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INDO-NIGERIA LINKAGES: AN EXAMINATION OF GLOBAL VAR APPLICATION

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ABSTRACT
This study assesses the relationship between Nigeria and India through the business cycle. The study examines the synchronization of both countries in comparison to the Euro Area (EA). The macroeconomic variables considered for Nigeria, EA and India include, GDP, inflation, real interest rate, short term interest rate, long term interest rate and treasury bills. All the variables are quarterly, and were sourced from the reserve bank of St. Louis spanning from 2010 to 2023. The finding of the study shows that Nigeria does not have much synchronization with India, which implies that despites the colossal amount of transaction between India and Nigeria, economic and financial disturbances of India, will have less or no impact to the Nigerian economy. However, the Nigerian monetary and fiscal policy makers should be watchful of Euro Area economic performances to avoid spillover effect in periods of economic and financial crisis emanating from Europe.

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1. INTRODUCTION

No country in the world is self sufficient, as such dependences of one country on the other continue to increase, especially with today's world becoming increasingly globalised due to trading, and international financial linkages, etc thus, one country's macroeconomic performances can affect the other, depending on the level of trade and financial transactions between the two countries. This generally, implies that fiscal as well as the monetary policies of the two trading partners can affect each other.

India and Nigeria have ties as friends, and have long lasting deep trading relationships. India, with a population of 1.3 billion, and Nigeria, over 200 million, are large developing and democratic countries with multi-religious, multi-ethnic, and multilingual societies. India as the largest democracy in the world and Nigeria as the largest in Africa, become natural partners. India established its Diplomatic House in Lagos in November 1958, two years before Nigeria became independent in 1960. Political contacts at the highest level were maintained during the last 60 years. In Oct 2007 Dr. Manmohan Singh, Prime Minister of India visited Nigeria. During this visit both countries raised the status of bilateral relationship to a "Strategic Partnership'. Our diplomatic relations have transformed from "Historical Friendship" to "Strategic Partners". Similarly, the presence of a large Indian expatriate community of about 50,000, the largest in West Africa adds value to the importance of the long-standing relationship between the two countries(India-Nigeria1` bilateral relations 2023). Nigerian leadership regularly visited India –with President Obasanjo in November 2004, Vice President Goodluck Jonathan (who later served as President from 2011-2015) in November 2007 and to the first India-Africa Forum Summit held in New Delhi in April 2008. During the historic State visit to Nigeria by Prime Minister Dr. Manmohan Singh in October 2007, India and Nigeria adopted the 1 Abuja Declaration for Strategic Partnership, which gave a new impetus to our bilateral ties. (India-Nigeria bilateral relations 2023)

Nigeria today, has a trading relationship with India of around $16 billion (US dollars) and has the potential to be more than 40 billion in few years to come. Such a colossal amount can expose macroeconomic variables of a trading partner country to fluctuations. It is with this, this study intends to apply global VAR, which follows the work of Pesaran etal (2004), and Sun etal (2013) to study the direct dependence of Nigeria's macroeconomic variables to India economy and Euro union (EU), or Euro Area (EA), thus the business cycle synchronization of the three regions, and the dependence of Nigeria's macroeconomic variables on common exogenous variables such as the oil prices, and world GDP.

International trade through exchange of goods and services, capital, and labor etc across borders leads to a globalised world. Such trade represents a share of GDP which influences the standard of living of the citizens, and a share of GDP per capita. Thus, globalization is simply the process of interconnection and interrelation among nations of the world. Different factors play a vital role in the globalization process, such as trade, FDI, Income etc. There are different organizations created to take care of the international trade transactions and process and these are WTO, and international financial institutions, the two further fosters the process of globalization.

The globalised world becomes the reason business cycle of one country affects the other country notably through trade and other factors. The issue of business cycle has so many dimensions. A lot of researches have contributed in almost all aspects of business cycle especially, after the great depression of the 1920"s. One issue that engulfed the literature was trying to find out the sources of business cycle. Some of the studies have focused and discussed extensively in this regard. For example Burns (1969) investigated the causes of business cycle, where he found different views existing in the literature, some having the view that monetary variables are responsible for business cycle, and some attributing the phenomena to the technology, while some researchers are of the view that it is indeed the nature of the fixed working capital that lead to business cycle.

Similarly, in the business cycle literature, great moderation is one aspect which is well researched by the scholars. It is believed that, the world has experienced a reduction of volatility in the macroeconomic variables, meaning that there is reduction of business cycle threat especially in the 1990"s and 2000"s. This reduction in volatility is attributed to the impact of globalization, financial integration and so on. A similar study in this regard was conducted by Stock and Watson (2002).

One important issue that took the attention of the scholars in the area of business cycle is of course that of the dating of the business cycle and turning points. See, for example, the work of, Dua and Benerji (2006), Pandy, Patrick and Shah (2016). The dating of the business cycle provides the exact chronology of the cycle in the economy, it is of paramount importance because history in most cases repeats itself if the same status quo is maintained. Now, to learn from the past the dating becomes significant, similarly, the turning points.

Moreover, prediction of business cycle has taken the interest of the researchers; some studies conducted on this aspect include that of Berge (2014). In this aspect, there are three important indexes that are being used frequently by researchers to predict the occurrence of business cycle. These indexes include, leading, lagging and coincident indicators. Thus, leading indicators are those that first crash before GDP, while lagging indicators crash after GDP, and finally, the coincident indicators or index, that crash at the same time with the GDP. In any of the cases, these indicators are very important in assessing the set in of business cycle in the economy. Thus, with the help of these indicators, business cycle could be forecasted well and could be prevented.

International business cycle synchronization or international co-movement has been another important aspect of business cycle where a lot of ink has been spilled. See, for example, the work of Darvas, Rose, and Szapany (2005), Del Nelgro and Otrok (2008), Bagliano and Morana (2008) and Huh Kim Kim, and Park (2014). In this aspect, researchers seek to find out the reasons for synchronization of business cycle of different economies. Huh, Kim, Kim, and Park (2014) for example, had conducted their studies on international co-movement related to some selected Asian economies and found the existence of synchronization in the studied area. There are different reasons the studies found, as to why co-movement exists within countries. Some found similarity in terms of monetary policy shock, some due to similar response in technological shock, etc.
Thus, this research work studies the business cycle synchronization of Nigeria and India, and these two countries are compared with Euro Area (EA) in order to find out how business of these two biggest trading of Nigeria affect the Nigerian economy.

2. LITERATURE REVIEW
Empirical Studies
Global VAR
Pesaran etal(2005), This study presents a quarterly global model linking individual country vector errorcorrecting models in which the domestic variables are related to the country-specific foreign variables. The global VAR (GVAR) model is estimated for 26 countries, the euro area being treated as a single economy, over the period 1979-2003. It advances research in this area in a number of directions. In particular, it provides a theoretical

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framework where the GVAR is derived as an approximation to a global unobserved common factor model. It develops a sieve bootstrap procedure for simulation of the GVAR as a whole to test the structural stability of the regression coefficients and error variances, and to establish confidence bounds for the impulse responses. Finally, in addition to generalized impulse responses, the paper also considers the use of the GVAR for "structural" impulse response analysis.

Sun etal (2013), use the Global VAR (GVAR) model proposed by Pesaran et al. (2004) to study cross-country linkages among euro area countries, other advanced European countries (including the Nordics, the UK, etc.), and the Central, Eastern and Southeastern European (CESEE) countries. An innovative feature of the paper is the use of combined trade and financial weights (Based on BIS reporting banks' external position data) to capture the very close trade and financial ties of the CESEE countries with the advanced Europe countries. The results show strong co-movements in output growth and interest rates but weaker linkages between inflation and real credit growth within Europe. While the euro area is the dominant source of economic influences, there are also interesting subregional linkages, e.g. between the Nordic and the Baltic countries, and a small but notable impact of CESEE countries on the rest of the Europe.

International Business Cycle
Alege (1978) develops a business cycle model for the Nigerian economy, using a Dynamic Stochastic General Equilibrium Model (DSGEM), designed to examine the sources of business cycle in the country. He uses quarterly data which was obtained from the international financial statistics from 1974-2004. He examines three different shocks in the research work. These shocks are monetary supply, technology and export supply shocks on selected macroeconomic variables. Similarly, the method of estimation adopted by the writer is Bayesian econometrics. The endogenous variables included in this study include consumption, labour, price level, deposits, loans, interest rates, wage rate, money supply, export, aggregate output and capital stock. The findings reveal that, all the three shocks contributed significantly to business cycle in Nigeria as driven by both real and nominal shocks.

Stock and Watson (2002) focus on the analysis and cause of great moderation in the US economy from 1959 to 2001. The study specifically intends to find out if business cycle changes over time. This they called the great moderation. Construed differently, the study tries to find out the issues related to reduction in volatility for different macroeconomic variables. 168 quarterly macroeconomic time series were used for the analysis. These variables were grouped into six categories namely Decomposition of real GDP; Money, credit, interest rates, and stock prices; housing; industrial production; inventories, order, and sales and. employment.

In the overall analysis on GDP for each 10 year the result reveals that there is a reduction in the volatility in the US GDP from an average volatility of 2.3 to 1.5 in 1990's. The 1990's is a period of decrease in volatility, meaning that there is a decline in volatility of GDP, otherwise known as the great moderation. This was however, detected through the standard deviation of the series from the mean. Similarly, majority of the macroeconomic series exhibit a decline in volatility in the 1980's and 1990's for example, total goods production series, durable goods, consumption and production, total investment, residential investment, construction output and inputs. The study shows that there is a sharp decline in volatility in all these variables stated above in the 80's. The evidence from the research work reveals that there is a moderation in volatility in 1990's which appeared in both nominal and real variables.

Blanchard and Simon (2001) had the same finding, stating that there is a widespread reduction in volatility in most developed nation in 1990's, this includes countries like Japan, Germany, and France. To check the evidence empirically, they used the QLR test to find out the exact break that is in GDP, this was to find out whether break occurs in GDP series or not. The test has rejected the null of no break and accepted alternative of break occurring in 1983:2. This means that the decline in volatility actually started mildly in the 1980's and spilled over to 1990's. Other researchers who contributed to the literature of great moderation include Kim and Nelson (2000), Mc Connel and Perez-quiro (2000) both of them used a Marcov Switching Approach in their analysis.

Eichenbaum and Singleton (1986) conduct a study to find out if the equilibrium business cycle theories explain postwar US business cycle. According to equilibrium business cycle theories, monetary shocks have not been an important source of aggregate fluctuations in real variables, thus, technological shocks, according to this school of thought is believed to be the major cause of aggregate economic fluctuations. These theories and arguments had been discussed extensively in the works of Kydland and Prescott (1982), Long and Plosser (1986), Kydland (1984), and Prescott (1986)**.** Thus, this study contributes to the literature where it assumes monetary shocks to have a small impact on real economic activity. Construed differently, the overall objective here is to find out if monetary shocks are important in explaining the US postwar fluctuations in aggregate economic activities. Granger causality was applied to find out the causal relationship between money growth or inflation and output. The results reveal that money growth does not granger cause output, meaning that money or inflation were not important source of output fluctuations in the post war period in the United State, lending a support for the relevance of RBC theories. Similarly, in the sample period covered, that lagged values of the monetary growth rate are not helpful in predicting the current and future growth rates of output. Thus, lending more support to the relevance of RBC theories. However, the researchers added that particular movements in output were largely due to monetary shocks. More so, that the finding of no causal relationship between money to output was obtained when both series were first differenced.

However, when linear deterministic trend was removed, the evidence was much more in favor of alternative hypothesis rather than accepting null as in the first case. Put simply, the paper concluded by significantly recognizing the importance and role of technological factors in generating business cycles.

3. METHODOLOGY

This study follows the work of Peseran etal (2004) and Sun etal (2013). The two studies used Global Vector auto regression (Global VAR) to study the dependence of European countries on the US economy. Global VAR (2004) is the first attempt to introduce a model that can be used to study interdependences between blocks or among blocks/regions. According Perseran etal (2004) Global VAR allows for

1. Study of dependences of Xt on Xt* and its lagged values. Where Xt stands for country specific variables and Xt* stands for foreign variables.
2. Study of dependence of country-specific variables on the global exogenous variables
3. Non-zero contemporaneous dependence of shocks in country A on the shock in country B

The following simple log-linear autoregressive specification is used to understand the basic application of the Global VAR model

$$x_{it} = a_{i0} + \Phi_i x_{it} + \Lambda_{i0} x^*_{it} + \Lambda_{i1} x^*_{it-1} + e_{it} \quad (1)$$

Where x_{it} is $K \times 1$ country specific variables, Φ_i is a $K_i \times K_i$ matrix of lagged coefficients. The term x^*_{it} is the $K \times 1$ vector osf foreign variables specific to country i. Similarly, the term e_{it} is the $K \times 1$ vector of country specific shocks assumed to be serially uncorrelated with zero mean and non singular co-variance matrixes defined as

$$E_{it} \approx iid(0, \Sigma_{ii}) \quad (2)$$

The shocks are also allowed to be correlated among the regions, this is given as follows (3)

$$E(\varepsilon_{it} \varepsilon'_{jt})$$

Dataset

The variables of this study are sourced from the reserved bank of St. Louis. These variables include GDP, Consumer price index (Inflation), short term interest rate, long term interest rate, real interest rate and Treasury bill. Crude oil price is treated as exogenous variable in the system. These variables are collected for both Nigeria and India. We assumed crude oil to be exogenous since not Nigeria nor India or EA determines the price of the crude oil, and by implication all the countries are assumed to be importers including Nigeria if not because of the recent refinery by Dangote which is also yet to operate to its full capacity. However, we expect these countries to react similarly to the same shock. We will observe the response of these variables to the exogenous shock, and the behavior of each country' series tells us more about the synchronization or otherwise of these countries

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4. RESULT PRESENTATION AND DISCUSSION

Stochastic properties of the Variables

The variables of this study have been subjected to Augmented Dickey fuller (ADF) unit root testing procedure. This is to determine the order of integration of each series in the study. The result of the procedure shows that all the variables are integrated of order 1, except inflation for the case of Nigeria. In the case of India, all the variables are found to be integrated of order I. Similarly, the crude oil price series is also integrated of order I.

Forecast Error Variance Decomposition and Impulse Response Function

Figure 1: Forecast Error Variance Decomposition

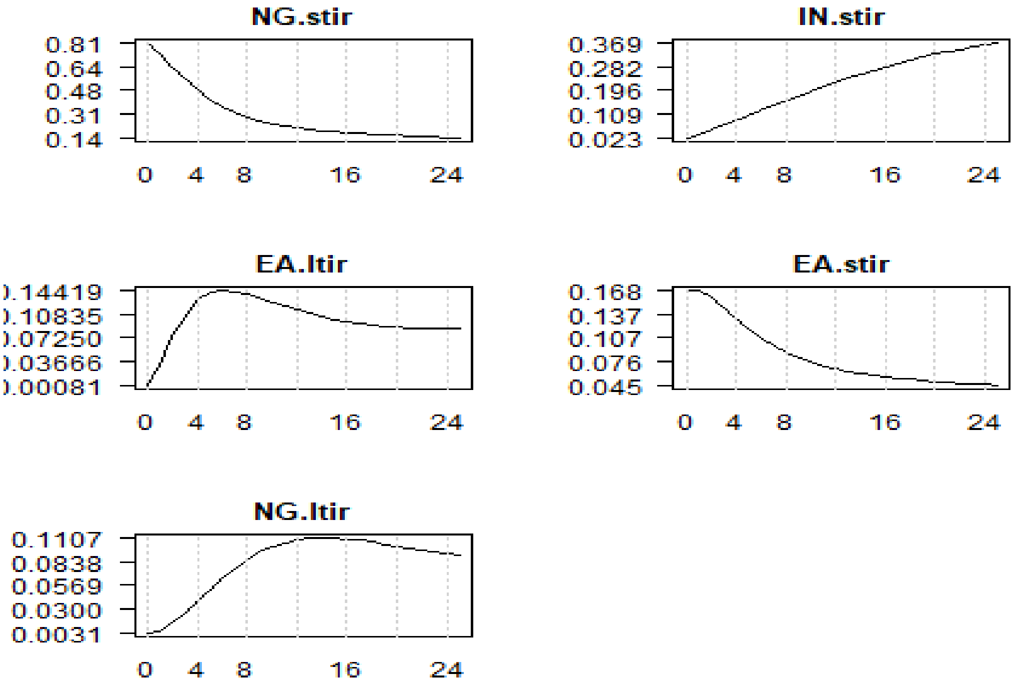

Figure 1 presents the forecast error variance decomposition of the three regions under study. The forecast error variance decomposition helps us to study the business cycle synchronization or co-movement among countries. With the help of this tool, we can be able to find out the contribution of each country to the fluctuation in the system. The shock from oil price, to short term interest rate shows that Nigeria accounted for 81 percent of fluctuation at the zero lag. India and Euro Area (hence forth EA) accounted for 0.023 and 0.168 respectively. In the 4th Nigeria accounted 0.48 while India accounted for 0.109 and EA accounted for 0.137 of the total fluctuation. There is seems to be more convergence between Nigeria and EA from 8th up to 24th horizons. It means Nigeria is more prone to the EA's shock than India. This is an indication that EA's business cycle can easily affect Nigeria. Similarly, the long term interest rate also exhibits a strong correlation between Nigeria and the EA. Thus, the business cycle in the EA will have a spillover effect to Nigeria.

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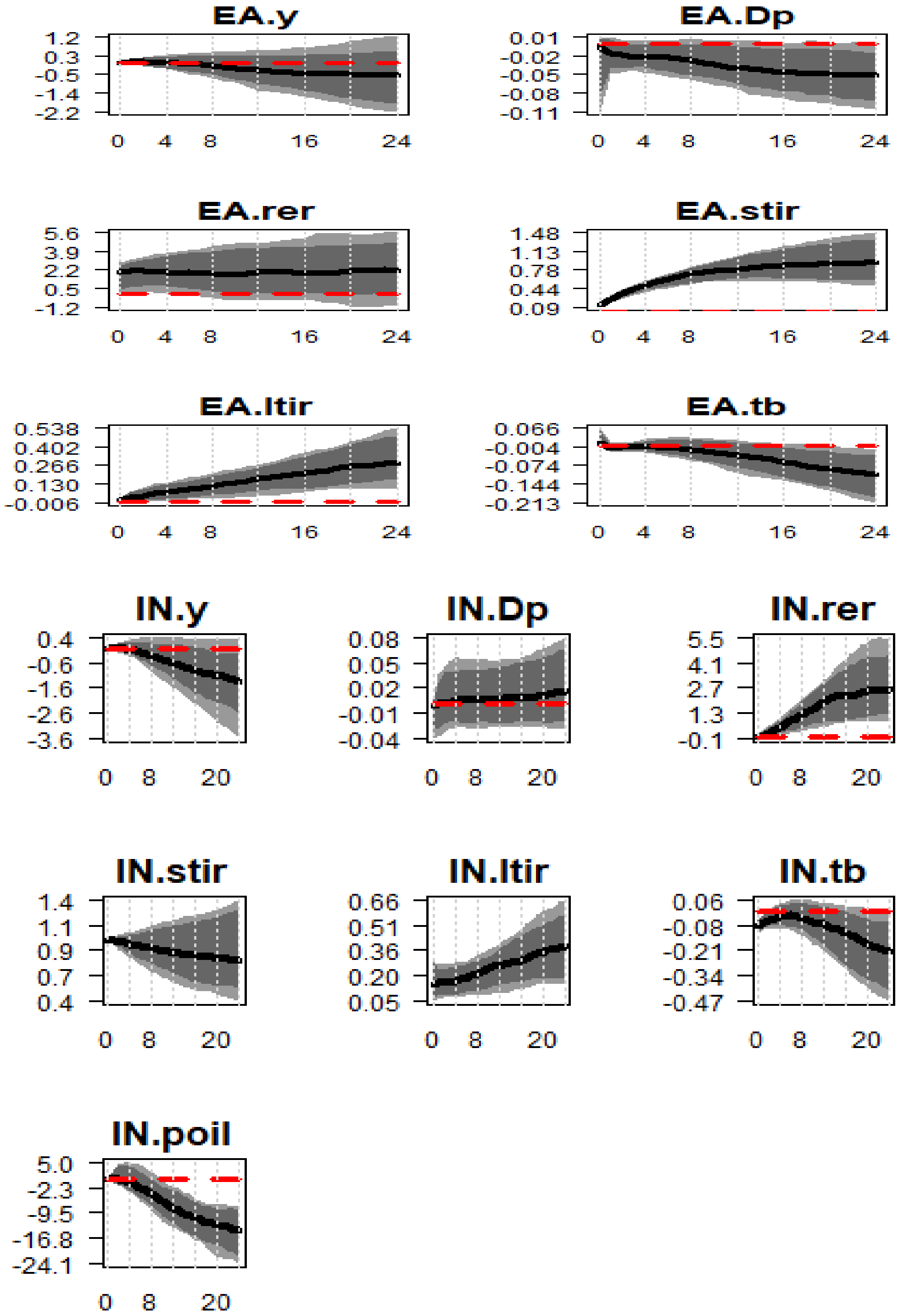
Figure 2: Impulse Response Function (IRF)



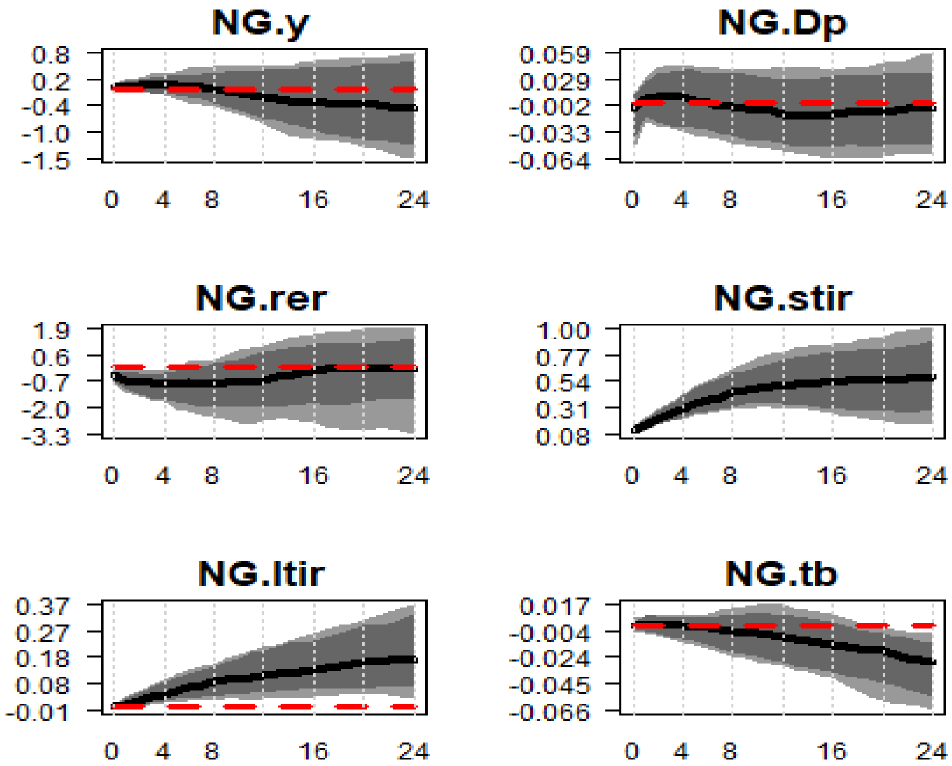


Figure 2 contains the graphs of the impulse response functions of GDP(y), inflation (Dp), real interest rate (rer), short term interest rate (stir), long term interest rate (ltir) treasury bills to crude oil price shock. The GDP(y) of both Nigeria and India have responded in the same manner. Both countries started positively and ended negatively at final horizon. Similarly, the response of India and Nigeria in terms of Inflation (DP) have been similar though between 8th and 16th horizon, Nigeria reacted negatively, however the response turned positive towards the 24th quarter. The response of inflation for the EA was negative for the entire forecasted periods; this implies that India and Nigeria almost have similar responses from a crude oil shock. The short term interest rate for EA was 0.09 percent at 0 horizons and ended at 24th horizon with 0.78 percent of the shock, the shock was decreasing for India over time. For case of Nigeria the shock started around 0.08 similar to that of EA and ended around 0.54 percent in the final horizon. The response of long term interest rate for all the countries was positive. Furthermore, the response of real interest rate is similar for Nigeria and EA, and both countries has seen a constant response for the all the forecasted periods. However, this is different for the case of India, since the shock case was increasing over time. Treasury bill for all the countries reacted similarly. All the countries reacted to the shock negatively with similar and close magnitude.

5. CONCLUSION

Despite the chunk of transaction between Nigeria and India which is estimated currently to be around $16 billion USD, we found out that Nigeria and India are not synchronous in terms of the exogenous variable, the crude oil. Nigeria seems to be more prone to the economic and financial disturbances of the European Union than India. This implies that, most of the economic shocks from India may not have much spillover effect to Nigeria but the EA's financial crisis is likely to affect the Nigerian economy because most of the variables show similar responses with EA as result of the exogenous shock. Thus, Nigerian government should place its monetary and fiscal policies in consideration of the EA's economic behavior, this will help Nigeria avoid being hit drastically by any future economic crisis in the Euro zone. Further studies should be conducted to study the business cycle of the EA and its effect to the Nigerian economy.

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