse 7,7) in the first, second, and fourth periods, but was negative in the third period. This means that in the short run, monetary policy responded positively to shocks emanating from itself. However, between the fifth and seventh periods, monetary policy responded negatively to shocks emanating from itself, and this was also the case in the eighth, ninth, and tenth periods. This means that monetary policy negatively influenced itself, thereby reducing its effectiveness in the medium and long run, during the study period.

In terms of the response of monetary policy to a standard deviation shock from financial development indicators, the result showed that monetary policy responded negatively to shocks from M2/GDP (impulse 7,1) both in the short run and eventually, except for the first period when it was positive. Similarly, monetary policy responded negatively to shocks from the MKTCAP/GDP ratio (impulse 7,3) and the DEBTSTOCK/GDP ratio (impulse 7,4) both in the short and long run. This means that the response of monetary policy to shocks from the DEBTSTOCK/GDP ratio and the MKTCAP/GDP ratio was negative between the second and tenth periods. However, monetary policy responded positively to a one standard deviation shock from CPS/GDP (impulse 7,2) between the seventh and tenth periods while its response was negative between the second and sixth periods.

This implies that the response of monetary policy to the CPS/GDP ratio was positive in the short run but negative in the long run. Furthermore, monetary policy responded negatively to shocks from the SVT/GDP ratio (impulse 7,5) between the second and tenth period, but was positive in the eighth and ninth periods, while a one standard deviation shock to financial liberalization negatively influenced monetary policy between the fourth and tenth periods, but was positive in the second and third periods (impulse 7,6).

Thus, we can say that monetary policy's response to shocks from financial development indicators in Nigeria was mostly negative during the study period (as shown in impulses 7,1; 7,3; 7,4; 7,5; and 7,6). We can then conclude that shocks to financial development negatively influenced monetary policy effectiveness in Nigeria, during the study period. This implies that instabilities and uncertainty in the Nigerian financial sector in terms of poor financial intermediation, poor credit facilities and exchange rate and stock market fluctuations hindered the effectiveness of monetary policy in the economy. This supports the theoretical argument that an effective financial system is a necessary prerequisite for the efficacy of monetary policy actions in the economy.

In the case of income inequality (impulse 7,8), the response of monetary policy to a one standard deviation shock from income inequality was positive in the first two periods, but became negative in the subsequent periods i.e., between the third and tenth periods. This means that monetary policy responded positively to shocks from income inequality in the short run, but the response was negative between the medium and long run in Nigeria, during the study period. This implies that monetary policy effectiveness is not hindered by income inequality in the economy in the short run, but it becomes adversely affected by growing income inequality over time, which is evident in the medium and long run periods in Nigeria. This finding also provides an explanation for the weak implementation and efficiency of monetary policy in Nigeria, since the Economy over time is bedeviled by poverty, poor infrastructure and high unemployment, which has aided the growing level of income inequality in the country over time.

(II) Forecast Error Impulse Response of Financial Development Indicators

Figure 5.2 reveals that M2/GDP (impulse 1,7) and CPS/GDP (impulse 2,7) responded negatively to a one standard deviation shock from monetary policy between the first and tenth periods, which implies that the responses of M2/GDP and CPS/GDP to monetary policy shocks were negative both in the short and long run. Similarly, both indicators (impulse 1,8 and impulse 2,8) responded negatively to a one standard deviation shock to income inequality between the first and tenth periods. Similarly, DEBTSTOCK/GDP responded negatively to a one standard deviation shock from monetary policy (impulse 4,7) and income inequality (impulse 4,8) between the second and tenth periods, indicating that the response was negative both in the short and long run. This implies that the responses of M2/GDP, CPS/GDP, and DEBTSTOCK/GDP to a one standard deviation shock from monetary policy and income inequality as well, were negative both in the short and long run.

However, MKTCAP/GDP responded positively to a standard deviation shock to monetary policy (impulse 3,7) between the first and sixth periods (short and medium run) but became negative between the seventh and tenth periods (long run). The response of MKTCAP/GDP to income inequality, on the other hand, was positive in all ten periods, indicating that its response remained positive in the short run and long run in Nigeria (impulse 3,8). In the case of SVT/GDP (impulse 5,7), a standard deviation shock to monetary policy induced a negative response from SVT/GDP in the second, and third period as well as the last three periods, indicating that the negative response persisted in both the short and long run.

With regards to the response of SVT/GDP to a standard deviation shock from income inequality, it was revealed that its response was positive in the first three periods, negative between the fourth and eighth periods, and positive in the last two periods (impulse 5,8). This means that the response of SVT/GDP to a standard deviation shock from income inequality was positive in the short run, negative in the middle periods, and became positive in the long run. Finally, in the case of financial liberalization, its response to a standard deviation shock to monetary policy was positive in all ten periods, indicating that its response remained positive in the short and long run in Nigeria (impulse 6,7). Also, financial liberalization responded positively in all the periods to a standard deviation shock from income inequality, indicating that its response was positive both in the short run and long run in Nigeria (impulse 6,8).

Thus, the study found that three of the financial development indicators namely, M2/GDP. CPS/GDP, and DEBTSTOCK/GDP, responded negatively to shocks from monetary policy and income inequality in Nigeria, while financial liberalization responded positively to a one standard deviation shock from monetary policy and income inequality. Furthermore, the response of the two other indicators, namely MKTCAP/GDP and SVT/GDP,

produced mixed results in the short and long run, in terms of their responses to shocks from monetary policy and income inequality in Nigeria.

(III) Forecast Error Impulse Response to Income Inequality

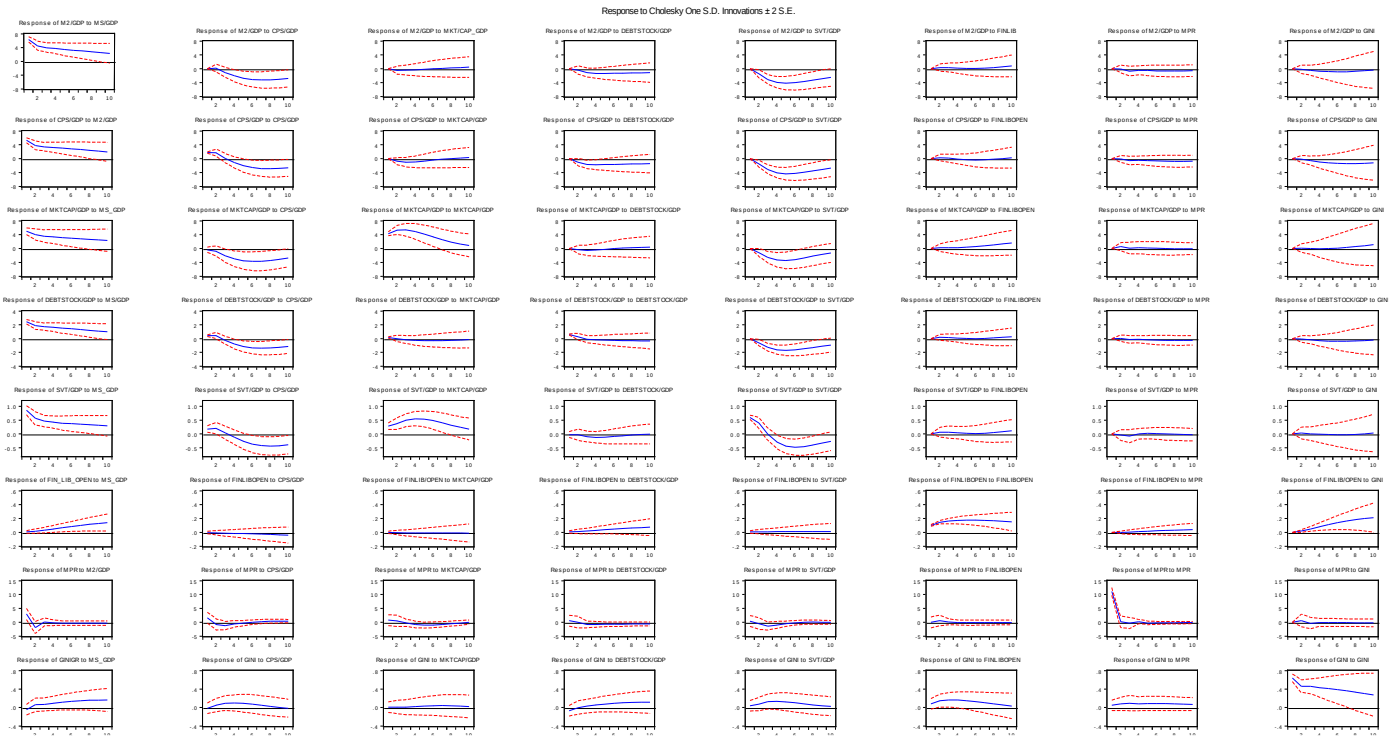
The impulse response function estimated over ten quarters is presented in Figure 5.2. The result showed that a standard deviation shock originating from income inequality positively influenced itself in the periods observed (impulse 8,8). This means that in the short and long run, income inequality responded positively to shocks emanating from itself. Similarly, income inequality responded positively to shocks emanating from monetary policy in the ten periods observed, which implies that the response of income inequality to monetary policy shocks was positive both in the short and long run (impulse 8,7). This implies that the monetary policy actions of the CBN reduced income inequality in Nigeria during the study period. This indicates that monetary authorities can adopt monetary policy as an effective tool to combat the growing level of income inequality, as opposed to the presumption that only fiscal policy is effective in lowering income inequality, as argued by some studies.

In terms of the response of income inequality to a standard deviation shock from financial development indicators, the results showed that income inequality responded positively to a shock to M2/GDP both in the short and long run (impulse 8,1).

Also, the scenario was similar for CPS/GDP, whose shock also spurred a positive response from income inequality, indicating that the response of income inequality to a standard deviation shock from CPS/GDP was positive in all the periods except for the first and last period which was negative (impulse 8,2). Furthermore, income inequality responded positively to a standard deviation shock to MKTCAP/GDP, SVT/GDP, and FINLIB in periods, indicating that the response of income inequality was positive to shocks from these indicators both in the short and long run (impulses 8,3; 8,5 and 8,6)

However, income inequality responded negatively to a standard deviation shock from DEBTSTOCK/GDP in the first two periods, but the response became positive in the subsequent periods i.e., between the third and tenth periods (impulse 8,4). Generally, we can infer that shocks from monetary policy and financial development indicators positively drive income inequality in Nigeria. This means that sudden and unanticipated improvements, efficiency and stability of the financial sector in Nigeria will immensely contribute towards the reduction of income inequality during the study period. Thus, to combat the growing level of income inequality, the government and monetary authorities should pay more attention to increasing the effectiveness of monetary policy actions, banking sector efficiency, and the stock market in Nigeria.

Figure 1: VAR Impulse response functions



Source: Author's Computation

Note: Financial Development indicators – M2/GDP, CPS/GDP, MKTCAP/GDP, DEBTSTOCK/GDP, SVT/GDP, FINLIB; Monetary Policy – MPR, Income Inequality – GI**NI**

5.0 CONCLUSION

This study examined the dynamic relationship among monetary policy, financial development, and income inequality in Nigeria. The variance decomposition and impulse response functions of the vector autoregression technique were adopted. The results showed that for the variance decomposition analysis, monetary policy is more affected by shocks to financial development. In addition, financial development is more affected by income inequality shocks and income inequality is more affected by shocks to financial development in Nigeria.

For the impulse response analysis, the results revealed that the response of monetary policy to income inequality shocks was positive in the short run but negative in the long run. However, the response of monetary policy to M2/GDP, DEBTSTOCK/GDP, and MKTCAP/GDP was negative in the short and long run but positive for CPS/GDP and FINLIB shocks. In addition, financial development indicators such as M2/GDP, CPS/GDP, and DEBTSTOCK/GDP responded negatively to monetary policy and income inequality shocks both in the short and long run, while FINLIB responded positively to both variables in the short and long run. Finally, income inequality responded positively to monetary policy shocks both in the short and long run. It also responded positively to shocks from all financial development indicators employed in the study.

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