Trans-Atlantic Transmission Of Interest Rate Shocks: Any Macroeconomic Concern For Nigeria?

Maria Chinecherem Uzonwanne [1] , Catherine Chidinma Mbah [2] , Kingsley Chidera Adonike [3] , Innocent Acho Egbunike [4]

Abstract:

The interconnectivity of global economies has created undue uncertainties in severeal domestic economies. As a result, this paper specifically investigates the trans-Atlantic transmission of interest rate shocks with a view to identifying any macroeconomic concern for Nigeria using Annual time series data from World Bank's Development Indicators 2020. To achieve the objectives of this study, various econometric tests were carried out on the variables such as the Augmented Dickey- Fuller (ADF) test, variance decomposition test as well as the impulse response test. The impulse response analysis of our VAR model shows that Nigerian variables respond significantly to shocks from foreign variables. The study therefore concluded that shocks in Nigeria are mostly from across the Atlantic. In line with this, the study recommended that monetary authorities in Nigeria should base their policy making on foreign shocks with a view to stabilizing the macroeconomic environment.
Keywords: *GDP growth rates, Interest Rates Shocks, Macroeconomy, Nigerian economy Trans-Atlantic shocks.*

1. Introduction

In a global interconnectedness, foreign monetary shocks are often an economic concern for growing market economies and other developing economies of the world. This is owing to the fact that The world is now a global village and is globally argued that in the era of globalization, macroeconomic policies (monetary and fiscal) applied in one country can have a trans-boarder effect on some other countries, either positively or negatively (Uzonwanne, Adonike & Egbunike, 2020). With the COVID-19 outbreak, the interconnectivities of the world economies have become pronounced following the uncertainties it has thrown to the path of the developed and the underdeveloped economies. With this new normal, one of the major problems facing policy makers across the globe, especially the developing countries has been the macroeconomic effects of cross boarder interest rate changes. Interest rate is a major macroeconomic variable whose changes has the tendency to affect the position of every economy (Nigeria Economic Society, 2021; Oguanobi, Akamobi & Agu, 2014).

Across the Atlantic, the United States of America is the economic powerhouse whose influence in the global macroeconomic sphere cannot be over emphasized (Han & Wei, 2017). This economic influence been exercised by the US government

[1]*Department of Economics, Nnamdi Azikiwe University, Awka, Anambra State.* mc.uzonwanne@unizik.edu.ng
[2]*Department of Economics, Nnamdi Azikiwe University, Awka, Anambra State.* cc.mbah@unizik.edu.ng
[3]*Department of Economics, Nnamdi Azikiwe University, Awka, Anambra State.* adonikekingsly@gmail.com
[4]*Department of Economics, Nnamdi Azikiwe University, Awka, Anambra State.* innoceg@gmail.com

on several instances. This including when the US Federal Reserve raised the interest rate multiple times in the early 2000s, when it rolled out quantitative easing (QE) after the start of the Global Financial Crisis, when it considered "tapering" in 2013, when the increase in the US interest rate actually took place in December 2015, when the market revised downward expectations in 2016 about the number of US interest rate increases that was expected to happen in 2016, and when the Federal Reserve further postponed another rate increase in the same year. During these periods, interest rates shocks were reported at the emerging markets (but not always) to follow the actual or anticipated changes in US interest rates.

Reports from the Central Bank of Nigeria (2020) showed that the rate of interest for example, rose from 12% to 15% in Q3 and Q4 respectively coupled with an epileptic foreign exchange policy of 2016. This resulted from the avowed policy of the Nigerian fiscal authority to 'spend our way' out of economic recession by expansionary government policies. This further led to upward trended inflationary pressures throughout 2016 as evident in increase in consumer prices from 12.8% in March 2016 to 13.7 % in April and 17.6 % in September. Indeed the core inflation rate in Nigeria increased by 17.85% in January of 2018 over the correspondent period in 2019 (CBN, 2020; Nigeria Bureau of Statistics, 2020) as shown in the fig1 below:
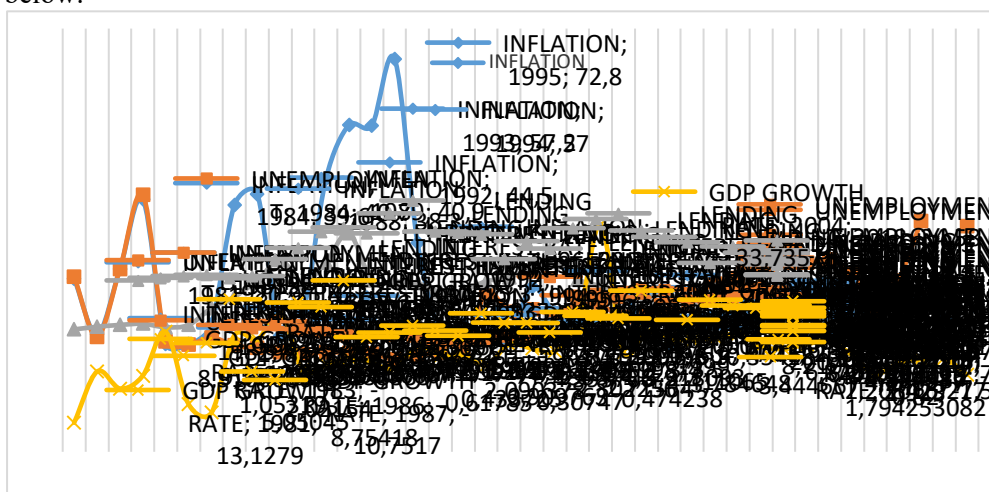

Figure 1. Fluctuating Trends of Some Selected Macroeconomic Variables in Nigeria (1981-2020)
Source: Central Bank of Nigeria statistical bulletin (2019); World Bank Data (2020).

In 2009, during which the United States interest rate decreased to 3.25%, Nigeria's interest rate remained on its path as it increased further to 18.9908%. Between 2008 and 2014, Nigeria experienced great increase in the rate at which her GDP grew (from 6.76% in 2008 to 8.0% in 2009 and then 8.0% in 2010). In 2011, there was a slight fall in the rate to 6.7%. Nigeria's inflation rate increased from 11.6% in 2008

to 12.5% in 2009 and then 13.7% in 2010 and maintained a higher rate in of 13.25% in 2020 as depicted in the figures 2
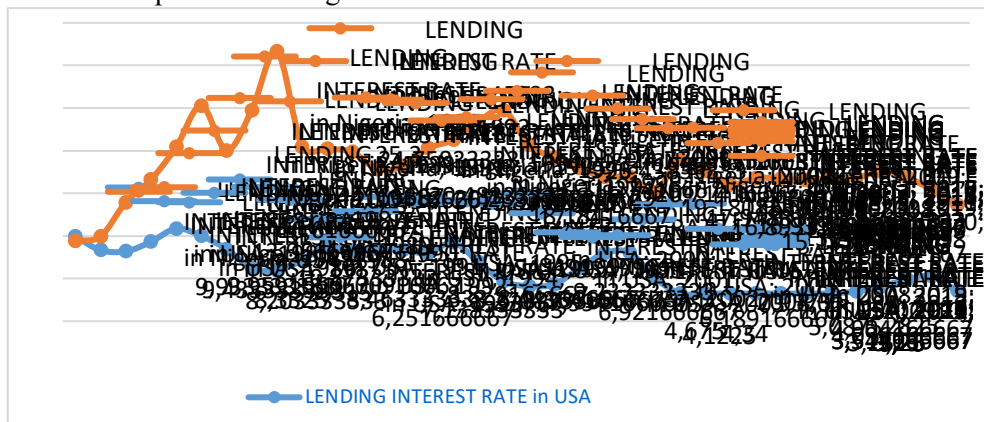

Figure 2. Comparative Trends of US and Nigeria rates of interest (1985-2020)
Source: World Bank Data (2020).

With the wild swings in interest rates and other macroeconomic indicators, financial planning has difficult for all stakeholders in the economy. Large companies tend to hold off on borrowing and postpone key investments while they assess the financial landscape. Banks find it very hard to plan and forecast profits if the rates at which they can borrow and lend are highly variable. Similarly, investors, tend to wait for a downswing in general interest rate which thus, slows down economic activities for an underdeveloped economy like Nigeria which is grasping for a post Covid-19 recovery.

In the light of the above discourse, several empirical studies (Ufuk, 2016; Edwards, 2010; Cristiano-Botia, Gonzalez-Molano & Huertas-Campos, 2018; Asaleye, Popoola, Lawal, Ogundipe & Ezenwoke; 2018; Oguanobi, Akamobi & Agu**,** 2014) on the cross boarder implication of macroeconomic shocks have reviewed with none conducted at post Covid-19 to the best of our knowledge. This may have the tendency of affecting the previous finding following the perceived dependence of Nigeria's economy to external shocks. To this end, the study provided the answer to the crucial questions as to what extent does Nigeria's interest rates respond to interest rate shocks in the United States.

Following the introduction, the rest of the paper is structured as follows; the next section 2 provides a review of literature. Section 3 details the theoretical framework and methodology, while section 4 presents and discusses the empirical findings. Section 5 concludes the paper with some policy recommendations.

2. Theoretical Background

Interest rate is seen as the return or yield on equity or opportunity cost of deferring current consumption into the future. Some examples of interest rate include the

savings rate, lending rate and the discount rate (Adebiyi, 2001). The rate of interest according to Keynes is determined by the forces of demand and supply of money. Keynes theory of income, output and employment explains how interest rate, through changes in investment, influences growth in an economy.

Interest rates as an important macroeconomic indicator in Nigeria, has changed within the time frame of regulated and deregulated regimes. These swings in interest rate have been witnessed at different times and in different sectors of the economy since 1970s and mid 1980s under the regulated regime (Acha & Acha, 2011). The preferential interest rates were based on the premise that the market, if freely applied, would exclude some priority sectors (Anyiyang, 2012). The fluctuations in these rates of interest across the Atlantic borders are perceived to transmit into the local economy which may further lead to an interest rate shocks as conceptualized below:
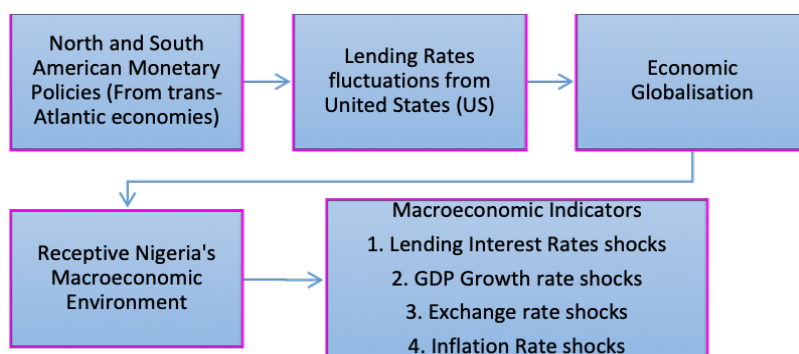

Figure 3. Conceptual Framework on Trans-Atlantic transmission of interest rate shocks
Source: Researchers' compilation, (2021)

The rational Expectation Theory

As developed by John F.Muth in 1961 and popularized by Robert Lucas and T. Sargent in the 1970s, the rational expectations theory is relevant for this kind of study as it assumed that outcomes that are being forecast do not differ systematically from the market equilibrium results. As a result, rational expectations do not differ systematically or predictably from equilibrium results. That is, it assumes that people do not make systematic errors when predicting the future, and deviations from perfect foresight are only random. This is applied in economic modeling by assuming that the expected value of a variable is equal to the expected value predicted by the model.

For example, suppose that I is the equilibrium interest rate in an economy, determined by supply and demand of capital. The theory of rational expectations indicates that the actual rate will only differ from the expectation if there is a ' shock in information' caused by information unforeseeable at when the expectations were

formed. In other words, ex ante rate is anticipated to fall in line with its rational expectation as modeled below:

$$I = I^* + e \qquad\qquad (1)$$
$$E(I) = I^* \qquad\qquad (2)$$

As applied to this study, this rational expectation theory helped explain how the shocks in the US interest rates can help predict the rate in the Nigerian lending rate. This expectation is expected to be rational following the 2008 stock market crisis in US whose shocks had macroeconomic effect across borders.

The Real Business Cycle (RBC) theory

As first presented by Kydland and Prescott (1982), the real business cycle theory explains the role of real shocks in driving business fluctuations. Prescott (1986) noted that total factor productivity (TFP) is a measure of exogenous technology shocks whereas other shocks can include but are not limited to monetary (interest rates), fiscal and oil price shocks. The real business cycle theory holds that fluctuations and perceived shocks are efficient responses to exogenous changes in the real economic environment. These fluctuations do not represent a failure of markets to clear rather, shows the most efficient operations of the economy, given the structure of the economy and the rationality of the economic agents.

The theory is however important to this study as it helps to identify that the macroeconomic shocks in Nigeria can be exogenously determined. These exogenous determinants are however, perceived to be efficiently responded to, following the interconnectedness of global economic indicators.

Empirical Literature

A number of studies have been conducted to evaluate the cross boarder macroeconomic shocks and as they affect other nations' economic environment. Ufuk (2016) investigated how external indebtedness and international financial integration can affect foreign interest rate shocks in a small-open economy. The empirical component of the analysis quantifies the effects of U.S. interest rate shocks on the Turkish economy. The study constructed a business cycle model that matched the empirical impulse response functions. The model was estimated on quarterly Turkish data whereas; findings revealed that the nexus between financial integration and macroeconomic volatility due to foreign interest rate shocks relies largely on the level of outstanding external debt. Financial integration mitigates the economy's responses to foreign rate shocks for higher levels of external debt and it magnifies the responses for lower levels of external debt.

Edwards (2010) analyzed the impact of changes in the U.S. Federal Reserve's Federal Funds rate on growing countries' interest rates using high weekly data. The study also analysed how changes in the U.S. term structure affect short term rates' differentials using GLS with White-corrected covariance estimates. The results

indicate that there is a strong and fairly rapid transmission of changes in the Federal Funds rate into interest rates in the Latin American economies. This impact is equally large in the Asian economies in the long run.

Furthermore, Cristiano-Botia, Gonzalez-Molano and Huertas-Campos (2018) employed the alternative economic models to identify whether policy interest rate expectations and unanticipated changes in the reference interest rates affect saving and credit interest rates in the Columbian economy. The study uncovered empirical evidence to show that policy surprises have predictive power to set passive and active interest rates. The study also found evidence of changes in deposits rates in advance of the announcement of the monetary authority and no significant change on the day of the announcement and the day after the change. Therefore, to fix interest rates, the study recommended that financial entities take into account their expectations about policy rate.

Asaleye, Popoola, Lawal, Ogundipe and Ezenwoke (2018) provided evidence on shock effects of monetary policy transmission through the credit channels on output and employment in Nigeria within the period of 1981 to 2016 using the Structural Vector Autor-egression and Autoregressive distributed lags (ARDL). Evidence from the forecast error shock showed that variations in monetary policy indicators affect output more than employment in the first two periods; however, it affects employment more afterwards. The findings further revealed that the Nigerian government can maximize the long-run benefits of monetary policy through the credit channels on employment. Thus suggesting the need for policymakers to look beyond short-run gain and promote long-run employment through monetary policy among others.

Oguanobi, Akamobi and Agu (2014) examined the possibility of interest rate shocks from the U.S to Nigeria using data on four Nigerian variables real gross domestic products, consumer price index, exchange rate and interest rate) and two foreign variables U.S federal reserve rates and the world consumer price index for the period 1983-2011. The impulse response analysis vector autoregressive model showed that Nigerian variables respond insignificantly to shocks from foreign variables. The study therefore concluded that shocks in Nigeria are basically home-made and further recommended that monetary authorities in Nigeria should base their policy making on domestic shocks, as considering external factors might be misleading

3. Methodology

This study adopted the Structural Vector Autoregressive (SVAR) methodology as used by Weber, Gerke and Worms (2009) and Malik, Ajmal and Zahid (2017). The SVAR uses economic theory to evaluate the simultaneous nexus between variables and provides a better empirical fit which serves as its advantage over other specifications of VAR models. Also, the SVAR model allows for investigating the effect of unanticipated shocks to one variable (external) on the other variables

(internal) in the system (Chuku, Akpan, Sam, & Effiong. 2011). Further, VAR estimation is highly responsive to the lag order of the selected variables. Hence, an adequate lag length can help manifest the long term impact of some of the variables on other variables in the system. The exogeneity assumptions also imply that Nigeria's economy is relatively small and cannot influence the world macroeconomic indicators either with lags or contemporaneously. Another suitability of this method over the other methods is that the block exogeneity assumption removes the impacts of spurious terms of trade and external financial shocks, thus we are able to examine the only the trans-Atlantic transmission of interest rate shocks with a view to identifying any macroeconomic concern for Nigeria. The internal (Nigeria) vector variables are the lending interest rates, real exchange rates, gross domestic product (GDP) growth rates and exchange rates whereas the external vector variable is the US lending rate as sourced from the World Bank Development Indicators (WDI, 2020).

Model Specification
In line with Yildrim (2016), we employ the following SVAR model with block exogeneity

$$\sum_{p=0}^{n} \begin{bmatrix} B_{11}(s) & B_{12}(s) \\ B_{21}(s) & B_{22}(s) \end{bmatrix} \begin{bmatrix} y_t^d \\ y_t^f \end{bmatrix} = \begin{bmatrix} {}_t^d \\ {}_t^f \end{bmatrix} \tag{3}$$

Where B_{ij} represents a coefficient matrix, $y_{t=}\begin{bmatrix} y_t^d, & y_t^f \end{bmatrix}^t$ is a vector of variables. ${}_t = \begin{bmatrix} {}_t^d, & {}_t^f \end{bmatrix}^t$ denotes a vector of structural disturbances that satisfies $E[{}_t|y_{t-s},s>0]$ $= 0$ and $E[{}_{tt}^d|y_{t-s},s>0] = I$. The vector of structural shocks of the domestic origin is represented by ${}_t^d$ while that of external origin is represented by ${}_t^f$. y_t^d is a vector of domestic variable in Nigeria and y_t^f is the vector of shocks exogenous to Nigeria. However, due to parameter identification problems associated with the SVAR models, Ordinary Least Squares (OLS) estimation of the models often yield inconsistent parameter estimates. This therefore warranted the presentation of the reduced for of the SVAR model in a reduced form as shown in (4)

$$Z_{it} = \begin{pmatrix} HINT \\ GDPR \\ INF \\ EXR \end{pmatrix} = a_1 + a_2(L)\, Z_{a-1} + \quad j(FINT) \tag{4}$$

Here, our baseline model comprised of four endogenous and one exogenous variables for the home country, Nigeria. The endogenous variables are the selected macroeconomic indicators of lending interest rate (HINT) real gross domestic product growth rates (RG*DP)*; inflation rates and exchange rate (HEXR)**.** These endogenous variables depend on their own lags and a constant term. The exogenous variables included in the model are the already defined and US lending rate (FINT) which is expected to have contemporaneous impact on the endogenous variables. The objectives of this study would be achieved by estimating the VAR equation (4)

and analysing the Impulse Response Functions (IRF). Conventionaly, the IRF have been widely used as a means of analysing an estimated VAR model (Hamilton, 1994 as cited in Oguanobi, et al. 2014). Here, the IRF is expected to expose the degree to which domestic interest rates, as well as how other domestic macroeconomic variables, respond to shocks in foreign interest rate.

4. Empirical Findings/Result

Time Series Properties of the Variables

The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were conducted for each series, and the results are presented in Table 1.

Table 1. Results of Unit Root Tests

Variables	Augmented Dickey-Fuller (ADF)			Decision
	First Difference	5% critical value	I(d)	
FINT	-5.268121	-2.954021	I(1)	Stationary
HINT	-6.461396	-2.951125	I(1)	Stationary
GDPR	-4.080988	-2.957110	I(1)	Stationary
INF	-4.633335	-2.976263	1(1)	Stationary
EXR	-3.988668	-2.951125	I(1)	Stationary

Source:*Source: Authors' computation (E-views 10), 2021*

In order for VAR estimates to be consistent it is a necessity for the time series data to be stationary. Non-stationary data leads to misleading regression results. The augmented Dickey Fuller test is used to check for stationarity by testing the null hypothesis which states that the variable do not contain a unit root, that is, the variable is non-stationary. In case of a unit root, all the variables are differenced until stationarity is realized as shown in Table 1. This further meant that the variables are integrated of order one, I(1).

Lag Length Selection

As the VAR model is lag sensitive, the next step in our analysis is to select the optimal lag length. In line with Jamali et al. (2011), the AIC is employed for this purpose. The lag length chosen is the one that keeps at a minimum the following:

$$AIC = -2\ln(L) + 2K \tag{5}$$

Where, K represents the total number of parameters and L represents the maximum value of the likelihood function for the model. Table 2 summarizes the results of employing this technique. As the AIC criterion is minimized for order 4, a VAR model with a lag length of 4 is employed for this study.

Table 2. Lag Length Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-472.8405	NA	16837930	30.82842	31.05971*	30.90381
1	-447.1028	41.51237	16455458	30.78083	32.16856	31.23319
2	-393.2008	69.55103*	2922916.	28.91618	31.46035	29.74551
3	-359.8742	32.25152	2517536.*	28.37898	32.07959	29.58529
4	-327.1101	21.13811	3827744.	27.87807*	32.73513	29.46135*

Source: Authors' computation (E-views 10), 2021

Based on the result in table 2, the lag length which minimises SC is lag four and thus our optimal lag length. Given our optimal lag length, we proceed to the impulse response of our study.

Impulse Response Functions

As shown in figure 4, the impulse response functions show the impact of a one standard deviation (SD) shock of one variable to all other variables in the system; therefore, it is considered as an essential tool in achieving the stated objectives of the study. This study however, applies the impulse responses and the variance decomposition tests results in order to study the trans-Atlantic transmission of interest rate shocks to other macroeconomic variables selected, with a view to identifying any macroeconomic policy concern for Nigeria. The impulse response functions are presented in the tables 4-7 below:
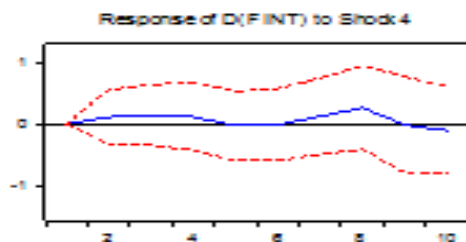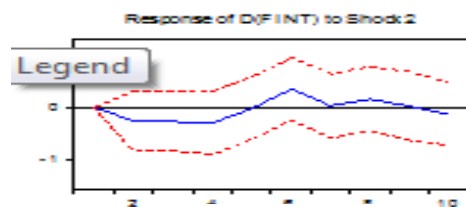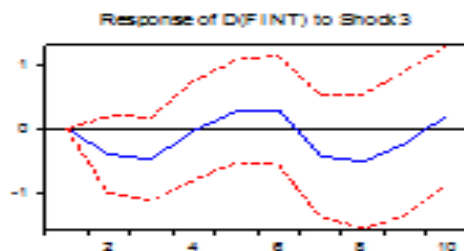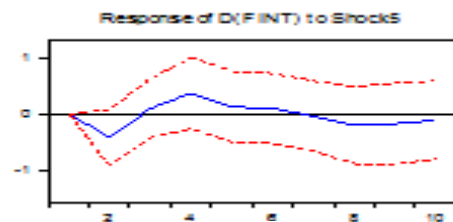

Figure 4

Figure 5

Figure 6

Figure 7

Note: Shocks, Shock 2 = HINT Shocks, Shock 3 = GDPR Shocks, Shock 4 = EXR Shocks, Shock 5 = INF shock

Variance Decomposition

Table 3. Variance Decomposition of D(FINT):

Variance Decomposition of D(FINT):						
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5
1	0.998413	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.193504	71.52793	4.491019	11.37883	0.955056	11.64716
3	1.371451	60.92516	7.270488	20.48697	1.944727	9.372652
4	1.485861	55.58487	10.15246	17.48833	2.378310	14.39603
5	1.556307	55.71161	9.262733	18.99944	2.193037	13.83318
6	1.627935	51.16794	13.23901	20.58591	2.005885	13.00126
7	1.722229	49.56155	11.86651	24.56457	2.351893	11.65547
8	1.875465	46.05597	10.77935	28.14863	4.094973	10.92108
9	1.901014	45.24697	10.52043	28.81527	3.989385	11.42795
10	1.923648	44.22741	10.70120	29.44966	4.154508	11.46723

Source: Authors' computation (E-views 10), 2021

The 2 standard deviation shocks FINT initially has no noticeable impact on HINT in periods 2 and 4. From the seventh periods, the response gradually declines until the eight when it started rising. When it hits its steady test value beyond the 9th period, HINT started falling below the steady-state value and remains on the negative region. This meant that responses to FINT will have an asymmetric impact on HINT both in the short-run and long-run.

The country's output growth rate responded positively to United States interest rate shock for roughly 8 years although, it maintained a steady state the 6th period. Afterward, it responded negatively towards the end of our sample period.

In summary, Nigeria's economy in general, responds significantly to foreign shocks. This is true following the asymmetric shock waves flowing from the cross Atlantic rates (USA lending rates) towards the trends in the impulse response. This may imply that severe macroeconomic volatility in the country has more to do with the external sector.

5. Conclusion

In this study, concern has been shown that our macroeconomic environment is exogeneouly determined. This study evaluated the transmission of United States interest rate shocks to Nigeria using a SVAR method. We found that the macroeconomic variables of the Nigerian economy responded significantly to the foreign variables' shocks. Overall, our findings suggest that the Nigerian economy is highly responsive to foreign shocks. However, this may imply that the huge macroeconomic volatility experienced by the country are from accorss the Atlantic and are not domestically driven with only an insignificant proportion of the domestic shocks can be linked to internal shocks (shocks transmitted from within the economy).

Based on the findings of this study and the conclusion that followed, we hereby recommend that monetary authorities in Nigeria should continue with inward oriented monetary policy making, especially as it concern interest rate control. By implication, they should monitor the happenings in the international financial markets with a view to taking advantage of the downswing of interest rates (especially in the US) to manage the domestic macroeconomy since they show some significant level of interconnectivity. Also, government should reduce the country exposure to foreign finance

References:

Agarwal, R., & Gopinath, G. (2021). A proposal to end the COVID-19 pandemic. *Staff Discussion Notes*, *2021*(004).

Berlinguer, G. (1999). Globalization and global health. *International Journal of Health Services*, *29*(3), 579-595.

Center, N. C. O. (n.d.). *National Command Operation Center*. Ncoc.gov.pk. https://ncoc.gov.pk/

Center, N. C. O. (n.d.). *National Command Operation Center*. Ncoc.gov.pk. https://ncoc.gov.pk/

China Exports To Pakistan2022 Data 2023 Forecast 1992-2020 Historical. (n.d.). Retrieved March 12, 2022, from https://tradingeconomics.com/china/exports/pakistan

Corman, V. M., Muth, D., Niemeyer, D., & Drosten, C. (2018). Hosts and sources of endemic human coronaviruses. *Advances in virus research*, *100*, 163-188.

COVID-19 Health Advisory Platform by Ministry of National Health Services Regulations and Coordination. (n.d.). Covid.gov.pk. http://covid.gov.pk/

covidvax.live: Live COVID-19 Vaccination Tracker - See vaccinations in real time! (n.d.). Covidvax.live. https://covidvax.live/location/pak

CSSE – Center For Systems Science and Engineering at JHU. (n.d.). Systems.jhu.edu. https://systems.jhu.edu/

Educational Institute Monitoring System. (n.d.). Eiss.ncoc.gov.pk. Retrieved March 12, 2022, from https://eiss.ncoc.gov.pk/

Ehsaas. (n.d.). www.pass.gov.pk. Retrieved March 12, 2022, from https://www.pass.gov.pk/

Fauci, A. S., Lane, H. C., & Redfield, R. R. (2020). Covid-19—navigating the uncharted. *New England Journal of Medicine*, *382*(13), 1268-1269.

guido. (2021, October 6). *Pakistan and ADB*. Asian Development Bank. https://www.adb.org/countries/pakistan/

Health Portal. Retrieved from https://telehealth.gov.pk/

Institute for Health Metrics and Evaluation. (2022, March 10). Retrieved March 12, 2022, from https://www.healthdata.org/

Liu, D. X., Liang, J. Q., & Fung, T. S. (2021). Human coronavirus-229e,-oc43,-nl63, and-hku1 (coronaviridae). *Encyclopedia of virology*, 428.

Page, J., Hinshaw, D., & McKay, B. (2021). In Hunt for Covid-19 Origin, Patient Zero Points to Second Wuhan Market–The man with the first confirmed

infection of the new coronavirus told the WHO team that his parents had shopped there. *The Wall Street Journal*.

Pakistan GDP Growth Rate 1961-2020. (n.d.). www.macrotrends.net. https://www.macrotrends.net/countries/PAK/pakistan/gdp-growth-rate

Prime Miniter`S Covid - 19 Panademic Relief Fund - 2020. (n.d.). Www.nbp.com.pk. Retrieved March 12, 2022, from https://www.nbp.com.pk/COVIDFUND/index.aspx

Roser, M., & Ritchie, H. (2020). Coronavirus Disease (COVID-19). *Our World in Data*. https://ourworldindata.org/coronavirus

Rural Support Programmes Network. (2013). Rural Support Programmes Network. http://www.rspn.org/

Saunders-Hastings, P. R., & Krewski, D. (2016). Reviewing the history of pandemic influenza: understanding patterns of emergence and transmission. *Pathogens*, *5*(4), 66.

Sehat Tahaffuz. helpline 1166 launched. (n.d.). Www.endpolio.com.pk. Retrieved March 12, 2022, from https://www.endpolio.com.pk/media-room/media-releases/586-sehat-tahaffuz-helpline-1166-launched

Sun, X., Wandelt, S., & Zhang, A. (2021). Vaccination passports: Challenges for a future of air transportation. *Transport policy*, *110*, 394-401.

Tiger force (n.d.). CRT.COVID.gov.pk. Retrieved March 12, 2022, from https://crt.covid.gov.pk/

We Care. (n.d.). Wecare.nhsrc.gov.pk. Retrieved March 12, 2022, from https://wecare.nhsrc.gov.pk/

World Bank. (2022). Vaccination statics *World Bank Group - International Development, Poverty, & Sustainability*. World Bank. https://www.worldbank.org/

Wu, T., Perrings, C., Kinzig, A., Collins, J. P., Minteer, B. A., & Daszak, P. (2017). Economic growth, urbanization, globalization, and the risks of emerging infectious diseases in China: a review. *Ambio*, *46*(1), 18-29.

Yaran-e- watan (n.d.). Retrieved March 12, 2022, from https://yaranewatan.gov.pk/ Accessed February, 08, 2022.