Monetary Policy Shocks and Income Inequality in Nigeria: Do Effects of Anticipated and Unanticipated Shocks Differ?

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Abstract

Given the spate of income inequality in developed and developing countries, monetary policy shocks have been identified as a determinant of rising income inequality in developing countries. Studies have examined the effects of types of monetary policy shocks on income inequality, however, the effects of nature (anticipated and unanticipated) of monetary policy shocks have not been investigated. Therefore, the study investigates whether anticipated and unanticipated monetary policy shocks differ in their impacts on income inequality in Nigeria, using the Dynamic Stochastic General Equilibrium approach. The results show that both anticipated and unanticipated shocks have the same effects on income inequality in Nigeria. It can be deduced that both shocks reduced income inequality in the country. The study, therefore, concludes that monetary policy authority should keep all stakeholders in the economy abreast of their decision to reduce the income inequality gap in the country.

Keywords: Income Inequality, Monetary Policy shocks, DSGE, Output, Inflation.
JEL Classification Code: E17, E52

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1. Introduction

There is a growing body of literature on the causes of income inequality both in developed and developing countries. Several factors have been considered to be responsible for increasing disparity in the level of income. Such factors range from technological progress, demographics, globalization, structure of the labour market, and structure of the economy (Furceri, Loungani, and Zdzienicka, 2017, p. 2). Recently, monetary policy has also been identified as one of the causes of inequality. It has been argued that the distributional effect of monetary policy also affects income inequality, however, the net effect of this policy on income inequality is not clear (Bernanke, 2015, p. 2).

In an attempt to examine the effect of monetary policy on income inequality, Coibion, Gorodnichenko, Kueng, and Silvia (2012, p. 5) found that expansionary monetary policy shocks reduce inequality in the U.S. After this pioneering study, Saiki and Frost (2014, p. 9) found a contradicting result in the case of Japan. The study reported a positive relationship between expansionary monetary policy shocks and inequality. These two contradicting results set the stage for further investigation of the subject matter. The results of further research could be grouped into four different categories. The first set found out that contractionary monetary policy increases inequality (Furceri, Loungani, and Zdzienicka, 2017; Aye, Clance, and Gupta, 2018; Feldkircher and Kakamu, 2018). The second set found out that contractionary monetary policy decreases income inequality (Davtyan, 2016; Siami-Namini, Lyford, and Trindade, 2020). The third set discovered that expansionary monetary policy increases income inequality (Inui, Sudo, and Yamada, 2017; Taghizadeh-Hesary, Yoshino, and Shimizu, 2018; Herradi and Leroy, 2019) while the fourth set found out that expansionary monetary policy reduces income inequality (Hohberger, Priftis, and Vogel, 2019, p. 18).

However, Policy Ineffectiveness Proposition explains that the impact of monetary policy action on macroeconomic variables depends on people's expectations. According to this theory, in an economy where agents have a rational expectation, anticipated monetary policy would not affect real variables since such changes would simply translate into price level changes. Unanticipated changes in monetary policy, on the other hand, would have real effects because agents cannot distinguish between current, relative, and absolute demand shifts. To verify the validity of this theory, Furceri, Loungani, and Zdzienicka (2017, p. 4) examined the effect of unanticipated monetary policy shocks on income inequality in 32 advanced and emerging market countries. The study found out that unanticipated monetary policy shocks increase income inequality. Nevertheless, nothing is said about the effect of anticipated monetary policy shocks on income inequality in the extant literature.

Furthermore, Davtyan (2016, p.1) argues that many authors commit the error of using measures of income inequality that do not capture the income distribution of the entire population. Such measures use household data that do not represent the income of the top few that controls the economy, especially in developing countries. In such a case, the results of the effect of monetary policy shocks on inequality from such data might be misleading. He suggests the use of an income inequality index that covers the whole income distribution of the entire population.

This study, therefore, contributes to the extant literature in three areas. First, it confirms the validity or otherwise of Policy Ineffectiveness Proposition in Nigeria. Second, it examines the effects of anticipated and unanticipated conventional monetary policy shocks on income inequality in Nigeria. Anticipated and unanticipated monetary policies are generated from the monetary policy function. The implementation of monetary policy in Nigeria follows the

Taylor-type reaction function as proposed by Taylor (1993, p. 202) where the short-term interest rate is the policy instrument. The predictive component of the policy function represents anticipated monetary policy and the residual represents the unanticipated. Third, the paper uses the Gini coefficient as a measure of income inequality as suggested by Davtyan (2016, p. 2). This measure of income inequality captures the income distribution (Upper, middle, and lower) of the entire populace in Nigeria.

The paper is structured as follows. Section 1 introduces the relationship among the variables of interest. Section 2 reviews the extant literature on the subject matter. Section 3 explains the methodology while section 4 provides the empirical analysis. Section 5 discusses the results and section 6 concludes

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2. Review of Extant Literature

Studies have examined the effects of the types and nature of monetary policy shocks on income inequality. Types of monetary policy shock are expansionary and contractionary shocks. Likewise, monetary policy shock could either be anticipated or unanticipated. The pioneering paper, Coibion *et al*. (2012, p. 2), investigated the effects of the types of monetary policy shocks on consumption and income inequality in the United State. The results showed that contractionary monetary policy shocks increase income inequality. This conclusion is supported by the findings of Furceri et al. (2017, p. 10) using a panel of 32 advanced and emerging market countries between 1990 and 2013 and Feldkircher and Kakamu (2018, p. 11) in Japan between 2002:1 and 2016:4. In the same vein, Aye, Clance, and Gupta (2019, p. 8) examined the effectiveness of monetary and fiscal policy shocks on inequality in the face of uncertainty in the United State between 1980:1 and 2008:4. The results also support the fact that contractionary monetary policy shock increases income inequality in the country.

However, Davtyan (2016, p. 23) and Siami-Namini et al. (2020, p. 8) found out that contractionary monetary policy shock decreases income inequality in the U.S. Another strand of the empirical literature (Inui et al., 2017; Taghizadeh-Hesary et al., 2018; Herradi and Leroy, 2019) reported that expansionary monetary policy shock increases income inequality in Japan and 12 advanced economies respectively. Contrary to this finding is Hohberger et al. (2019, p. 18). The study found an inverse relationship between expansionary monetary policy shock and income inequality in the euro area. Furthermore, Furceri et al. (2017, p. 10) studied the effects of the nature of monetary policy shock on inequality using a panel of 32 advanced and emerging market countries. The study concentrated only on the effect of unanticipated shock on inequality, neglecting the anticipated shock. Results showed that unanticipated shock increases inequality over the period under study. Aside from Furceri et al. (2017, p. 10), the empirical literature on the effects of the nature of monetary policy shocks on income inequality is sparse. This, therefore, calls for further research.

Another important issue raised in the literature is about the measurement of income inequality. Several studies (Inui et al., 2017; Feldkircher and Kakamu, 2018; Saiki and Frost, 2019; Aye et al., 2017) used Gini coefficient generated from micro-level data. Davtyan (2016, p. 1) cast doubt on the estimates generated from such data because they might not represent the whole population, especially the top one percent that are controlling the economy. This study, therefore, contributes to the extant literature by investigating the role of anticipated and unanticipated monetary policy in generating income inequality in Nigeria, using the Dynamic Stochastic General Equilibrium approach. This is because income inequality is prominent in developing countries and understanding the impact of these shocks will help policymakers in curbing its spread. Besides, the study uses the Gini index, generated by World Development

Indicator, to measure income inequality in the country. The index measures the extent to which distribution of income among individuals or households within an economy deviates from a perfectly equal distribution.

3. Methodology

3.1 Empirical Model

The study adopts the New Keynesian model with standard Calvo sticky price and no capital, as considered by Clarida, Gali and Gertler (1999, p. 8), Woodford (2003, p. 462), Liu and Zhang (2010, p. 544), Ireland (2005, p. 9), Adebiyi and Mordi (2011, p. 2), Mordi et al. (2013, p. 7), Akinlo and Apanisile (2019, p. 5), and Apanisile and Osinubi (2020, p. 5). The New Keynesian is an extension of the neoclassical real business cycle. It introduces features of Keynesian to real business cycle thereby making monetary policy to be central to explaining macroeconomic fluctuations. The key assumptions of the model are imperfect competition which is based on the fact that firms produce heterogeneous goods and sticky prices which make it difficult for all firms to reset their prices at the same time. Key players in the model are household, firm, and government.

Household

The model presumes a set of identical and infinitely lived households that make consumption and labour supply decisions, demand money and bonds, and seek to maximize:

$$max_{C_{t,} N_t, \frac{M_t}{P_t}} E_0 \sum_{t=0}^{\infty} \beta^t \ U \left(C_{t,} N_t, \frac{M_t}{P_t} \right) \qquad (1)$$

Where E_0 denotes expectation operator condition on time 0 information, β is the discount factor, $\frac{M_t}{P_t}$ is the real money holding; subject to the budget constraint:

$$P_t C_t + Q_t B_t + M_t \leq + M_{t-1} B_{t-1} + W_t N_t + J_t \qquad (2)$$

Where $C_t\ (i)$ represents the quantity of good i consumed by the household in period t, for $i \in [0,1]$ for t = 0, 1, 2, …., $P_t\ (i)$ is the price of good i, N_t denotes hours of work, W_t is the nominal wage, B_t represents purchases of one-period bonds at a price Q_t, B_{t-1} is the number of bonds purchased last year, M_t is money holding and J_t is a lump-sum component of income. $\in$ measures the intertemporal elasticity of substitution between the differentiated goods, which is equal to the price elasticity of demand. Using the Kuhn-Tucker approach to obtain FOC conditions of equations (1) and (2) and re-arrange, we have:

$$1 = \beta(1 + i_t) E_t \left\{ \frac{U_{c(t+1)}}{U_{c(t)}} \frac{P_t}{P_{t+1}} \right\} \qquad (3)$$

$$- \frac{U_{N(t)}}{U_{C(t)}} = \frac{W_t}{P_t} \qquad (4)$$

$$\frac{U_{M(t)}}{U_{C(t)}} = \frac{i_t}{1+i_t} \qquad (5)$$

Equations (3), (4), and (5) determine the intertemporal consumption allocation (the Euler equation), the labour- leisure choice, and the money demand respectively. The equations determine the rational forward-looking household's allocation decision.

Under the assumption of a period utility given by:

$$u(C_t, N_t, M_t) = \frac{C_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\varphi}}{1+\varphi} + \frac{\left(\frac{M_t}{P_t}\right)^{1-v}}{1-v} \quad (6)$$

The marginal utilities of consumption, labour, and money become:

$$U_{Ct} = C_t^{-\sigma}$$
$$U_{Nt} = -N_t^{\varphi}$$
$$U_{Mt} = \left(\frac{M_t}{P_t}\right)^{-v}$$

Substituting the marginal utilities into equations (3) – (5), we have:

$$1 = \beta Q_t^{-1} E_t \left\{ \left(\frac{C_{t+1}}{C_t}\right)^{-\sigma} \frac{P_t}{P_{t+1}} \right\} \quad (7)$$
$$C_t^{\sigma} N_t^{\varphi} = \frac{W_t}{P_t} \quad (8)$$
$$\frac{M_t}{P_t} = C_t^{\frac{\sigma}{v}} \left(\frac{1+i_t}{i_t}\right)^{\frac{1}{v}} \quad (9)$$

Log- linearize equations (7) – (9) and denote log of variables in the capital letter with small letters, we have:

$$c_t\ E_t c_{t+1} - \frac{1}{\sigma}(i_t - \rho - E_t \pi_{t+1}) \quad (10)$$
$$w_t - p_t = \sigma c_t + \varphi n_t \quad (11)$$
$$m_t - p_t = c_t - \eta i_t \quad (12)$$

Firm

The model also assumes a continuum of firms indexed by $i \in [0,1]$. Each firm produces a differentiated good, but they all use an identical technology. This is represented by the production function:

$$Y_{it} = A_t N_{it}^{1-\alpha} \quad (13)$$

Y_{it} is the output produced by firm i in period t, A_t is the economy-wide technology level and N_{it} is labor force used by the firm. One key ingredient in the New Keynesian model is price rigidity. When firms set their prices, they can do so freely. However, they do not know when the next opportunity to change price will emerge. Therefore, the probability of not knowing when to change the price in a given period is θ. This is the fraction of all firm that is stuck with the price they had last period while the remaining 1 – θ firms reset their prices. All firms face an identical elastic demand schedule with price elasticity ϵ and take aggregate price level P_t and aggregate consumption index C_t as given. Besides, the aggregate price dynamics are described by the equation:

$$\pi_t^{1-\epsilon} = \theta + (1-\theta)\left(\frac{P_t^{*}}{P_{t-1}}\right)^{1-\epsilon} \quad (14)$$

Where:

$\pi_t \equiv \frac{P_t}{P_{t-1}}$ is the gross inflation rate and P_t^{*} is the price set in the period t by firms that are re-optimizing their price in that period. Since all firms will choose the same price because they face an identical problem, the steady-state with zero inflation will give $\pi = 1$. In that case, $P_t^{*} = P_{t-1} = P_t$. Therefore, a log-linear approximation to the aggregate price index around zero-inflation steady state gives:

$$\pi_t = (1-\theta)(P_t^{*} - P_{t-1}) \quad (15)$$

Equation (15) above shows that inflation in the present period is a result of re-optimizing firms that choose a price that is different from the economy's average price in the previous period. Hence, to understand the evolution of inflation over time, there is a need to analyze the factors underlying firms' price-setting decisions. This is done by considering a firm that is re-optimizing in period t that choose a price P_t^{*} that maximizes the current market value of the profits generated while the price remains effective. The optimization problem is solved as follows:

$$max P_t^{*} \sum_{k=0}^{\infty} \theta^k E_t \left[Q_{t,t+k} \left(P_t^{*} Y_{t+k/t} - \varphi_{t+k}\left(Y_{t+k/t}\right)\right)\right] \quad (16)$$

Subject to the sequence of demand constraints

$$Y_{t+k/t} = \left(\frac{P_t^{*}}{P_{t+k}}\right)^{-\epsilon} C_{t+k} \quad (17)$$

The first-order condition of the problem takes the form:

$$\sum_{k=0}^{\infty} \theta^k E_t\left(Q_{t.t+k} Y_{t+k/t}\left[P_t^{*} - M\omega_{t+k/t}\right]\right) = 0 \quad (18)$$

for k = 0,1,2,…….. where $Q_{t,t+k}$ is the stochastic discount factor for nominal payoffs, $\varphi_t(.)$ is the cost function and $Y_{t+k/t}$ denotes output in period t+k for a firm that last reset its price in period t, θ^k is the probability of being stuck with today's price in K periods and M is the desired or frictionless mark-up. The optimal price P_t^{*} becomes:

$$p_t^{*} = \mu + (1-\theta\beta)E_t \sum_{k=0}^{\infty} \theta^k \beta^k [mr_{t+k|t}^{r} + p_{t+k}] \quad (19)$$

To solve for equilibrium in the goods market, the market-clearing condition requires that:

$$Y_{it} = C_{it} \quad (20)$$

Aggregate output in the market is defined as:

$$Y_t = \left(\int_0^1 Y_{it}^{\frac{\epsilon-1}{\epsilon}} \, di \right)^{\frac{\epsilon-1}{\epsilon}} \quad (21)$$

Substitute for (20) in (21), equation (21) then becomes:

$$Y_t = C_t$$

Taking the log of both sides, we have:

$$y_t = c_t \quad (22)$$

Equation (22) is the aggregate market clearing condition. Also, market-clearing in the labour market equals:

$$N_t = \int_0^1 N_{it} \, di \quad (23)$$

Re-arrange equation (13) by making N_{it} the subject. Equation (13) becomes

$$N_{it} = \left(\frac{Y_{it}}{A_t} \right)^{\frac{1}{1-\alpha}}. \quad (24)$$

Substitute (22) and (24) into (23) then log-linearized the result. Equation (22) becomes:

$$y_t = a_t + (1-\alpha)n_t \quad (25)$$

Monetary Authority

The monetary authority (government) implements monetary policy according to a simple rule. The Taylor-type rule takes the form:

$$i_t = \alpha_r i_{t-1} + (1-\alpha_r)(1+\alpha_\pi)\pi_t + \beta_x(\hat{y}) + v_t \quad (26)$$

Where:

$i_t = short\ term\ interest\ rate$
$i_{t-1} = lag\ of\ short\ term\ interest\ rate$
$\pi_t = inflation\ rate$
$y_t = output\ gap$
$v_t = is\ the\ monetary\ shock$

3.2 Log-linearized model

Log-linearization reduces the computational complexity of macroeconomic models and allows the simultaneous computation of the equations. The log-linearized systems of the above model are as follows:

$$\hat{y}_t = E_t\hat{y}_{t+1} - \sigma(i_t - E_t\pi_{t+1}) \quad (27)$$
$$\pi_t = \beta E_t(\pi_{t+1}) + k\check{y}_t \quad (28)$$
$$i_t = \alpha_r i_{t-1} + (1-\alpha_r)(1+\alpha_\pi)\pi_t + \beta_x(\hat{y}) + v_t \quad (29)$$

Equation (27) is the dynamic IS curve. The equation shows that the current level of the output gap is a function of its expected future level of the output gap and its ex-ante real interest rate. This is obtained by subtracting the expected inflation rate from the nominal interest rate. This equation corresponds to a log-linearized version of the Euler equation linking an optimizing household's inter-temporal marginal rate of substitution to the real interest rate. The second equation is the New Keynesian Philip curve. The equation corresponds to a log-linearized version of the first-order condition describing optimal behaviour of monopolistically competitive firms that either face explicit costs of nominal price adjustment, as suggested by Rotemberg (1982, p. 1206), or set the nominal prices in a randomly staggered fashion, as suggested by Calvo (1983, p. 392). The third equation is an interest rate rule for monetary policy proposed by Taylor (1993, p. 202). In equation three, the short-term interest rate is the policy instrument. The apex bank adjusts the instrument in response to movements in inflation and output. The three equations involve four variables namely output gap(y_t), inflation (π_t) nominal exchange rate, and nominal interest rate (r_t).

3.3 Data

The study uses quarterly data between1986:1 and 2019:4 to examine the effect of anticipated and unanticipated monetary policy shocks on income inequality in Nigeria. Data on output, nominal interest rate, nominal exchange rate, domestic inflation rate, terms of trade, and Gini index are gathered from World Development Indicator (online source). The output gap is generated from the nominal output using the Hodrick-Prescott filter. Also, anticipated and unanticipated monetary policy shocks are generated from monetary policy function where the interest rate is the policy instrument as proposed by Taylor (1993, p. 202). The predictive component and the residual of the policy function are generated. The predictive component is anticipated shock and the residual is an unanticipated shock. All sources of noise are eliminated to ensure the stability of the model.

4. Empirical Analysis

The use of the Bayesian technique in estimating DSGE models has several advantages over all other techniques (Akinlo and Apanisile, 2019, p. 5; Apanisile and Osinubi, 2020, p. 5). It requires the calibration of parameters of interest to solve identification problems that are peculiar to estimating DSGE models. Calibration implies fixing parameters which could be seen as imposing strict prior. Parameters that are important to defining the steady-state equilibrium are calibrated. This provides the opportunity for assessing the extent to which the data validate the selected priors in achieving the steady-state for key parameters in the country's economy. Priors for this study are selected based on information from published articles on DSGE in Nigeria. The selected studies are Adebiyi and Mordi (2011, p. 2), Mordi et al. (2013, p. 7), Akinlo and Apanisile (2019, p. 5), and Apanisile and Osinubi (2020, p. 5). Priors of the parameters of interest and standard error of shocks are presented in table 1.

Besides, the Bayesian method allows the combination of prior (theoretical knowledge) and likelihood function to produce the posterior distribution needed for the estimation.

The posterior, as defined by Baye's theorem, is given as:

$$p\left(\theta \middle| Y_{1,}^{T}, M\right) = \frac{L(\theta|Y_1^T, M)p(\theta|M)}{p(Y_1^T|M)}$$

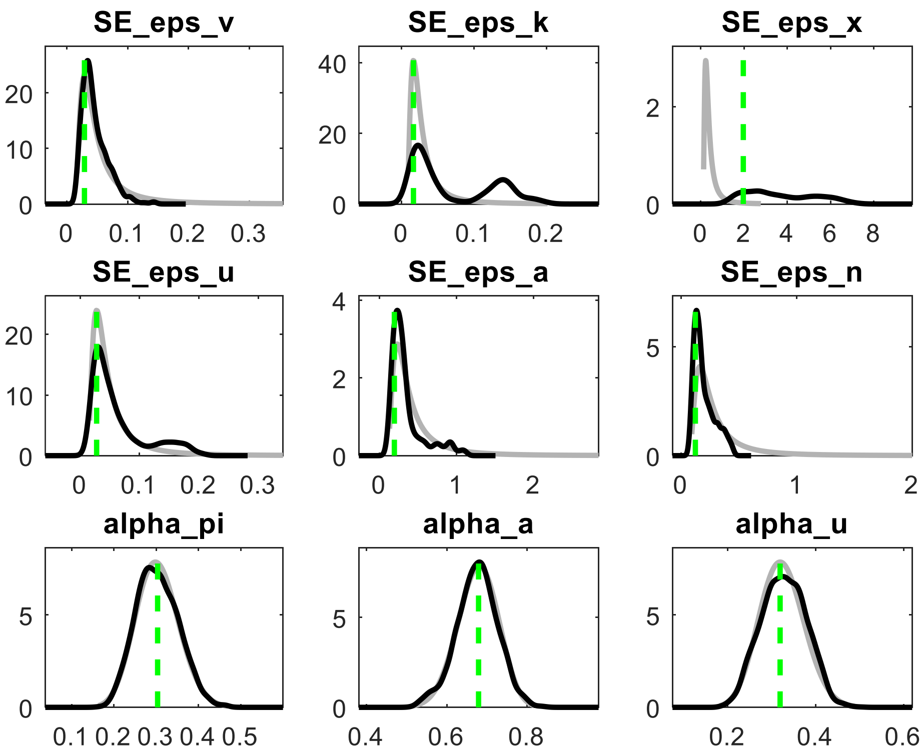
Where $\theta \ and \ Y_1^T$ denote the whole set of model parameters and the observed data, respectively. L denotes the likelihood function, $p(\theta|M)$ and $p(Y_1^T|M)$ are the prior density and the marginal data density conditional on M, respectively. The study constructs and evaluates $L(\theta|Y_1^T, M_i)$ by Kalman filter. The posterior kernel, $L(\theta|Y_1^T, M_i)p(\theta|M_1)$, is simulated for each model specification by a random-walk Metropolis-Hastings(MH) algorithm, which is a Markov chain

Monte Carlo (MCMC) simulation method. The study employs Matlab and Dynare (version 4.3.3) for estimation.

Furthermore, the models are simulated to verify the existence of the steady-state of the models and obtain the steady-state values of the endogenous variables. This is done by calibrating the value of the shocks and simulate. The calibrated values of the shocks are presented in table 1 (see appendix). Results of the simulation show that a steady-state exists. This implies the solution to the models exists and the values of the endogenous variables are generated.

5. Discussion of Results

The posterior density of the parameters of interest and monetary policy shocks considered in the study are generated. The MH algorithm produces 10,000 draws to generate the posteriors. The model also generates a log data density value of 134.861626. Table 2 (see appendix) presents the priors, posteriors, and confidence intervals of the parameters of interest and the standard error of shocks. Also, figure 1 shows the shape of the priors and the posteriors. The grey line represents the prior and the black line represents the posterior distribution of the parameters estimated in the model. The vertical green line is the posterior mode generated from the numerical optimization. Figure 1 shows that the posterior mode is similar to the prior mode generated during simulation except for few charts in figure 1.



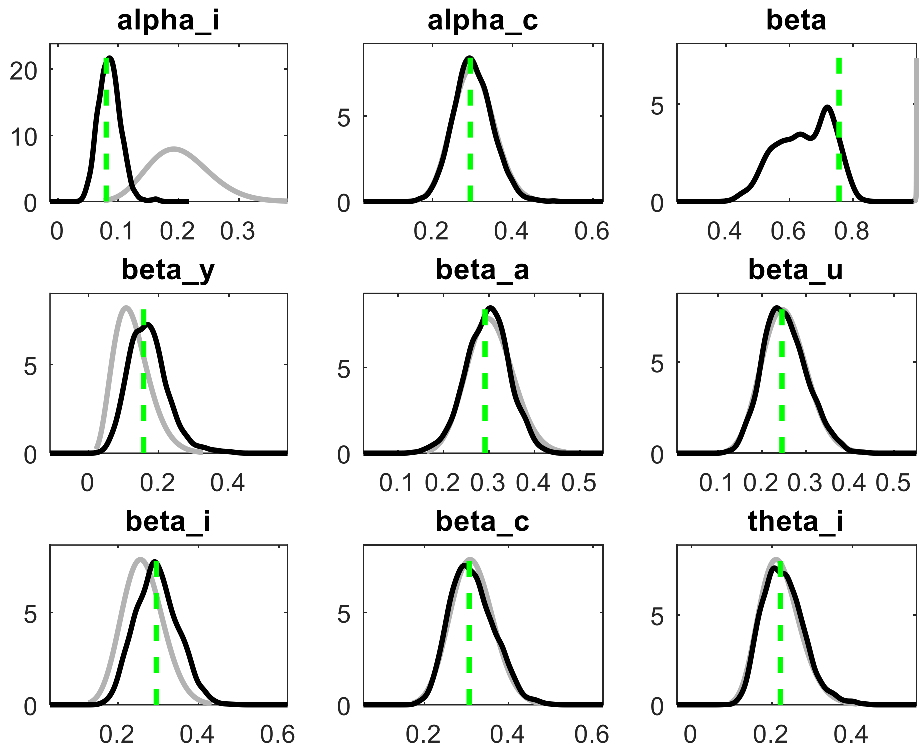


Figure 1: Shapes of Prior and Posterior distribution of estimated parameters

It can be deduced from the results presented in table 2 and figure 1 that the selected priors perfectly fit the model and appropriate. Also, the results show that the data is informative as the value of priors is not significantly different from the posteriors generated from the data. This further substantiates the validity of the estimates. Lastly, figure 1 shows that the posterior graphs do not deviate significantly from normality, which implies the parameters data are normally distributed.

Moreover, figure 2 presents the smoothed diagram of all the shocks in the model. However, based on the objective of the study, the study generates Bayesian impulse-response of responses of income inequality and other macroeconomic variables to anticipated and unanticipated monetary policy shocks.

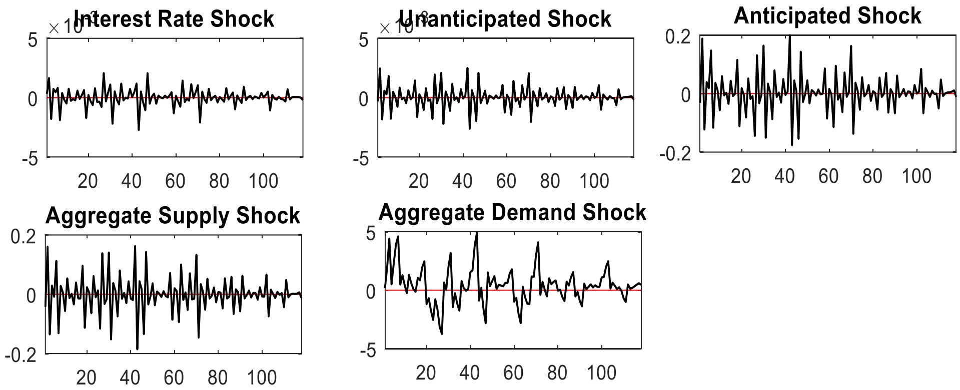


Figure 2: Smoothed diagram of shocks in the model

5.1 Bayesian Impulse Response Result

Bayesian impulse responses of monetary policy shocks are presented in Figures 3 and 4. The figures show the responses of macroeconomic variables and income inequality to 1% unanticipated and anticipated monetary shocks. Five macroeconomic variables considered are output, inflation, interest rate, exchange rate, and terms of trade. The major variable considered in the study is income inequality. It can be deduced from figure 3 that 1% unanticipated shock increases inflation, exchange rate, and terms of trade. However, it reduces output level and interest rate. On the variable of interest, income inequality, unanticipated monetary policy shock reduces income inequality and promotes equality in income distribution in the country. This result negates the findings of Furceri et al. (2017, p. 10).

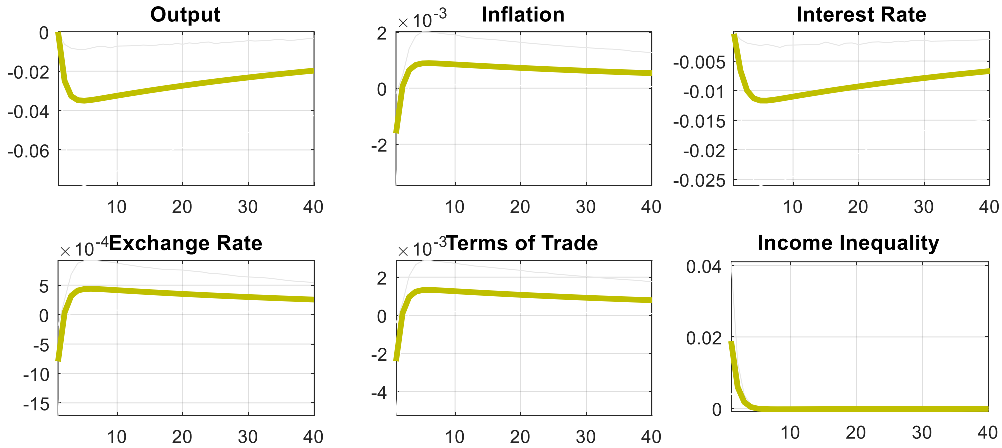


Figure 3: Response to 1% Unanticipated Monetary Policy Shock

Responses of macroeconomic variables and income inequality to 1% anticipated monetary policy shocks are presented in figure 4. The responses of the variables under anticipated monetary policy shock are similar to that of unanticipated shock but with different magnitudes. 1% anticipated shock increases inflation, exchange rate, and terms of trade. It, however, reduces output and interest rate. As for income inequality, the anticipated shock also promotes equality by reducing income inequality over the period under study. This implies, the response of income inequality is indifferent to the nature of monetary policy shock.

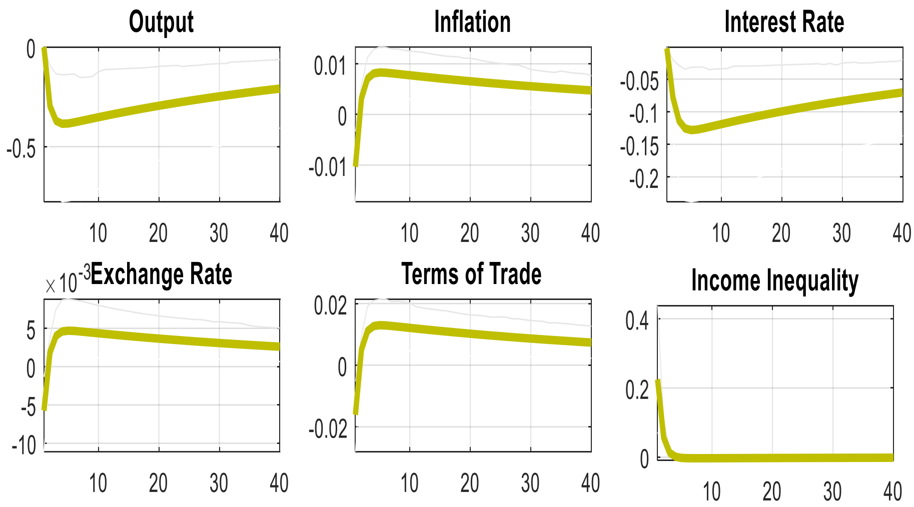


Figure 4: Response to 1% Anticipated Monetary Policy Shock

5.2 Robustness and Diagnostic Checks

Following Coibion (2012, p. 8), the study uses cross-sections standard deviations of log levels, in addition to Gini coefficients of levels, as a robustness check. This becomes necessary because measurement of income inequality is of major concern in the literature and also to check whether the result of the study will change. The results remain the same for both measures of income inequality. Besides, the multivariate convergence graph is presented in figure 5 to show the stability of the model. Figure 5 presents the parameters mean (interval), second moment (m2), and third moment (m3) are generated. The rule of thumb is that the two distinct lines that represent the between and within chains must be constant and converge to each other. It can be deduced that the distinct lines in all the graphs in figure 5 demonstrate convergence, which shows the stability of the model. Lastly, prior means and standard deviations are increased by 1% and re-estimated for sensitivity analysis. Changes observed, when compared with the benchmark model, are not significant. Results of the sensitivity analysis are available upon request.

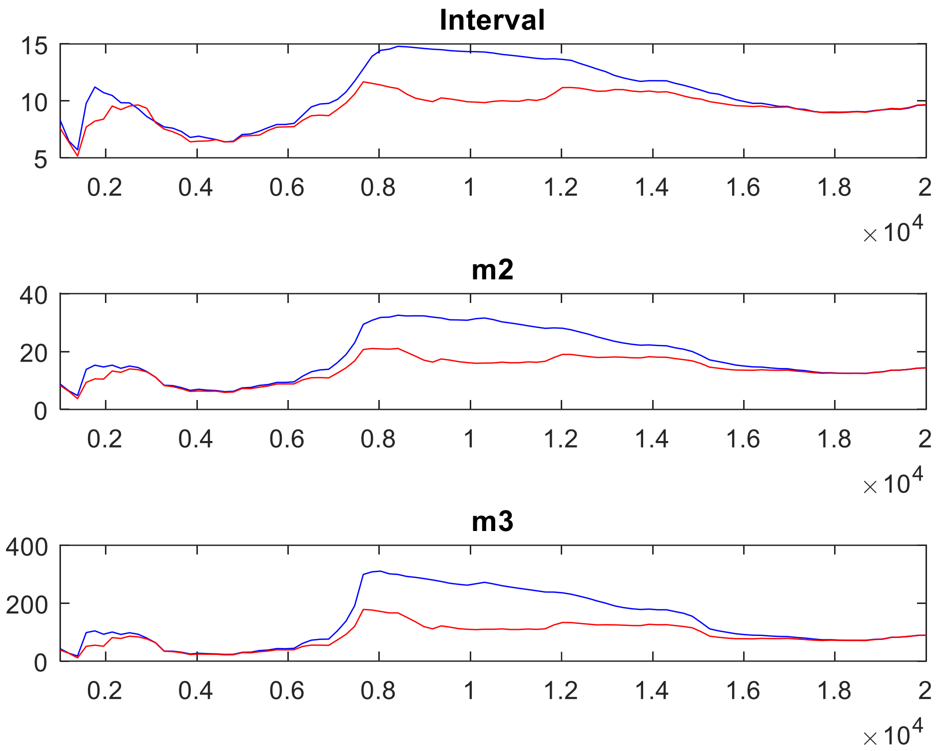


Figure 5: Multivariate Convergence Diagnostic Result

6. Conclusion

The extant literature has recently identified monetary policy shocks as one of the determinants of increasing income inequality in developed and developing nations. Studies have examined the effect of types (expansionary and contractionary) of monetary policy shock on income inequality. However, the effect of the nature (anticipated and unanticipated) of monetary policy shock on income inequality is missing in the literature, especially in developing countries. Investigating this effect becomes necessary due to increasing disparity among different income groups in developing countries. The objective of this study, therefore, is to analyze the impact of anticipated and unanticipated monetary policy shocks of income inequality in Nigeria, a developing country with a spate of income inequality. The study estimates a sticky-price DSGE similar to Ireland (2005, p. 9) and Belongia and Ireland (2014, p. 3), Adebiyi and Mordi (2011, p. 2), Mordi et al. (2013, p. 7), Akinlo and Apanisile (2019, p. 5), and Apanisile and Osinubi (2020, p. 5). The study employs quarterly data between 1986:1 and 2019:4. The results show that the policy ineffectiveness proposition (PIP) does not hold in Nigeria as both anticipated and unanticipated monetary policy reduces income inequality in the country. The study concludes that a monetary policy shock is a potent tool in reducing income inequality irrespective of its nature. Therefore, monetary policy authority should keep the stakeholders abreast of every decision they might want to take as it reduces disparity among the income groups in the country.

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Appendix

Table 1: Priors of the Estimated Parameters

Parameter	Description	Density	Mean	Std Deviation
α_1	Measures impact of inflation on the output gap	beta	0.230	0.005
α_2	Measures impact of anticipated monetary policy on the output gap	beta	0.290	0.065
α_3	Measures impact of unanticipated monetary policy on the output gap	beta	0.320	0.005
α_4	Measures impact of interest rate on the output gap	beta	0.620	0.005
α_5	Measures impact of income inequality on the output gap	beta	0.500	0.105
β_2	Measures of impact of inflation expectation on the rate of inflation	beta	0.320	0.005
β_3	Measures of impact of output persistence on the rate of inflation	beta	0.260	0.005
β_4	Measures impact of anticipated monetary policy on inflation	beta	0.240	0.005
β_5	Measures impact of unanticipated monetary policy on inflation	beta	0.170	0.005
β_6	Measures impact of interest rate on inflation	beta	0.320	0.005
β_7	Measures impact of income inequality on the rate of inflation	beta	0.280	0.005
φ_2	Measures weight put on the interest rate by policymakers	gamma	0.260	0.050
φ_3	Measures weight put on inflation by policymakers	gamma	0.320	0.125
φ_4	Measures weight put on output by policymakers	gamma	0.260	0.065
eps_v	Measures interest rate shock	invg	0.063	0.0118
eps_a	Measures anticipated monetary policy shock	invg	0.505	0.1954
eps_x	Measures aggregate demand shock	invg	0.493	1.9620
eps_u	Measures unanticipated monetary policy shock	invg	0.061	0.0113
eps_n	Measures aggregate supply shock	invg	0.356	0.0352

Table 2: Priors and Posteriors of the Estimated Parameters

Parameter	Density	Prior Mean	Posterior Mean	Std Deviation	Confidence Interval	
α_1	beta	0.230	0.2295	0.005	0.2214	0.2378
α_2	beta	0.290	0.2897	0.065	0.1921	0.4101
α_3	beta	0.320	0.3196	0.005	0.3121	0.3281
α_4	beta	0.620	0.6197	0.005	0.6117	0.6271
α_5	beta	0.500	0.5144	0.105	0.3579	0.6826
β_2	beta	0.320	0.3199	0.005	0.3121	0.3274
β_3	beta	0.260	0.2601	0.005	0.2518	0.2684
β_4	beta	0.240	0.2392	0.005	0.2317	0.2478
β_5	beta	0.170	0.1699	0.005	0.1614	0.1776
β_6	beta	0.320	0.3203	0.005	0.3124	0.3283
β_7	beta	0.280	0.2979	0.005	0.2717	0.2879
φ_2	gamma	0.260	0.2550	0.050	0.1611	0.3425
φ_3	gamma	0.320	0.2430	0.125	0.0853	0.3836
φ_4	gamma	0.260	0.2595	0.065	0.1588	0.3533
eps_v	invg	0.063	0.0459	0.0221	0.0163	0.0765
eps_a	invg	0.505	0.3467	0.0689	0.1124	0.7168
eps_x	invg	0.493	3.6659	0.0110	1.3505	6.1133
eps_u	invg	0.061	0.0625	0.0368	0.0155	0.1477
eps_n	invg	0.356	0.1989	0.1176	0.0810	0.3546