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CURRENT ACCOUNT BEHAVIOR, REAL EXCHANGE RATE ADJUSTMENT AND RELATIVE OUTPUT IN NIGERIA

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This paper examines the relationship between current account dynamics, relative output performance and real exchange rate adjustment in Nigeria. A structural vector autoregression model that imposes the long-run neutrality assumption of Blanchard and Quah was used to analyze data for the period 1981Q1-2017Q4. Findings show that fiscal shocks drive the dynamics of relative output and current account in Nigeria but do not explain real exchange rate adjustment. However, exchange rate shocks influence the path of relative output while a deterioration of the current account balance in response to a monetary contraction is observed, suggesting the existence of the expenditure-switching effect. The worsening of the current account in response to a fiscal expansion validates the twin-deficit hypothesis in Nigeria. The impact of shocks was found to be more pronounced under the fixed relative to a flexible exchange rate regime. The results make a case for policies that could improve the trade balance and boost productivity complemented by exchange rate flexibility to promote more efficient allocation of resources.

Keywords: Current Account, Real Exchange Rate, Relative Output, Structural VAR, Nigeria
JEL Classification: F31, F41, F43

1. INTRODUCTION

The nexus between the current account, real exchange rate and relative output has important implications for macroeconomic stability and policy management. This is because it provides insight about the actions and expectations of agents in a small open economy like Nigeria where already fragile external and fiscal positions are magnified by oil price and production shocks. The current account balance is an important component of government savings and investment which, is crucial for growth, exchange rate stability and competitiveness (Srdan, 2012). Although the sustainability of current account has received considerable attention (Shuaibu and Oyinlola 2016; and Chen, 2014), the deficit remains high reflecting a narrow export base and high import demand. The current account provides information on a country's external condition and reflects its long-term competitiveness (Hounsou, 2017).

The real exchange rate is an important price that visibly affects output, inflation, income distribution, and the balance of payments (Liberman, 2017). Weak exchange rate adjustment to current account imbalances could be partly explained by rigid exchange rate management systems characterized by multiple exchange rates that breed speculative activities and misallocation of scarce resources. For instance, Garcia-Herrero and Koivu (2007) opine that a more flexible exchange rate could foster the adjustment of trade balance while Gervais et al. (2015), Kim and Pyun (2018), and Nakatani (2018) note that a flexible exchange rate lowers the cost of current account adjustment. Therefore, Nigeria's current account is reexamined through the lens of uncertainty by assessing the impact of relative output, exchange rate, oil price, monetary and fiscal shocks. These impacts are also examined under different exchange rate regimes.

The theoretical literature is rooted in the new open-economy macroeconomics (Obstfeld and Rogoff, 1995 and 1996). More recent developments have synthesized the nexus using structural models such as Chen and Liu (2017) for China; Dumrongrittikul and Anderson (2015) for 14 Asian developing countries; Kim (2015) for 18 industrial countries; Gervais, Schembri and Suchanek (2015) for selected emerging market economies; Affandi and Mochtar (2013) for Indonesia; Lee and Chinn (2006) for G7 countries; Ahmad and Pentecost (2012) for 11 African countries; and Leonard and Stockman (2002) for the US. In Nigeria, the focus has been on analyzing the determinants of external account (Egwaikhide, 1997; Olasunkanmi and Babatunde, 2013; Uneze and Ekor, 2012; Oladipupo and Ogheneovo, 2011; Oshota and Badejo, 2015) and more recently, the sustainability of current account (Shuaibu and Oyinlola, 2016; Chen, 2014; Gnimassoun and Coulibaly, 2014).

This paper contributes to the debate by imposing identifying restrictions that are consistent with the intertemporal approach to current account modelling. This is important because the use of prior restrictions to the reduced-form correlation between real exchange rate and current account are endogenous to technological shocks (Kim, 2015). Thus, we utilize the long-run neutrality restriction of Blanchard and Quah (1989) and Clarida and Gali (1994). Furthermore, we restrict the sign of responses to innovations we seek to identify ala Chen and Liu (2017). The structural vector autoregression model (SVAR) model uses the small open economy assumption as a restriction to identify global and country-specific shocks; and to test the prediction of the intertemporal approach regarding the response of current account to shocks (Kano, 2008). Although the current account responds instantaneously to shocks; this has not been adequately explored in Nigeria.

The remainder of the paper is organised as follows: Section 2 presents a review of related literature. Methodological issues are discussed in Section 3. Section 4 presents and discusses the empirical results. Section 5 concludes and highlights some policy implications.

2. LITERATURE REVIEW

2.1. Theoretical Review

The last two decades have witnessed a fundamental shift in the literature from the traditional Mundell-Fleming model to the intertemporal approach. The Mundell-Fleming model asserts that an appreciation of the Real Exchange Rate (REER) affects a country's competitiveness due to a deterioration of the current account. This means that a depreciation of the REER is expected to restore equilibrium if the Marshall-Learner condition holds. Mussa (1986) posits that the sluggish price adjustment could explain short-run exchange rate movement. Stockman (1987) note that the behaviour of real exchange rate had since the collapse of Bretton Woods failed to reflect the importance of sluggish price-level adjustment but rather, the influence of real shocks with a large permanent component. Campbell and Clarida (1987) and Meese and Rogoff (1988) have also questioned the validity of the sticky price assumption in the open macroeconomy framework.

Early intertemporal analysis of current account focused on flexible prices and non-monetary factors, and real shocks are identified as drivers of the current account. More recent micro-founded dynamic optimizing models that account for preferences, technology and capital market access have emerged (Chen and Liu, 2017). The pioneering work of Obstfeld and Rogoff (1995, 1996) introduced market imperfections such as price stickiness and monopolistic competition in the intertemporal model, whilst highlighting the importance of current account under floating exchange rate regime. The assumption of purchasing power parity and non-stationarity led to further insights on the relationship between the exchange rate and net foreign asset accumulation with less emphasis on the latter (Cavallo and Ghironi, 2002).

2.2. Empirical Review

The empirical literature on the determinants of the current account focuses mainly on two approaches. The first set of studies use panel regression models to explain the ratio of the current account balance to GDP, against a set of explanatory variables. Some of these studies include Chinn and Prasad (2003), Bussiere, Fratzscher and Muller (2005), Cheung, Chinn and Fujii (2009), Rafiq (2010), Dumrongrittikul and Anderson (2015), Unger (2017), Kim (2015), Bouakez and Eyquem (2015) among others. For instance, while Kim (2015) and Dumrongrittikul and Anderson (2015) find government consumption and real exchange rate drive the current account; Rafiq (2010) show that fiscal policy plays a minor role in determining current account and real exchange rate. Kim (2015) reveals that a depreciation of the real exchange rate and improvement in the current account is larger in countries operating flexible exchange rate regimes than those with less flexibility. This underscores the role of exchange regime in explaining how the current account responds to shocks.

The second approach analyses the real exchange rate, current account dynamics using SVAR models (Giuliodori, 2004; Bussiere et al., 2005; Lee and Chinn, 2006; Ahmad and Pentecost, 2012; Chadha and Prasad, 1997; Affandi and Mochtar, 2013; Chen and Liu, 2017; Bouakez, Chihi and Normandin, 2013). Based on evidence from 11 African countries, Ahmad and Pentecost (2012) find that permanent shocks exert a positive impact on the current account and real exchange rate. Similarly, Bussiere et al. (2005) found that country-specific productivity shocks explain current account deficits while budget deficits play a lesser role. Contrariwise, Lee and Chinn (2006) find that temporary shocks have large short-term impacts on the current account and real exchange rate in G7 countries, while permanent shocks have a long-term effect on the real exchange rate, but a relatively short-term impact on the current account. Chadha and Prasad (1997) reveal that the real exchange rate was driven mainly by demand and supply shocks with the impact of the latter being higher. Moore and Pentecost (2006) and Affandi and Mochtar (2013) found that real shocks exert a permanent impact on the real exchange rate of India and Indonesia, suggesting that the exchange rate management is ineffective.

Some other studies focus on the impact of government spending on current account and exchange rate (Chen and Liu, 2017; Olasunkanmi and Babatunde, 2013; Javid, Arif, and Sabir, 2010; Caporale, Ciferri, and Girardi, 2011). However, excluding the study by Javid et al. (2010) who found that fiscal shocks lead to a depreciation of the exchange rate in India, other studies show that government spending leads to an appreciation of the exchange rate. Caporale et al. (2011) note that in many cases, fiscal shocks are the main drivers of the real exchange rate. Against this backdrop, we contribute to the literature by analyzing the shocks that drive real exchange rate, relative output and current account in Nigeria. The empirical model is subjected to a battery of exogenous disturbances that influence the economy with due consideration to the effect of oil price, monetary, fiscal shocks as well as the role of exchange rate regimes which, has not been well documented.

3. METHODOLOGY

3.1. Analytical Context

The real exchange rate could facilitate current account adjustment, regardless of the exchange rate regime. This paper draws inspiration from the new open macroeconomy literature following Rogoff and Obstfeld (1995). The model assumes that agents exhibit forward-looking behaviour. This means that the current account responds to shocks in a small open economy that could borrow or lend to smoothen consumption. In line with the works of Clarida and Gali (1994) and Giulidori (2004) productivity and monetary shocks are considered while exogenous shocks that affect the current account following Chinn and Lee (1994). This is due to the vulnerability of the Nigerian economy to oil price and production shocks. Therefore, the current account adjustment is assumed to follow country-specific domestic shocks that that largely explain the international monetary transmission mechanism (Obstfeld and Rogoff, 1995, 1996).

Although the model assumes external adjustment through the real exchange rate channel; this may not be the case in Nigeria because real exchange rate adjustment will occur in response to a current account imbalance through money supply under a fixed exchange rate regime or through the exchange rate channel under a flexible system (Gervais et al. 2009). The relative price change induced by current account adjustment to a real exchange rate shock leads to an *expenditure-switching effect.* This effect holds in the Rogoff and Obstfeld framework provided that nominal prices are fixed and the exchange rate pass-through is complete.

3.2. Model specification and empirical strategy

The analysis follows the work of Blanchard and Quah (1989) who pioneered the use of long-run restrictions as a means of identification in VAR models and Sims' (1980) short-run identification scheme. Structural shocks are identified by imposing both long- and short-run restrictions that provide an optimal identification scheme. In an n-variable system, $n(n-1)/2$ restrictions are required for exact identification after imposing a structural shock. Thus, the SVAR model adopted requires 15 restrictions for exact identification. The model accounts for the current account-GDP ratio, real exchange rate, money supply, oil price and government expenditure as endogenous variables while dummy variable that reflects the exchange rate regime is also included. Levy-Yeyati, Sturzenegger and Gluzmann (2013) opine that analyzing exchange rate regimes is one of the most important questions in international economics.

Using the identified model, the responses of the current account to other innovations that the intertemporal approach imposes on the SVAR and this is expected to yield a better specification of the stochastic process of the current account (Kano, 2008, p.758). The model is specified as follows:

$$A_0 Z_t = \alpha + \sum_{i=1}^{p} A_i Z_{t-1} + \mu_t, \tag{1}$$

where $z_t = (OP, Y, C, R, M, G)$, OP represents oil price to GDP ratio; Y is relative output; C is current account to GDP ratio; R is real exchange rate; M is narrow money (M1) as a ratio of GDP; G is government expenditure as a ratio of GDP, α represents an nx1 vector of constants. μ_t is the vector of serially and mutually uncorrelated structural innovations and $E\mu_t\mu_t' = I$. We assume that A_0^{-1} has a structure that follows the reduced-form errors ε_t, where $E\varepsilon_t\varepsilon_t' = \Sigma$ can be decomposed with $\varepsilon_t = A_0^{-1}\mu_t$ as follows:

$$\varepsilon_t = \begin{bmatrix} A_{11}(I) & A_{12}(I) & A_{13}(I) & A_{14}(I) & A_{15}(I) & A_{16}(I) \\ A_{21}(I) & A_{22}(I) & A_{23}(I) & A_{24}(I) & A_{25}(I) & A_{26}(I) \\ A_{31}(I) & A_{32}(I) & A_{33}(I) & A_{34}(I) & A_{35}(I) & A_{36}(I) \\ A_{41}(I) & A_{42}(I) & A_{43}(I) & A_{44}(I) & A_{45}(I) & A_{46}(I) \\ A_{51}(I) & A_{52}(I) & A_{53}(I) & A_{54}(I) & A_{55}(I) & A_{56}(I) \\ A_{61}(I) & A_{62}(I) & A_{63}(I) & A_{64}(I) & A_{65}(I) & A_{66}(I) \end{bmatrix} \begin{bmatrix} \emptyset_t \\ \delta_t \\ \vartheta_t \\ \rho_t \\ \tau_t \\ \gamma_t \end{bmatrix} \quad (2)$$

From equation 2, $\emptyset_t$ represents oil price shock; δ_t is a supply or technology shock; ϑ_t is a current account shock, ρ_t is an exchange rate shock, τ_t is a monetary shock while γ_t represents a fiscal shock. The identification scheme is the non-recursive type, which indicates that no prior restriction is imposed on the ordering of variables. First, in our identifying restriction, oil price shock itself is identified as the only shock that can have a long-term effect on the real oil price. However, in the short run, all shocks are assumed to be neutral on oil prices:

$$A_{12}(I) = A_{13}(I) = A_{14}(I) = A_{15}(I) = A_{16}(I) = 0$$

Second, identifying assumption that distinguishes between demand and supply shocks is that in the long run, the level of production will be determined by supply-side factors and real oil price shocks (Blanchard and Quah, 1989). However, in the short run, due to nominal and real rigidities, all three disturbances do not influence production. Hence, $A_{24}(I) = A_{25}(I) = A_{26}(I) = 0$

To maintain exact identification, we assume that monetary and fiscal policies do not respond to output shocks. This is because government spending is usually predetermined and unlikely to respond to business cycle fluctuations within a quarter; in addition to a relatively unchanged monetary policy stance. Therefore, the restriction $A_{52}(I) = A_{62}(I) = 0$ holds.

3.3. Data and preliminary diagnostics

The period considered dates from 1981Q1 to 2017Q4. Data for relative GDP is sourced from the International Monetary Fund's (IMF) International Financial Statistics (IFS) database, while real oil price, narrow money (M1) to GDP ratio and real exchange rate, government expenditure to GDP ratio and current account to GDP ratio are obtained from Central Bank of Nigeria Statistical bulletin. The data sets are not available quarterly and therefore, we interpolated to generate quarterly series using the Chow and Lin (1971) method. The trend for both series remains the same and thus could be used for further analysis.

The real exchange rate is affected by domestic and external conditions; therefore, relative measures of macroeconomic conditions are relevant for defining output and exchange rate. The relative output is defined as domestic real GDP minus US real GDP while the real exchange rate is defined as the nominal exchange rate (national currency per US dollar) multiplied by the ratio between the foreign (the U6S) and domestic prices. Therefore, an increase in the real exchange rate implies a real depreciation (Chadha and Prasad, 1997; Caporale et al., 2011; Ahmed, 2003; and Berg et al., 2002; for similar data transformations). The US is used because it is a large economy and Nigeria's major trading partner. Also, crude oil which is Nigeria's major export commodity is indexed in the US dollar and thus a change in this currency price is quickly transmitted to the domestic economy.

The time-series properties of the variables are examined. Panel A of Figure 1 shows the trend of the real exchange rate (RER), government consumption expenditure (GCONS) and the ratio of the current account to GDP. The trends of these variables show considerable variation. The depreciating path of the naira exchange rate during the review period and the spikes observed in the current account is an indication that exchange rate policies in Nigeria have not stabilized the current account. This may be explained by the high import intensity of the country. Panel B shows that oil price volatility could partly explain the swings in the current account and relative output. Likewise, the exchange rate plays a role in adjusting current account imbalances in line with the predictions of Obstfeld and Rogoff (2000). However, the effectiveness of the exchange rate in the current account adjustment process in Nigeria could be influenced by oil market uncertainties.

Panel B shows huge variations in the current account. The current account to GDP ratio (CAGDP) shows a deficit in early years albeit fluctuations over the full sample while a surplus was recorded from 2003 to 2014. These periods coincide with positive oil prices (see Figure 1, Panel B). The co-movement between oil price and current account suggests the presence of a long-run relationship. The trend of relative output shows a distinct pattern as it declines in the early years due to the economic slowdown of the 1980s but rose sharply afterwards. The increase in relative output is not unconnected to favourable oil prices. The trend observed in the government's fiscal stance (GCONS), fluctuation in the oil price (OILP) and monetary policy indicate that these are important control variables in the nexus between current account, real exchange rate and relative output in Nigeria.

The descriptive statistical properties of the variables are presented in Table 1A. The kurtosis measures the peakedness of the distribution of the series and is greater than 3 for CAGDP. This suggests that CAGDP out of the series is leptokurtic relative to the normal distribution. GCONS, M1GDP, OILP, RER and RGDP are less than three, suggesting they are platykurtic. This means that these series are largely lower than the average. In terms of skewness, the series has a long right tail or are positively skewed with values close to zero. This implies that they mirror a normal distribution. Although, the Jarque-Bera normality test statistic for all the variables are statistically significant indicating the series are not normally distributed, however, as pointed out by Lee and Tse (1996), the Johansen method produces testing procedures that are robust to the presence of non-normality. The standard deviation of the series is quite high, indicating significant dispersion from the mean. This suggests that some shocks could change the path of the variables.

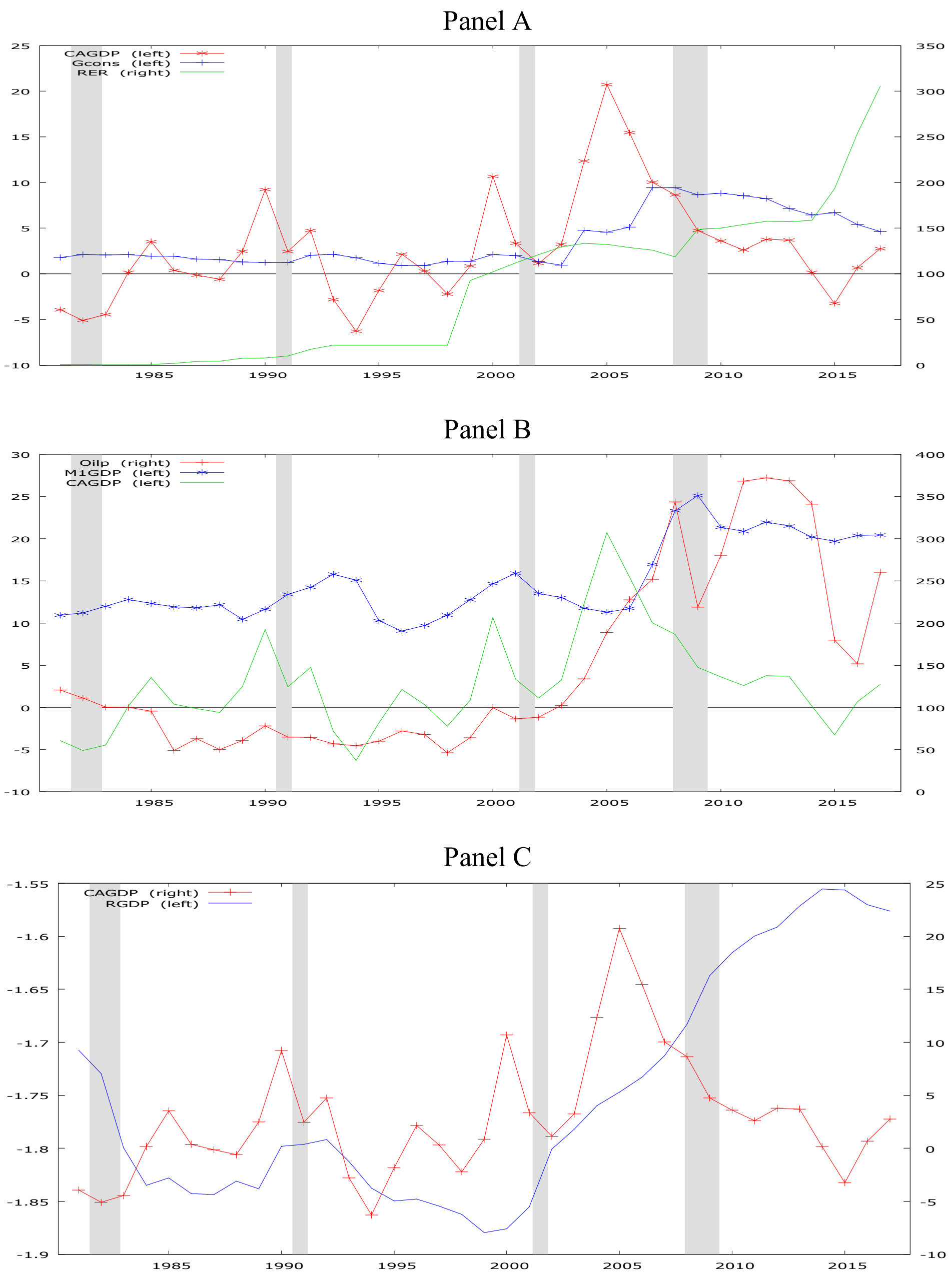

Figure 1. Real exchange rate (RER), Current account (CAGDP), Oil price (OILP) and Government consumption expenditure (GCONS)

The correlation matrix shows a high positive correlation between oil price (OILP) and RGDP, RER, M1GDP and GCONS suggesting that oil price drives domestic economic activities. Also, the high positive correlation between RGDP and M1GDP suggest that monetary policy is crucial for the growth process. The high positive correlation between the control variables and the key variables of interest (CAGDP, RER and RGDP) indicate that they are important explanatory factors. See Table 1B.

Table 1A. Descriptive Statistics

	CAGDP	GCONS	M1GDP	OILP	RER	RGDP
Mean	2.86	3.66	14.91	146.34	81.33	-1.75
Median	2.19	2.05	13.03	98.99	92.69	-1.80
Maximum	20.74	9.45	25.12	372.11	305.79	-1.56
Minimum	-6.29	0.91	9.06	46.34	0.61	-1.88
Std. Dev.	5.38	2.85	4.32	103.68	76.25	0.11
Skewness	1.08	0.86	0.77	0.10	0.61	0.74
Kurtosis	4.30	2.14	2.20	2.58	2.59	2.08
Jarque-Bera	38.17	22.30	18.06	25.16	9.90	18.23
Probability	0.00	0.000	0.00	0.00	0.01	0.00
Observations	145	145	145	145	145	145

Table 1B. Correlation Matrix

	CAGDP	GCONS	M1GDP	OILP	RER	RGDP
CAGDP	1.00					
GCONS	0.35	1.00				
M1GDP	0.06	0.86	1.00			
OILP	0.32	0.93	0.81	1.00		
RER	0.35	0.70	0.73	0.70	1.00	
RGDP	0.09	0.83	0.82	0.86	0.77	1.00

Unit root tests were carried out to ascertain the mean reversion property of the series and the result is presented in Table 2. The results show that the null hypothesis of a unit root in the series cannot be rejected against the alternative hypothesis of stationarity around a deterministic linear trend in both the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) test. Because of potential breaks in the data, a stationarity test that accounts for a structural break using the Perron (2006) approach that includes a trend and intercept in the test equation. The significance of a structural break in the series may lead to biased and inconsistent result as pointed out by Searle and Mama (2010) as cited in Shuaibu and Oyinlola (2016). The test identifies the period of this structural change endogenously and presents a break date as evident in Table 3. However, the results of both tests (with and without a structural break) are consistent, as both tests confirm that the test statistics exceed their respective critical values at 5 per cent significance, confirming that all the series are the first-difference stationary.

Table 2. Unit Root Test Result

Variables	Augmented Dickey-Fuller Test				Philips Peron Test				OOI
	Levels		First Difference		Levels		First Difference		
	with c	with c&t	with c	with c& t	with c	with c&t	with c	with c&t	
CAGDP	-2.63	-2.61	-5.42	-5.38	-2.51	-2.50	-8.05	-9.95	I(1)
RER	2.24	-1.21	-3.30	-3.80	1.83	-0.18	-3.30	-3.79	I(1)
RGDP	-0.74	-2.72	-3.10	-3.30	-0.30	-2.56	-3.00	-3.26	I(1)
OILP	-1.19	-2.39	-5.42	-5.34	-1.19	-2.45	-5.35	-5.26	I(1)
GCON	-1.17	-2.55	-5.44	-5.36	-1.36	-1.84	-5.51	-5.43	I(1)
MIGDP	-1.19	-2.62	-4.99	-4.92	-1.22	-2.07	-3.63	-3.60	I(1)

Notes: The ADF and Philip Perron test statistics for the null hypothesis of a unit root process for the variables in the levels and first differences. The critical value at the 1 per cent significance level is 4.05 if a constant and a linear trend (c&t) are included in the regression, 3.49 with only a constant term (c). At the 5 per cent significance level, these values are 3.45, 2.89 and 1.94, respectively (MacKinnon, 1996). OOI means the order of integration.

Table 3. Perron Unit Root Test with a Structural Break

	Level		First Difference		
	T-stat	Break Date	T-stat	Break Date	OOI
CAGDP	-4.24	1998Q1	-4.86	2005Q1	I(1)
RER	-0.72	2014Q1	-5.23	2014Q1	I(1)
RGDP	-3.35	2001Q1	-4.98	1983Q1	I(1)
OILP	-4.22	2004Q1	-4.79	2015Q1	I(1)
GCON	-4.29	1982Q3	-5.04	2004Q2	I(1)
MIGDP	-3.89	2006Q2	-4.92	1994Q2	I(1)

Notes: Critical values for the Perron test are –5.28 and –4.62 for the 1 per cent and 5 per cent levels of significance, respectively. RER is the log of real exchange rate; MIGDP, the log of the ratio of M1 to GDP; GECON, the log of government expenditure as a percentage of GDP; ROILP, log real oil price (ratio of oil price to CPI); RGDP, relative GDP; CAGDP, the ratio of the current account to GDP.

Table 4. Test for Cointegration

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.23	110.15	83.94	0.00
At most 1 *	0.21	72.74	60.06	0.00
At most 2	0.15	39.71	40.17	0.06
Trace test indicates 2 cointegrating equation(s) at the 0.05 level				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.23	37.42	36.63	0.04
At most 1 *	0.21	33.02	30.44	0.02
At most 2	0.15	22.72	24.16	0.08
Max-eigenvalue test indicates 2 cointegrating equation(s) at the 0.05 level				

Notes: *(**) denotes rejection of the hypothesis at the 5% (1%) level.

The next step is to check if there is a long-run relationship between the variables. If the variables are cointegrated, there would be misspecification error in a first difference VAR (Chadha and Prasad, 1997). Thus, a cointegration relationship among the level variables could then be explored to obtain efficient estimates of the short-run dynamic association. The trace test indicates 2 cointegrating equations at the 5 per cent significance level while the maximum eigenvalue statistic shows 2 cointegrating links at the 5 and 1 per cent significance levels.

4. DISCUSSION OF FINDINGS

This section presents results from the SVAR analysis. There are several ways to examine the effect of structural shocks in a system. The first step is to examine the impulse response of each variable to a standard innovation or shock, and thereafter the analysis of forecast error variance decomposition. The unrestricted reduced form SVARs were estimated using data over the period 1981Q1-2017Q4 and an optimal lag length of 7 for each variable based on the Schwarz information criteria.[1]

4.1. Impulse Response Function Results

The impulse response presented in Figure 2 shows the response of relative output to a one standard deviation shock, together with standard-error confidence bounds. The effect of oil price shock gives important insights. In response to a positive oil price shock, relative output improves (increases) up to the 15th quarter and decreases afterwards but responds negatively after the 20th quarter. This may be explained by the fact that Nigeria is a net exporter of crude oil and a net importer of refined petroleum products. This implies that the impact of a positive oil price shock in the international market may not signify permanent output improvement especially in the absence of fiscal discipline and low incentives to save especially at the sub-national level. The positive output effect following an oil price shock worsens the current account due to the appreciation of the naira exchange rate. Morsy (2014) shows that following an increase in oil price, major oil-exporting countries experience surpluses that constitute an average of 23 per cent of GDP. Consequently, these countries spend more on import of goods and services, amounting to an average of 37 per cent of GDP leading to a deterioration of the current account balance.

Also, the appreciation of the exchange rate due to a long-run increase in oil price portrays evidence of the Dutch disease phenomenon among oil-exporting countries (Syeda and Tufail, 2013). The results also indicate that a positive oil price shock improves the current account up till the 9th quarter but worsens thereafter. The response

[1] To conserve space the optimal lag length selection result is not presented here but is available on request.

of the exchange rate to a positive oil price shock is an appreciation of the exchange rate and consequently, a deterioration of the current account. In response to a positive output shock, current account improves in the short-run but deteriorates over the long-run. This is consistent with the intertemporal approach to the current account where an increase in output prompts an increase in the demand for foreign goods and thus worsens the current account. The consequent counter-cyclical pattern of the current account has been well documented by Kim and Roubini (2008).

The response of relative output to fiscal policy shocks record a decline initially and a steady rise thereafter. Similarly, the current account improves up to the 10th quarter followed by deterioration. A fiscal shock exerts depreciating pressure on the domestic currency. Obsfeld and Rogoff (1995) suggest that permanent government consumption shocks lead to a short-run demand-driven improvement in the current account but leads to a depreciation of the real exchange rate. The impact of fiscal policy on relative output is expected because it originates from the real sector and it induces a shift in relative prices. This is in line with Stockman (1980), Lucas (1982) and Hsieh (1987) who posit that exchange rate movement responds to product-market distortions that arise from demand- or supply-side perturbations. The results of the impulse response function validate the Twin deficit hypothesis as the current account deteriorates in response to fiscal expansion.

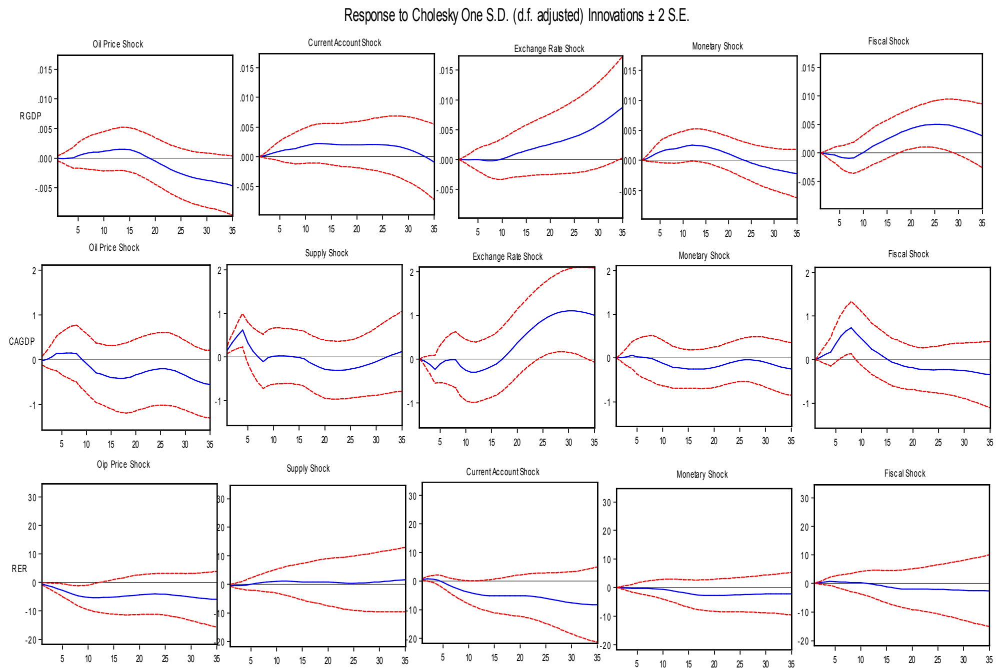

Figure 2. Impulse Response Function

Table 5. Forecast Error Variance Decomposition

	Variance Decomposition of RGDP						Variance Decomposition of CAGDP						Variance Decomposition of RER					
$Qtrs$	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t
1	0.02	99.98	0.00	0.00	0.00	0.00	0.16	8.37	91.47	0.00	0.00	0.00	5.35	2.40	6.72	85.53	0.00	0.00
	(1.13)	(1.13)	(0.00)	(0.00)	(0.00)	(0.00)	(1.13)	(4.52)	(4.62)	(0.00)	(0.00)	(0.00)	(3.70)	(2.80)	(3.93)	(5.58)	(0.00)	(0.00)
5	0.15	95.70	1.10	0.00	2.55	0.50	0.63	11.77	83.85	1.19	0.07	2.50	10.14	0.34	1.13	87.44	0.12	0.83
	(2.41)	(4.97)	(2.18)	(1.52)	(3.17)	(2.06)	(2.79)	(7.38)	(8.43)	(2.43)	(1.42)	(3.33)	(7.40)	(2.02)	(2.15)	(8.31)	(1.41)	(2.19)
10	1.35	88.06	3.43	0.03	6.22	0.90	0.79	5.93	78.15	1.23	0.17	13.73	19.23	0.58	6.75	72.95	0.16	0.33
	(5.21)	(10.34)	(5.74)	(4.19)	(6.59)	(3.73)	(4.80)	(5.76)	(11.77)	(4.54)	(2.66)	(10.12)	(11.70)	(4.08)	(6.49)	(12.79)	(2.35)	(3.00)
15	2.88	76.25	6.68	1.05	9.87	3.27	3.85	5.38	72.21	3.08	1.69	13.78	18.30	0.65	11.29	68.54	0.92	0.30
	(7.28)	(13.79)	(8.45)	(7.46)	(8.48)	(6.01)	(7.84)	(6.46)	(13.04)	(7.12)	(4.12)	(9.95)	(12.88)	(6.07)	(9.15)	(15.23)	(3.91)	(4.12)
20	2.65	62.59	8.27	4.40	9.88	12.21	7.57	5.75	67.06	3.90	3.08	12.65	15.70	0.54	12.44	68.39	2.05	0.88
	(7.55)	(14.94)	(9.28)	(10.57)	(8.16)	(10.01)	(10.22)	(6.93)	(12.81)	(7.59)	(5.21)	(9.33)	(12.60)	(7.91)	(9.94)	(16.45)	(5.52)	(5.49)
25	4.12	47.72	8.64	9.56	7.63	22.33	7.45	6.58	57.40	14.37	2.84	11.36	13.32	0.40	13.04	69.59	2.41	1.23
	(8.17)	(14.70)	(9.25)	(12.96)	(6.84)	(12.37)	(10.33)	(8.40)	(12.28)	(9.57)	(5.11)	(8.72)	(11.96)	(9.13)	(10.27)	(17.01)	(6.35)	(6.58)
30	7.81	35.24	7.54	17.20	6.17	26.05	6.69	5.47	47.78	28.56	2.17	9.35	11.86	0.33	14.48	69.60	2.30	1.43
	(9.20)	(14.05)	(9.10)	(15.31)	(6.03)	(13.31)	(9.65)	(8.65)	(11.60)	(11.96)	(4.92)	(8.02)	(11.49)	(9.84)	(10.65)	(17.28)	(6.52)	(7.22)
35	11.04	25.57	5.56	29.46	5.59	22.78	8.00	4.20	42.13	35.32	2.14	8.21	11.17	0.38	15.68	69.18	2.05	1.54
	(9.68)	(13.05)	(8.80)	(17.39)	(5.81)	(13.24)	(9.70)	(8.37)	(11.56)	(13.22)	(5.01)	(7.81)	(11.28)	(10.22)	(11.10)	(17.47)	(6.34)	(7.60)

Notes: The variables are oil price, relative output, current account to *GDP* ratio, real exchange rate, narrow money supply *(MIGDP)* and government consumption expenditure as a ratio of *GDP*. The shocks are: $\emptyset_t$, oil price shock; δ_t, supply shock; ϑ_t, current account shock; ρ_t, exchange rate shock; τ_t, monetary shock and fiscal shock, γ_t. One standard error band for the variance decomposition are reported in parentheses. Approximate standard errors were computed using the Monte Carlo simulations with 500 replications.

4.2. Forecast Error Variance Decomposition Results

Table 5 presents the forecast error variance decomposition (FEVD) and the result shows that an exchange rate shock is the most important source of variation in relative output, accounting for 29.46 per cent of the forecast error variance over followed by its own perturbation at 25.57 per cent. Oil price shocks account for 11.04 per cent while monetary and current account shocks accounted for 5.59 and 5.56, respectively. The impact of a fiscal shock was found to influence the dynamics of relative output accounting for 22.78 per cent. The predominance of fiscal shock implies that fiscal policy is important in enhancing relative output and this conforms with the finding of Chen and Liu (2017) and Olusunkanmi and Babatunde (2013).

The FEVD for CAGDP shows that the current account variation is significantly influenced by its own perturbation (42.13 per cent) followed by an exchange rate shock that accounted for 35.32 per cent. Oil price accounted for 8.00 while fiscal shocks contributed 8.21 per cent. The variance decomposition results for real exchange rate showed that it is more responsive to its own shock in the first and 35th quarter followed by a current account shock which accounted for 15.68 per cent in the 35th quarter. This implies that trade dynamics significantly affect exchange rate stability. Oil price shocks accounted for 5.35 and 11.17 per cent in the 1st and 35th quarter, respectively. Other variables were found to affect real exchange rate movement except for own and current account shocks. The result indicates that 0.38, 2.05 and 1.54 per cent variation in the real exchange rate was due to current account, monetary and fiscal shocks, respectively.

4.3. Further Analysis: Role of Exchange Rate Regimes

In this section, the sensitivity of the findings is examined under fixed and flexible exchange rate regimes.[2] This is because the real exchange rate adjusts in response to current account imbalance either through money supply and price level movements under a fixed or flexible exchange rate regime (Gervais et al., 2009). The fixed exchange rate system was practised in Nigeria between 1959 and 1986 while a flexible (or managed float) regime commenced from June 1986 to date (CBN, 2016). Therefore, the classification of the exchange rate regime dummy for the period of the fixed exchange rate takes 1 for the 1981Q1-1986Q1 and 0 otherwise. For the flexible exchange rate regime dummy, it takes 1 from 1986Q2 to 2017Q4 and 0 otherwise.

There is no clear consensus on which type of exchange rate regime is more favourable for macroeconomic stability. Proponents of the fixed exchange rate regime argue that the system promotes higher trade and macroeconomic stability which in turn stimulates foreign investment inflows and growth. On the other hand, proponents of flexible exchange rate regime argue that the advantage of exchange rate flexibility is that

[2] The exchange rate regime refers to a system were a country can de facto peg its exchange rate to another currency, letting it float freely or control its float.

it corrects for domestic and external distortions in the event of real shocks (Pietrucha, 2015).

Table 6. Forecast Error Variance Decomposition under a Fixed Exchange Rate Regime

	Variance Decomposition of RGDP						Variance Decomposition of CAGDP						Variance Decomposition of RER					
$Qtrs$	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t
1	91.77	8.23	0.00	0.00	0.00	0.00	0.02	38.69	61.29	0.00	0.00	0.00	91.97	7.51	0.14	0.38	0.00	0.00
	(1.24)	(1.24)	(0.00)	(0.00)	(0.00)	(0.00)	(1.01)	(5.78)	(5.78)	(0.00)	(0.00)	(0.00)	(1.20)	(1.17)	(0.04)	(0.06)	(0.00)	(0.00)
5	76.56	14.61	2.19	5.22	0.97	0.45	2.65	17.18	48.49	8.28	21.35	2.05	73.81	17.08	2.58	4.34	1.70	0.49
	(4.87)	(3.89)	(2.10)	(1.85)	(0.89)	(0.86)	(2.35)	(4.42)	(6.05)	(3.57)	(5.19)	(1.23)	(4.93)	(4.12)	(2.23)	(1.85)	(1.16)	(0.86)
10	65.30	21.98	5.06	4.49	1.77	1.41	9.22	18.85	29.88	14.86	25.60	1.59	64.21	21.93	5.97	3.94	2.22	1.73
	(5.65)	(4.93)	(2.60)	(1.67)	(1.15)	(1.37)	(5.32)	(6.08)	(7.13)	(5.94)	(7.15)	(1.07)	(5.68)	(5.01)	(2.83)	(1.69)	(1.22)	(1.47)
15	58.54	21.47	5.87	4.75	6.67	2.70	9.80	19.40	28.79	14.99	24.73	2.28	51.85	21.29	6.94	6.34	10.51	3.05
	(5.54)	(4.86)	(2.60)	(1.84)	(2.36)	(1.73)	(5.51)	(6.34)	(7.02)	(6.08)	(7.05)	(1.23)	(5.65)	(4.76)	(2.64)	(2.49)	(3.18)	(1.71)
20	41.52	18.19	17.64	7.90	11.90	2.86	9.94	19.56	28.64	15.01	24.59	2.26	48.63	21.56	7.91	6.89	11.39	3.64
	(5.04)	(4.20)	(3.80)	(2.79)	(3.40)	(1.57)	(5.60)	(6.51)	(7.07)	(6.09)	(7.09)	(1.22)	(5.66)	(4.71)	(2.66)	(2.70)	(3.42)	(1.82)
25	32.10	18.52	21.81	10.78	14.78	2.03	9.96	19.55	28.65	15.01	24.54	2.29	42.64	21.25	11.34	8.41	13.16	3.20
	(5.56)	(4.78)	(5.01)	(4.06)	(4.49)	(1.28)	(5.61)	(6.53)	(7.09)	(6.09)	(7.08)	(1.25)	(5.73)	(4.76)	(3.38)	(3.26)	(3.93)	(1.66)
30	31.45	18.46	22.22	11.00	14.79	2.08	9.96	19.54	28.65	15.01	24.54	2.29	41.88	21.19	11.88	8.63	13.21	3.21
	(5.70)	(4.92)	(5.16)	(4.23)	(4.57)	(1.29)	(5.61)	(6.55)	(7.10)	(6.09)	(7.09)	(1.26)	(5.81)	(4.83)	(3.55)	(3.40)	(3.99)	(1.66)
35	31.43	18.45	22.23	11.00	14.79	2.09	9.96	19.55	28.65	15.01	24.54	2.29	41.87	21.18	11.89	8.64	13.21	3.21
	(5.68)	(4.95)	(5.19)	(4.23)	(4.59)	(1.29)	(5.62)	(6.56)	(7.11)	(6.10)	(7.09)	(1.26)	(5.83)	(4.87)	(3.56)	(3.42)	(4.02)	(1.66)

Table 7. Forecast Error Variance Decomposition under a Flexible Exchange Rate Regime

	Variance Decomposition of RGDP						Variance Decomposition of CAGDP						Variance Decomposition of RER					
$Qtrs$	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t	$\emptyset_t$	δ_t	ϑ_t	ρ_t	τ_t	γ_t
1	33.42	66.58	0.00	0.00	0.00	0.00	4.45	3.59	91.94	0.00	0.00	0.00	4.47	11.32	0.18	84.03	0.00	0.00
	(6.30)	(6.30)	(0.00)	(0.00)	(0.00)	(0.00)	(3.57)	(3.42)	(4.67)	(0.00)	(0.00)	(0.00)	(3.43)	(4.96)	(1.04)	(5.73)	(0.00)	(0.00)
5	33.22	66.78	0.01	0.00	0.00	0.00	3.34	2.08	90.71	0.13	0.66	3.06	10.63	10.54	1.03	76.85	0.76	0.16
	(10.06)	(10.41)	(1.80)	(1.68)	(1.29)	(1.65)	(4.70)	(3.76)	(6.89)	(1.37)	(1.59)	(3.52)	(6.38)	(6.20)	(2.60)	(8.60)	(1.52)	(1.15)
10	32.71	67.25	0.03	0.00	0.00	0.00	2.04	1.83	77.80	0.13	6.79	11.39	11.60	11.68	7.35	68.01	0.87	0.46
	(12.96)	(13.64)	(4.12)	(3.44)	(2.96)	(3.36)	(4.57)	(3.77)	(11.57)	(3.18)	(6.75)	(8.98)	(8.28)	(8.01)	(7.44)	(12.34)	(2.97)	(2.62)
15	32.52	67.41	0.04	0.00	0.01	0.02	2.62	3.97	68.95	0.83	12.31	11.30	10.29	10.98	13.93	62.95	0.64	1.20
	(13.67)	(14.61)	(5.59)	(4.90)	(4.00)	(4.55)	(5.38)	(5.71)	(12.65)	(4.88)	(9.70)	(8.66)	(8.85)	(9.13)	(10.53)	(14.03)	(3.86)	(4.34)
20	32.56	67.32	0.04	0.02	0.01	0.04	3.21	6.17	60.28	4.02	11.39	14.92	9.20	10.19	18.07	60.09	0.57	1.87
	(13.86)	(15.23)	(6.73)	(6.37)	(4.33)	(5.70)	(6.23)	(6.83)	(12.80)	(6.68)	(9.24)	(8.61)	(9.06)	(10.02)	(11.99)	(14.92)	(4.52)	(5.76)
25	32.71	67.10	0.04	0.07	0.00	0.06	3.85	7.96	51.85	8.56	9.33	18.44	8.63	9.72	20.37	58.53	0.66	2.10
	(14.02)	(15.87)	(7.71)	(7.78)	(4.37)	(6.88)	(6.41)	(7.65)	(13.23)	(8.34)	(8.56)	(9.43)	(9.33)	(10.87)	(12.69)	(15.52)	(4.91)	(6.71)
30	32.95	66.73	0.04	0.19	0.00	0.0714	4.06	8.64	48.11	12.17	8.44	18.55	8.27	9.38	21.61	57.94	0.77	2.02
	(14.06)	(16.47)	(8.53)	(9.11)	(4.29)	(7.76)	(6.40)	(8.24)	(13.46)	(9.68)	(8.58)	(9.87)	(9.60)	(11.60)	(13.06)	(15.97)	(5.11)	(7.34)
35	33.21	66.23	0.06	0.41	0.00	0.07	3.92	8.62	47.18	14.58	8.08	17.59	8.00	9.10	22.27	57.98	0.83	1.83
	(13.99)	(17.01)	(9.19)	(10.35)	(4.23)	(8.35)	(6.48)	(8.49)	(13.57)	(10.64)	(8.66)	(10.06)	(9.80)	(12.17)	(13.24)	(16.34)	(5.18)	(7.80)

The forecast error variance decomposition (FEVD) for relative output under fixed and flexible exchange rate systems are presented in Tables 6 and 7, respectively. The FEVD of relative output and current account indicates that a monetary shock is more pronounced under a fixed compared to a flexible system. This is due to the demand-augmenting effect of monetary policy under a fixed exchange rate regime as in Nigeria where the monetary authority has persistently intervened in the foreign exchange market and carried out quasi-fiscal activities.

The results also show that a monetary shock contributes 14.79 and 24.54 per cent to the forecast errors of RGDP and CAGDP compared to an exchange rate shock that contributed 11 per cent under a fixed exchange rate system and about 15 per cent under a flexible regime. This shows marked differences in the monetary transmission mechanism under both regimes. Similarly, a monetary shock contributes 13.21 and 0.83 per cent in the forecast error of exchange rate under fixed and flexible exchange rate regimes, respectively. De and Sun (2019) also report that the floating exchange rate regime is more susceptible to shocks compared with the fixed regime. The exchange rate shock contributed 8.64 and 57.98 per cent to its own perturbation under fixed and flexible exchange rate regime, respectively. The findings generally conform with Kim and Pyun (2018) who observe that the exchange rate regime plays an important role in the business cycle.

Under a flexible exchange rate regime, the value of export and import affect the demand and supply of foreign exchange. If the demand for export responds to price changes, a currency depreciation makes exports cheaper relative to imports. Thus, a depreciation may not prompt an improvement in the trade balance especially if there is a lag in export bills due.

The FEVD for relative output in both regimes shows that the impact of exchange rate shock to relative output under fixed exchange rate regime is higher compared to flexible exchange rate regime as the shock was found to contribute 11 per cent under fixed and 0.41 per cent under the flexible system. This suggests that the flexible exchange rate regime could be more effective in mitigating the impact of currency shocks. The effect of the exchange rate regime on the business cycle is contentious. Ahmed et al. (1993) find limited evidence indicating systematic differences in business cycles under fixed and floating exchange rate regimes using post-war data. However, Gerlach (1988) finds that the business cycle under a flexible exchange rate regime was more synchronized compared with the Bretton woods era.

This means that the inability of Nigeria to harness the gains of a flexible exchange rate system could be partly explained by weak financial systems, low diversification, and a narrow export base. Stotsky et al. (2012) opine that the reason why developing countries are unable to reap the benefit of flexibility is due to an underdeveloped financial market, as countries with more developed financial markets are better able to manage exchange rate volatility associated with a flexible exchange rate regime. This makes it relatively easier for such countries to achieve the benefits of flexible regimes especially in terms of enhancing adjustment capacity to real shocks without undermining stability. Friedman (1953) also found that a flexible regime enhances the speed of external adjustment and minimizes vulnerabilities as countries running current account deficits could reduce imbalances by devaluing the exchange rate to boost export and minimize import.

Further analysis conducted using impulse response function validate our findings. The results are not presented due to space but are available on request. The figures show the generalized one standard deviation shocks to relative output, current account and real exchange rate. The result indicates that under a fixed exchange rate regime, the response of relative output fluctuates and then tapers off to zero over the forecast period due to exchange rate, fiscal and monetary shocks. However, relative output responded positively to oil price shock over the forecast period under exchange rate flexibility but was not responsive to other policy shocks. The results also show that the current account responds positively to shocks under a flexible exchange rate system compared with a fixed system. This corroborates the FEVD results.

5. CONCLUSION

Extant literature that investigates the relationship between relative output, real exchange rate adjustment and current account dynamics remain largely inconclusive due to limitations arising from identification problems or non-consideration of exchange rate regimes. This paper contributes to the debate by investigating the role of the exchange rate regime and using the identification strategy proposed by Blanchard and Quah. The impact of fiscal, monetary and oil price shocks are also considered. Using the SVAR approach, we account for six shocks hitting the economy to shed more light on the link between real exchange rate adjustment, relative output and current account dynamics in Nigeria.

The findings show that fiscal shocks drive the dynamics of the current account and relative output in Nigeria while it plays an insignificant role in real exchange rate adjustment. The results also suggest that the exchange rate and monetary shocks play an important role in relative output performance and current account stabilization. The reveals that a deterioration of the current account in response to monetary policy contraction; suggesting the existence of the expenditure-switching effect of monetary policy. Interestingly, the current account balance worsens as a result of fiscal expansion, confirming that the twin-deficit hypothesis holds in Nigeria. Monetary and oil price shocks exert a significant impact on relative output and the current account balance under a fixed exchange rate regime compared to a flexible system. The results show that the current account and relative output are more capable of absorbing shocks under a flexible exchange rate system.

The empirical exercise does not explicitly allow us to identify other important factors that could make the flexible exchange rate system more effective. This could be considered in future research. The important policy lesson from this paper is the need for more efficient market-based exchange rate management system whilst building up fiscal buffers that can help mitigate macroeconomic vulnerabilities.

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