Abuja Journal of Economics & Allied Fields, Vol. 12, No. 5, December, 2023.
Print ISSN: 2672-4375 Online: 2672-4324

Spill-over Effects of United States Monetary Policy on Macroeconomic Stability in Nigeria

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Abstract

The monetary policy pronouncement and implementation by the US may have implication for macroeconomic stability in Nigeria. The objective of the paper was to examine US monetary policy spill-over on macroeconomic stability in Nigeria.To achieve this objective the stochastic properties of the data were examined. The optimal lag length selection criteria were used to select the optimal lag length for the model, while the impulse response functions were generated from the Bayesian VAR to determine the innovation from US monetary policy to macroeconomicstability in Nigeria.The findings vary by the type of macroeconomic variable under consideration. MPR and OPS had the greatest negative impacts following innovation from US monetary policy, while ER, CPI and IBCR had slightly negative impacts following the innovation and GDPGR had the least negative impact. Generally, the negative impacts are greater in quarters and magnitudes than the positive impact following US monetary policy innovation. The findings may beuseful for macroeconomic policy-maker as this may be required to understand the spill-over effects – direction and magnitude of innovations and then can plan for a macroeconomic policy coordination and then intervention to deal with the spill-over effects.

JEL Classification Numbers: E5, E6 & C4
Keywords: *Monetary policy, Macroeconomic stability, Bayesian Vector Autoregression*

1.1 Introduction

The US policy had been expansionary in response to the global financial crisis and the great recession (Danladi, 2022). This may also be coupled with her policy of globalism. Generally, the monetary policy pronouncement by the advanced economies may have a global or regional connotation Danladi, (2022) and possibly specific country's effect. However, these effects would depend on the macro fundamentals of the economy in question (Danladi, 2022).These argumentsare situated within the Mundell-Fleming model who posited an open economy with external trade and financial transactions, and how the key macroeconomic variables are determined, interact and the effects of these on fiscal and monetary policy.It also shows how an expansionary monetary policy would weakens the domestic currency and makes the terms of trade to worsen leading to lowering prices of domestic goods (Frenkel and Razin, 1987).

The likelihood of spill-over effects may have

steam from the fact that there are investmentsflows between Nigeria and the US. For instance,the Foreign Direct Investment (FDI) in Nigeria was $5.6 billion in 2019 and Nigeria's FDI in the US stock was $105 million in 2019 (US Trade, 2022). Despite the importance spill-over effects,few studies have been conducted in Nigeria. For instance,Deng et al., (2022);Geng et al.,(2021); Kawai (2015);Ntshangase et al.,(2023); Ahmed et al., (2021);Cecchetti et al.,(2021) &Arbatli-Saxegaard et al., (2020) conducted studies across emerging and selected countries. However, only few studies for Nigeria - spillover effectsof US monetary policy and macroeconomic conditions(Danladi, 2022). Therefore, more studies are required to deepen the monetary authorities' understanding of US monetary spill-over effects for macroeconomic stability in Nigeria. Again, considering that crude oil priceisa vital for macroeconomic stability,it was not incorporated in(Danladi, 2022) study. Though, this was incorporated in(Tule et al., 2019), the study was on US spill-over effects forTreasury bond yield in Nigeria. More, all these studies used descriptive statistics as summary statistics and VAR estimation technique, including Danladi(2022) who used Time-Varying Parameter Structural Vector Autoregression (TVP-VAR). However, TVP-VAR approach suffers from inference problem. This would be overcomedin the current paper by using Bayesian approach to the Time-Varying Parameter Structural Vector Autoregression (TVP-VAR) with SV. Therefore, the objective of the paper is to examine US monetary policy spill-over on macroeconomic stability in Nigeria. It is expected that the spill-over from the U.S monetary policy would have an impact on Nigeria's GDP, MPR, CPI inflation, exchange rate, oil price shock and interbank call rate. The results would be used in cushioning the effects of these spill-overs so as to maintain macroeconomic stability in the country. The rest of the paper is structured as follows section 1.2 stylized facts, 1.3 is the literature review, section 1.4 the methodology, section 1.5 the results, section 1.6 the discussions, section 1.7 the conclusion and the recommendations.

1.3 Literature

1.3.1 Theoretical Literature

Several models have similarly explained the spill-over effects of monetary policy across nations. These are the Small Open Economy (SOE) model, the Global Financial Cycle (GFC) model and the Mundell Fleming MF model.

The SOE model, describes the imperfection in the financial markets and the impact of exchange rate in SOEM(Lepez, 2015).The GFC explains the co-movement in the risky assets such as leverage financial aggregates assets prices and capital flows through the globe is linked to a theory called the Global Financial cycle (GFC). This theory poses several questions; however, the one related to our problematic is the explanation of the importance fluctuations in aggregate risk taking in the global market. The theory also explains that the global variables in-inflow and out-flow tend to relate to one another. It also emphasizes that these variable are separated by assets type. These assets are portfolio bonds, equity flow and banking flow as they co-move to determine the overall flow variables (Lepez, 2015). The capital flow is also highly associated with commodity indices such as oil prices and international trade in global output.

The MF model explained the role played by international capital movement in influencing monetary policy effectiveness under the different types of foreign exchange rate regimes. The model is extended to the economies that deal with international trade and financial assets (Frenkel and Razin, 1987)**.** The notion that monetary policy may have an international connotation began with the MFM - a model of international macroeconomics. The model originated from the spirit of Robert and Mundell and Marcus and Fleming in the earlier part of the 1960s. However, the model was first applied by Frenkel and Razin in 1987 to examine the transmission of monetary policy among nations. The model also focuses on the

short term relationship between the economy's nominal exchange rate, interest rate and output. Some of its doctrines provide the framework for the current study. It explains the transmission mechanism through which domestic monetary policy may have an effect on the foreign output inflation, asset prices and monetary policy. For instance, the model predicts that expansionary monetary policy could lead to exchange rate depreciation. This could further leads to terms of trade deterioration with the consequences for cheaper goods and servicesin the foreign countries. This is called the beggar-they-neighbor-effect (Tran and Pham, 2020). MFM had been used to explain a macroeconomic trilemma. What this meant is that, it may be difficult for a country ensure or implement the policy of fixed exchange rate, free capital flow and independent monetary policy, all at the same time.

Another version of the MFM is the Dornbusch 1976 type and explained that changes in monetary policy can lead to large changes in asset prices and also exchange rate. This is a phenomenon through which monetary policy expansion would lead to exchange rate changes and would lower interest rate and appreciate the partner countries. Also in the spirit of MFM and expansionary monetary policy could weaken the domestic currency and leads to terms of trade deterioration. This further leads to lowering prices at home goods and services (Frenke and Razin, 1987). The lowering of prices which is a merit for the home country leads to an appreciation of export. This further leads to a fall in the output in the foreign countries.The model also explains how rising liquidity emanating from US monetary policy would lead to rising equity and property prices in foreign countries (Ntshangase, 2023).

Though the GFC and the MF models have explained the spill-over effects of monetary policy across economies, the MF model is more robust in this regards. Thus, this is adapted for this study and is used as the theoretical framework for the study in the method section. It is important to note that the portfolio investment and other channels of spill-over effects are in particular what led to the spill-over effect of the 2007/2008 global financial crisis for Nigeria.

1.3.2 Empirical Literature

The Mundell-Fleming Model (MFM) describes the workings of a small economy open to international trade in goods and financial assets, and provides a framework for monetary and fiscal policy analysis.

Most of the empirical literature conducted on US spill-over effects of monetary policy and macroeconomic stabilitycut across emerging and developed market economies. To facilitate the review process most of the studies have been summarized and presented in Table 1 to ease the review process. The titles of the table represent themajorfocus of the reviews - author/coverage/country or region, objective, variables, methods, results.

Most of the studies Deng et al.,(2022);Geng et al., (2021); Danladi, (2022); Ntshangase et al., (2023) and Tule et al.,(2019) are not from Nigeria. Given the investment and trade linkages between Nigeria and the USA the US spill-over effects and it macroeconomic stability becomes necessary. In addition there are growing opportunities between Nigeria and USA which are yet to be taped and harnessed and would continue to increase there by leading to spill-over effects between the two countries. Therefore, most studies in the area of US spill-over effects are warranted to understand the magnitude and direction and of this spill-over effects Nigeria economy that receives this negative shocks can be repositioned for better economic stability.

With reference the variables used in previous studies, the variables that determine spill-over effects and macroeconomic stability have been used to examine the spill=over effects . These variables cut across most of the specialized areas in economics such as public sector/public finance, monetary, international trade. However, given the position of Nigeria as an oil producing economy a study that incorporates oil price

shock asmajor variable that may tend to cause macroeconomic instability in the country during such periods of spill-over effect is warranted.

Concerning the methods most of the studies Deng et al.,(2022); Geng et al.,(2021); Danladi, 2022 and Ntshangase et al.,(2023) with the exception of Tule et al.,(2019) use VAR of various forms. However, traditional VAR has been found to suffer from over-parameterization with poor forecasting abilities especially when small samples are used. The Bayesian VAR model BVAR which are known for their flexible priors and the reliable lag selection system have been used for this current study.

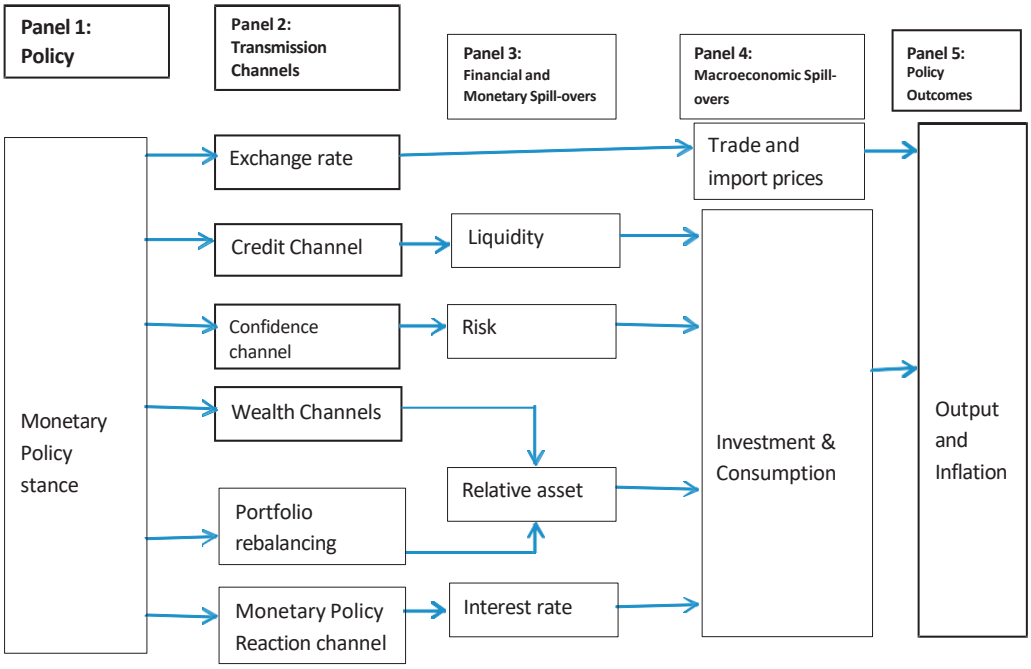
Regarding the conclusions drawn from the previous studies US spill-over effects. It was observed most are not directly applicable for Nigeria as the portfolio size and type flowing between US and the countries in question may differs thereby signaling a different spill-over effect. Therefore, the current study is required to examine the spill-over effect of US monetary policy to Nigeria.

1.4 Methodology

1.4.1 Conceptual framework of Channels of International Spill-over Transmission Mechanism of Monetary Policy

Fig1 depicts the channels of international spill-over transmission mechanism of monetary policy. This is broken down into 1-5 panels. Panel 1, is the monetary policy stance of the US monetary policy authorities. The Federal fund rate is used in the current study as to represent the stance of the monetary authorities. Panel 2, is the transmission channels of monetary policy. The relative effectiveness of the channels will depend on the areas of trade transaction and portfolio investment between US and Nigeria.

Fig1: Channels of International Spill-over Transmission Mechanism of Monetary Policy



Source: Adapted from (Danladi, 2022)

Channels 3 and 4 are the spill-over channels which are determined by portfolio and traded transactions between the US and Nigeria. Panel 5 is the policy outcomes of the spill-over effects. This shows the outcome of the spill-over on the final goal of monetary policy.

1.4.2 Theoretical framework

The MF model explained the role played by international capital movement in influencing monetary policy effectiveness under the different exchange rate regimes. The model is extended to the economies that deal with international trade and financial assets (Frenkel and Razin, 1987). The notion that monetary policy may have an international connotation began with the MFM. This is a model of international macroeconomicsthat originated from the spirit of Robert and Mundell and Marcus and Fleming in the earlier part of the 1960s. However, the model was first applied by Frenkel and Razin in 1987 to examine the transmission of monetary policy among nations. The model also focuses on the short term relationship between the economy's nominal exchange rate, interest rate and output. Some of its tenets provide the framework for the current study. It explains the transmission mechanism through which domestic monetary policy in this case US monetary policy may have an effect on the foreign output inflation, asset prices and monetary policy. For instance, the model predicts that expansionary monetary policy could lead to exchange rate depreciation. This could further leads to terms of trade deterioration with consequences for cheaper goods and services in the foreign countries. This is called the beggar-they-neighbor-effect (Tran and Pham, 2020). MFM had been used to explain a macroeconomic trilemma. What this meant is that, it may be difficult for a country ensure or implement the policy of fixed exchange rate, free capital flow and independent monetary policy, all at the same time.

Another version of the MFM is the Dornbusch 1976 type and explained that changes in monetary policy can lead to large changes in asset prices and also exchange rate. This is a phenomenon through which monetary policy expansion would lead to exchange rate changes and would lower interest rate and appreciate the partner countries. Also in the spirit of MFM and expansionary monetary policy could weaken the domestic currency and leads to terms of trade deterioration. This further leads to lowering prices at home goods and services (Frenke and Razin, 1987). The lowering of prices which is a merit for the home country leads to an appreciation of export. This further leads to a fall in the output in the foreign countries. The model also explains how rising liquidity emanating from US monetary policy would lead to rising equity and property prices in foreign countries (Ntshangase, 2023).

1.4.5 Data, description and sources

Secondary data set on US monetary policy (Federal Fund Rate), GDP, MPR, CPI inflation, Exchange rate, Oil price shock, Interbank call rate were obtained from the World bank development indicator of the World Bank and the Central Bank of Nigeria.

1.4.3 Empirical framework and Estimation Technique

Bayesian Vector Autoregression

The Bayesian model approach has often been utilized for forecasting multivariate VAR economic time series rather than for univariate model (Kenny el al., 1998). This approach was pioneered by Doan, Litterman and Sims (1984). The priors assumed in this studyare called Minnesota and Litterman priors were assumed for an n-dimensional VAR of a non-stationary time series data. If we consider the n-variable VAR of order p, VAR(p) as in the equation below.

$$Y_t = \Gamma_1 Y_{t-1} + \cdots + \Gamma_P Y_{t-P} + \mu + \in_t \quad \text{----------1}$$

Whereas

$$y_t = n\ x\ 1\ vector\ of\ non-stationary\ time\ series\ data$$

$$\mu = n\ x\ 1\ vetcor\ of\ coefficient$$

$$\in_t = nx1\ vetcor\ of\ error\ term$$

r^1 through rp = (nxn) matrix of parameter requiring estimation

Therefore, VAR(p) is a set of equations which each variable depending on the constant and lags 1, through p of all n variables in the system. Each equation in the VAR system contains same explanatory variables and can be estimated using OLS. Therefore, the equation above has exactly n = pn2 parameters that required estimation. It is not surprising that the results from unrestricted VARs often provide estimated that are imprecise and insignificant. This issue of having more model parameter that require over-parameterization is more pronounced in small sample size model. Such models are often used for macroeconomic forecasting.

Studies have shown that unrestricted VAR models usually produce poor-out-of-sample forecast(forecast affected by mismatch between variables and data set) (Kenny el al., 1998).To overcome this Doan, Litterman and Sims have proposed the use of Bayesian approach in the estimation of the parameters of the model specified in the above equation. The Litterman or Minnesota prior was based on the notion that each series is described as a random walk around unknown deterministic components. Therefore, the prior distribution (mean and variance) is centeredon the random walk specification for variable n as given in the equation below.

$$Y_{n,t} = \mu_n + Y_{n,t-1} + \epsilon_{n,t} \quad \text{------} \quad 2$$

The above equation states that the mean of the prior distribution on the first lag of the n in the equation for the variable n =1

The mean of the prior distribution on all the other coefficients =0

However, if the data suggests that there are greater effects from the lags other than the first own lag, or from the lag of all the other variables in the model this will be shown in the results. The prior information is assumed to be known regarding the prior mean on the deterministic components. Therefore, the data determines the deterministic independently normal. Therefore, once the means have been specified, the other prior inputsare some estimate of the dispersion about the prior means.

Estimating the Order BVAR Model

In this paperBVAR(1) is selected by the criterion implying BVAR(1) is the best since it has the minimum AIC, SBIC, and HQIC (Table 5). Based this criteria, we can use the BVAR(1) model for prediction and forecasting purposes as shown in equations [3-5]. Therefore, the BVAR(1) model to be estimated at lag1 are as follow;

Matrix form of the Bayesian Var

$$\begin{bmatrix} CPI_t \\ ER_t \\ FFR_t \\ GDPGR_t \\ IBCR_t \\ MPR_t \\ OPS_t \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \\ c_7 \end{bmatrix} + \begin{bmatrix} b_{11}^1 b_{12}^1 b_{13}^1 b_{14}^1 b_{15}^1 b_{16}^1 b_{17}^1 \\ b_{21}^1 b_{22}^1 b_{23}^1 b_{24}^1 b_{25}^1 b_{26}^1 b_{27}^1 \\ b_{31}^1 b_{32}^1 b_{33}^1 b_{34}^1 b_{35}^1 b_{36}^1 b_{37}^1 \\ b_{41}^1 b_{42}^1 b_{43}^1 b_{44}^1 b_{45}^1 b_{46}^1 b_{47}^1 \\ b_{51}^1 b_{52}^1 b_{53}^1 b_{54}^1 b_{55}^1 b_{56}^1 b_{57}^1 \\ b_{61}^1 b_{62}^1 b_{63}^1 b_{64}^1 b_{65}^1 b_{66}^1 b_{67}^1 \\ b_{71}^1 b_{72}^1 b_{73}^1 b_{74}^1 b_{75}^1 b_{76}^1 b_{77}^1 \end{bmatrix} \begin{bmatrix} CPI_{t-1} \\ ER_{t-1} \\ FFR_{t-1} \\ GDPGR_{t-1} \\ IBCR_{t-1} \\ MPR_{t-1} \\ OPS_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \\ \epsilon_{3t} \\ \epsilon_{4t} \\ \epsilon_{5t} \\ \epsilon_{6t} \\ \epsilon_{7t} \end{bmatrix} \cdots - 3$$

4.4 Properties of the data Set

Prior to the estimation of the model, descriptive statistics and correlation matrix would be performed to provide summary statistics and to determine if there is need to conduct a unit root test. If there is need, two tests would be conducted – (i.) ADF test checks to check if the mean of the time series is constant over time and complement it with(ii) Phillips-Perron test to checks if the variance is constant over time. The estimation technique would be the Bayesian approach to the Time-Varying Parameter Structural Vector Autoregression (TVP-VAR) with SV. This is important to overcome the inference problem that might have been encountered in TVP-VAR conducted by (Danladi, 2022).

4.5 Results

In table 2, is presented the summary statistics of the data. The values of the skewness are fairly symmetrical going by the rule of thumb as they fall between -0.24119 and 1.404585. Similarly, the valueof the kurtosis was discovered to be platykurtic with values <6,suggesting that the distributions are shorter, with thinner tails, withpeak lower and broader. This suggests that the data are free from outliers.

Table 2: Descriptive statisticsof thedata set

Statistics	CPI	ER	FFR	GDPGR	IBCR	MPR	OPS
Mean	144.552	198.9996	1.508478	5.145792	10.68968	10.89762	71.70303
Median	110.8261	153.8625	0.63	5.917685	10.54167	10	69.0775
Maximum	421.0711	425.9792	6.5	15.32916	22.95417	14	116.6925
Minimum	29.60007	101.6973	0.13	-1.79425	4.016667	6.083333	26.08667
Std. Dev.	107.0668	98.64922	1.822908	3.619883	3.743725	2.118741	30.35774
Skewness	1.067839	1.062442	1.404585	0.362132	1.280235	-0.24119	0.128423
Kurtosis	3.215737	2.699514	3.887617	4.19952	5.94278	2.365271	1.838844
Jarque-Bera	17.6627	17.65412	33.27063	7.526386	58.32785	2.436376	5.421303
Probability	0.000146	0.000147	0	0.02321	0	0.295766	0.066493
Sum	13298.79	18307.97	138.78	473.4128	983.4508	1002.581	6596.679
Sum Sq. Dev.	1043161	885581.8	302.3923	1192.423	1275.409	408.5046	83864.92
Observations	92	92	92	92	92	92	92

***Source**: Extracted from the e-views output results by the author*

Some of the probability values of the Jarque-Beravalues are <0.05. Thisinfers that the series are not normally distributed and suggest that a unit root is present in the series and warrant that a stationarity test is conducted to remove the unit root from the data.In table 3 is presented co-movement of the macroeconomic variables The correlation coefficients for most of the with US monetary policy rate.

Table 3: Co-movement of macroeconomic variables with US monetary policy rate

variables of interest which are presented in a matric form lies between -0.5 and 0.5. This suggests that there is no possibility ofmulticolinearity among the variables since they do not show high association.

In this study an optimal lag length was examined following Log-likelihood (LogL),likelihood ratio (LR),final prediction error (FPE), Akaike's information criterion

Variable	CPI	ER	FFR	GDPGR	IBCR	MPR	OPS
CPI	1	0.978663	-0.38561	-0.63868	0.316363	0.69655	0.250551
ER	0.978663	1	-0.32196	-0.65859	0.346758	0.693276	0.07788
FFR	-0.38561	-0.32196	1	0.10911	-0.26594	-0.15706	-0.44283
GDPGR	-0.63868	-0.65859	0.10911	1	-0.41441	-0.66366	-0.14616
IBCR	0.316363	0.346758	-0.26594	-0.41441	1	0.577053	0.199583
MPR	0.69655	0.693276	-0.15706	-0.66366	0.577053	1	0.177226
OPS	0.250551	0.07788	-0.44283	-0.14616	0.199583	0.177226	1

Source: *Extracted from the e-views result by the author*

(AIC), Schwarz Criteria (SC) and Hannah- Quinn (HQ) lag length selection criteria. The results of the lag selected are shown in Table 4.

Table 4: Optimal lag length selection forthe macroeconomic variables

VAR Lag Order Selection Criteria
Endogenous variables: CPI ER FFR IBCR MPR OPS
Exogenous variables: C Date: 08/31/23 Time: 10:04
Sample: 2000Q1 2022Q4
Included observations: 84

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1717.13	NA	2.65E+10	41.02697	41.2006	41.09677
1	-1203.85	941.0108	308124.9	29.6632	30.87861*	30.15178
2	1196.97	11.63968	624173.3	30.3564	32.61359	31.26377
3	-1183.22	21.2769	1095488	30.88621	34.18517	32.21236
4	-1045.73	193.137	104194.5	28.46984	32.81059	30.21479
5	-929.761	146.3462	17287.58*	26.56574*	31.94826	28.72946*
6	-919.284	11.72464	37582.71	27.17342	33.59772	29.75593
7	898.902	19.89673	70181.91	27.54528	35.01136	30.54658
8	-827.127	59.81202*	43314.7	26.6935	35.20136	30.11359

Source: *Lag orders from e-views extracted by the author*

Note: *Indicate the lag order chosen by each criterion

It was discovered that SC has chosen a model with lag 2, FPE and AIC and HQ with lag 5, and LR with lag 8. Since the author is at liberty to choose based on the lag structure displayed by the various criteriona lag of 5 was then chosen. This is because it accommodates most of the criterion FPE, AIC and HQ with the least values.

The study applied ADF and PPT unit root tests. The PP test has the advantage that it is robust to heteroskedasticity in the error term and correct for the variance, while the ADF corrects or the mean.Based on this the decision rule were taken considering the PPT test. A null hypothesis of the presence of a unit root test was accepted for all the series when the tests were conducted at levels. In Table 5, it was found that at first difference all the variables were stationary and the VAR model was estimated.

Table 5: Unit root test

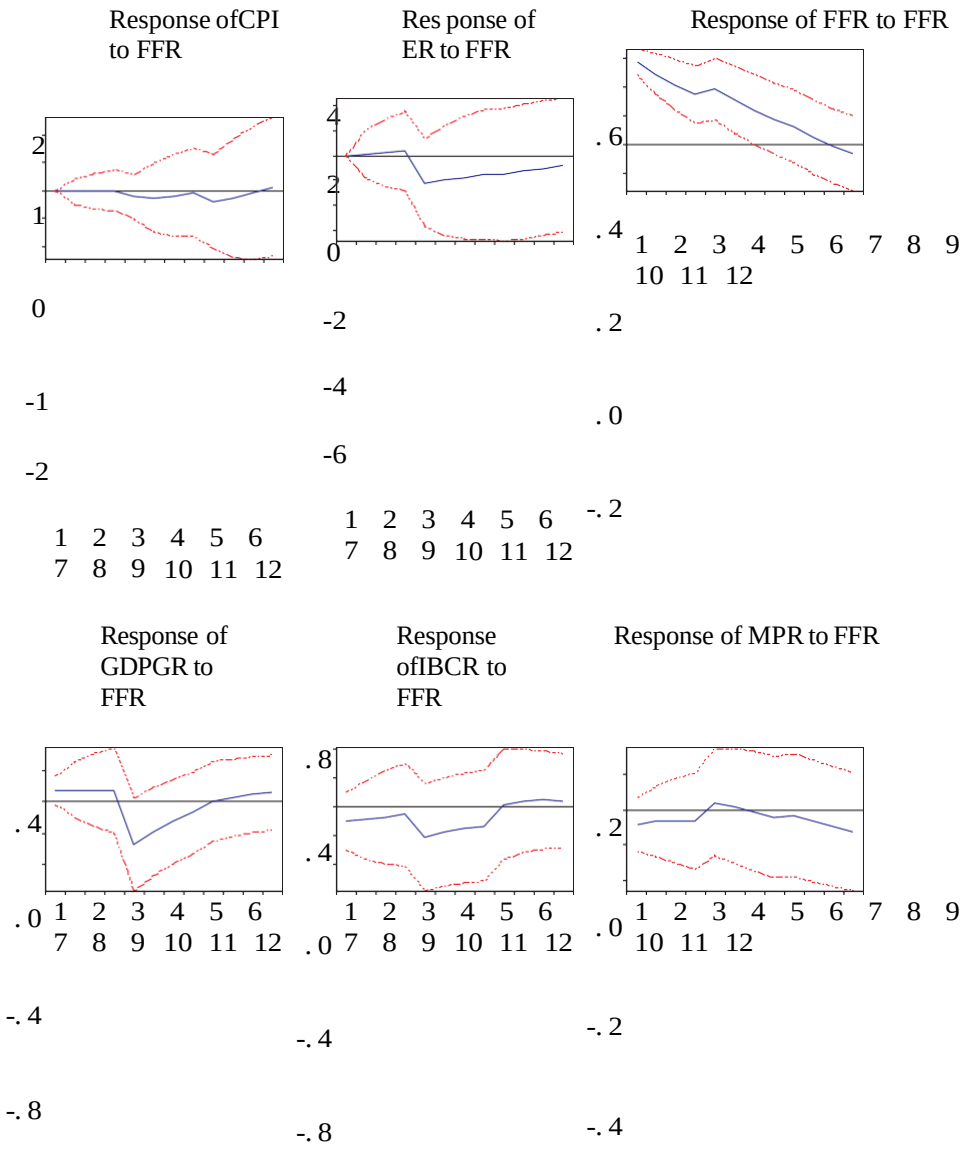
Variable	ADF				P P1				Final Decision Rule
	Level	1st Diff.	2nd Diff.	Decision Rule	level	1st Diff.	2nd Diff.	Decision rule	
Cpi	2.52	-3.46	-84.52	I(2)	-1.06	-13.66	-	I(1)	I(1)
Er	-1.23	-3.14	-17.69	I(2)	-0.58	-11.07	-	I(1)	I(1)
Fir	-2.88	-9.51	-	I(1)	-2.88	-9.51	-	I(1)	I(1)
Gdpgr	-3.50	-6.77	-	I(1)	-3.69	-9.33	-	I(1)	I(1)
Ibcr	-3.08	-9.33	-	I(1)	-3.37	-9.33	-	I(1)	I(1)
Mpr	-2.11	-9.40	-	I(1)	-2.16	-9.40	-	I(1)	I(1)
Ops	-9.38	-	-	I(0)	-1.95	-9.38	-	I(1)	I(1)

Source: *Compile from e-views output by the author*

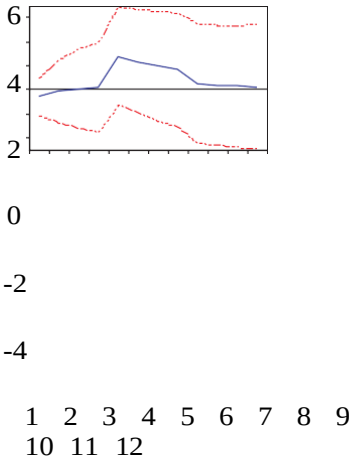
Impulse response results

The IRF is depicted in Figure 1, it depicts that the response CPI, ER, GDPGR IBCR MPR and OPS from US monetary policy. Each graph has 3 lines; the outer 2 red lines are the 95% confidence interval and the middle red line the IRF line. The blue line must lay between the 95% degree 2 red lines for the IRF to make sense.

Figure 1: Impulse response results



Res ponse of OPS to FFR



The one (1) SD shock (innovation)to CPI from US monetary policy is shown in the first graph. A one (1) SD shock to CPI at the initial quarters 1-5 has no appreciable impact on the CPI. However, from quarters 4th to 6th the response gradually declines, gets to negative until it reaches the 7thquarter. It starts to rise as from 8th quarter againto quarter 9th. From quarter 9th it raises continuously until it gets to positive between the quarters of 11 and 12. On the overall, the result portrays that innovation from US monetary policy to CPI would have no initial impact, then negative impact in the short run and a positive impact in the long run.

The innovation to ER is similar in trend CPI. It shows no initial minimal from quarters 1-4. Then a negative impact from quarter 4-5 and a gradual rise from quarters 5-12 though still at the below zero line. On the overall, there is minimal impact following an innovation, followed by a negative and then a positive impact.

The innovation to GDPGR follows a similar trend like CPI and ER. There is no initial impact from quarters 1-4, though with positive values. From quarter 4-5 it became negative with a sharp drop from 4-5 quarters. From 5- 12quarters there is steep rise though in a positive line right to quarter 12. On the overall, there is no impact following an innovation, then a negative and then a positive impact and the positivity extends above the zero line.

The innovation to IBCR showed a slight increase in IBCR (1-4) quarters, though the IRF still remainbelow the zero line. There was a sharp drop from quarters 4-5 and a further slight rise from 5-8and a sharp rise from 8-9. Form quarters 9-12 there was no impact. Generally, unlike the CPI, ER, and GDPGR there was an initial impact following an innovation, then a sustained rise and then no impact in the long-run.

The innovation to MPR showed no initial impact from quarter 1-4. From quarter 4-5 there was an increase which peaked at quarter 5 after the zero line. Form quarter 5-8 there was a slight drop and then from 8-9 a slight increase and from 9-12 a slight drop again. Generally,there was apositive increase in the short run and a negative decline in the long run.

The innovation to OPS showed an initial impact, following innovation from the US monetary policy which increased from quarter 1-4 zero line. From quarters 4-5,there was a sharp rise to quarter 5. From quarter 5-8 there was a slight decrease from quarters 8-9. Form quarters 9-12 there was no impact at all following an innovation. Generally, following an innovation from US monetary policy increase in the short run, then decrease after and no impact in the long run.

4.6 Discussions

This current paper found that US monetary policy innovation impact negatively on GDP, CPI, MPR and ERin Nigeria. This is consistent with Geng et al.(2021) who also found out for China, Japan, EU and Canada that US monetary policy innovation impact negatively on GDP, CPI and MPR. This study also concur with Deng et al.(2022) who also found out for BRICS countries that US monetary impact negatively on their

GDP, CPI and MPR. Therefore mitigating the spill-over effects for Nigeria in particular and USA and these countries in general would be essential. This could be in improving on the monetary policy that response to inflow and out flows between Nigeria and the USA.

Generally, the current study discovered that the US monetary policy innovation are negative and last for longer quarters and in intensity than positives impacts. This is consistent with Danladi et al.(2022) who also discovered for Nigeria that the US monetary policy innovations impacts last longer with more of the negative than the positivesimpacts. Therefore, improving on the trade and investment flows to address these long lasting and negative effects would be useful.

4.7 Conclusion and Recommendation

MPR and OPS had the greatest negative impacts following US monetary policyinnovation. However, ER, CPI and IBCR had slightly negative impacts and GDPGR the least negative.On the overall, the negative impacts are greater in most quarters and in magnitudes than the positive impacts following US monetary policy innovation, suggesting that US spillover effects may more harmful than beneficial. The findings may be essential for macroeconomic and monetary policy-maker in magnitude and direction of policy aimed at cushioning the spill-over effects.

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