Fiscal policy, Monetary policy and External imbalances: Cross-country evidence from Africa's three largest economies (Nigeria, South Africa and Egypt)

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Fiscal policy, Monetary policy and External imbalances: Cross-country evidence from Africa's three largest economies (Nigeria, South Africa and Egypt)[1]

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[1] We acknowledge the contribution of Guy Russel

1. Introduction

The rise of excessive international imbalances has been at the heart of academic research as well as policymaking discussions and decisions, especially in light of the 2008 financial crisis and the subsequent 2010 sovereign debt crisis. These imbalances are viewed to be critical in threating economic and financial stability and appropriate policies are needed to reverse them (Yuan and Chen,2015 & Blanchard and Milesi-Ferretti, 2010). A number of policy recommendations have been suggested as prescriptions for correcting external imbalances, especially the current account deficit (see Yuan and Chen, 2015; Bagnai, 2009; Mundell, 1962). It is worth noting that the contribution of Mundell (1962) has been fundamental to this end. The author shows that fiscal and monetary policies can be used independently to attain internal and external stabilities. According to Mundell (1962), monetary policy ought to be aimed at external objectives and fiscal policy at internal objectives or balances. However, Kearney and Monadjemi (1990) emphasise the importance of fiscal policy for external and internal balances. The authors show that government financing decision has been responsible for twin deficit relationship in developed economies. Nickel and Vanbsteenkiste (2008) assess the empirical relationship between fiscal policy and the current account and consider how the Ricardian equivalence affects this relationship in 22 industrialised countries. The authors show that for countries with debt to GDP ratio up to 90%, government balance affects positively the current account, that is the increase in fiscal deficit leads to higher current account deficit. Gosse and Guillaumin (2013) find that the US monetary shocks has an influence on East Asia current account balances through real and monetary channels.

While studies on the effects of fiscal and monetary shocks on the external balances abound for developed economies, such studies are few in the case emerging and developing economies, especially for African countries (see Anoruo & Ramchander 1998; Egwaikhide 1999). For example, Egwaikhide (1999) finds that a worsening of the government balance causes a deterioration of the trade balance in Nigeria, whilst Anoruo & Ramchander (1998) find that causality runs from the external balance to government expenditure in Egypt, in that deterioration of the trade balance causes an increase in fiscal expenditure in the country. Yuan and Chen (2015) conducted an empirical analysis of the interaction between monetary, fiscal policy, exchange rate and external balances and their impacts on economic growth and inflation in BRICS (Brazil, Russia, India, China and South Africa). The authors find a significant effect of monetary policy on economic growth. Moreover, they show that exchange rate does not play a critical role in the adjustment of trade deficit. Duarte and Schnabl (2015) contributed to the literature on the adjustment channels of current account imbalances by examining the role of exchange rates and macroeconomic policies as determinants of current accounts for a set of 86 mainly emerging market economies between 1990 and 2013. The authors find that nominal exchange rates are not the main determinant of current account positions. Instead, depending on the region, monetary and/or fiscal policies are identified as the main driving force of current accounts. For example, in East Asia and for oil-exporting countries, contractionary monetary policy turn out to be the main determinants of current account balance. In contrast, for many European periphery countries fiscal policy stances are at the core of current account positions. Moreover, the exchange rate seems to play a significant role as determinant of current account positions only for the Latin American

countries. The findings of Duarte and Schnabl (2015) show that policies to address external imbalances are country specific and vary per regional groupings.

This paper contributes to the literature on the effects of macroeconomic policies (fiscal and monetary policies) and exchange rate policy on external balances in Africa, especially the three largest African economies, namely Nigeria, South Africa and Egypt, henceforth NSE countries. These countries are chosen due to the size of their economies (gross domestic product (GDP) in billions of US Dollars) (WDI, 2015). With Africa quickly emerging as a fast-growing economic hub, it is important to understand the dynamic relationship between policy transmissions and external imbalances and their impacts on economic performance and economic growth in the three largest African economies, which represent the "wealth" of the continent. The findings of this paper will reveal whether African economies differ from other economies with regards to the role of macroeconomic and exchange rate policies in adjusting external imbalances. Moreover, the paper considers the dynamic transmission of exchange rate, fiscal and monetary shocks in a framework that accounts for endogenous reaction between key economic variables by making use of the panel vector autoregressive (PVAR). The rest of this paper is organised as follows: Section 2 presents the methodology used; Section 3 describes the data sources and the definitions of the variables used; Section 4 discusses the empirical results alongside the impulse response functions. Finally, Section 5 concludes

2. Methodology

A panel vector autoregressive (VAR) model with fixed effects is estimated to capture the interdependency between Africa's three largest economies in assessing the impact of fiscal and monetary policy shocks on the current account, proxy for external balances, and other key macroeconomic variables. This type of VAR model allows a flexible framework in which all variables in the system of equations are treated as endogenous. A panel VAR (PVAR) has since become a normal tool in assessing the effects of policy transmissions as well as other shared behaviours among economic variables. Applying a standard VAR model to panel data has increased in popularity quite recently following studies by (Love and Zicchino, 2006; & Goodhart and Hofmann, 2008). The panel VAR structure benefits from the advantage of the VAR approach when dealing with endogeneity as well as panel data techniques in improving estimation efficiency (Yuan and Chen, 2015).

A panel VAR model with fixed effects is used as follows:

$$Y_{it} = \alpha_i + \sum_{j=1}^{p} \beta_j Y_{it-j} + \mu_{it} \qquad (1)$$

Where Y_{it} is a vector of endogenous variables and μ_{it} is a vector of errors, α_i is a vector of country-fixed effects which accounts for unobserved individual heterogeneity. They are all $k \times 1$ vectors. β_j is a $k \times kp$ matrix.

To account for control variables in the main relationship between fiscal policy, monetary policy and the external balances, our VAR model includes: the log difference of real GDP, ΔGDP_{it}, the log difference of government budget, specifically government expenditure, ΔGB_{it}, the log difference of real effective exchange rate, ΔE_{it}, the log difference in the current account, ΔCA_{it}, and the short-term nominal interest rate, IM_{it}. Thus, the vector Y_{it} includes

$$Y_{it} = (\Delta GDP_{it}, \Delta GB_{it}, \Delta E_{it}, \Delta CA_{it}, IM_{it}) \quad (2)$$

The advantage of dealing with variables at first difference is to create a possibility of a stable VAR with variables that are possibly stationary. Moreover, with a 5-dimensional VAR model, a time-series model that focuses at individual country level would generally suffer considerable loss in degrees of freedom. A panel model, which is the focus of this study, guarantees a substantial increase in the degree of freedom, necessary to generate large confidence interval for the impulse response functions. It is important to note that impulse response function is the important results of the VAR analysis as coefficient estimates do not have meaningful policy interpretation (Sims, 1980).

Various estimators based on generalised method of moments (GMM) have been proposed to calculate consistent estimates, mostly based on the first difference transformation of Equation (1) (See Bun and Carree, 2005 ; kiviet, 1995). However, given the assumption that errors are serially correlated in a dynamic equation the first difference transformation may provide estimates that are not consistent. It is in that context that Arellano and Bover (1995) proposed an alternative transformation known as the forward orthogonal deviation (FOD). With the FOD, each observation is subtracted by the mean of the remainind future observation available in the sample. The transformed variables and errors are as ;

$$Y^{*}_{i,t-s} = w_t \left[Y_{i,t-s} - (Y_{i,t-s+1} + \ldots + Y_{i,T-s})/(T-t) \right] \; s = (0,1,\ldots,p) \quad (3)$$

$$\mu^{*}_{it} = w_t \left[\mu_{i,t} - (\mu_{i,t+1} + \ldots, \mu_{iT})/(T-t) \right] \text{ with } w_t^2 = (T-t)/(T-t+1) \quad (4)$$

Where T is the size of the time series for a given country, which shoud be the same for all the countries in a balanced panel. w_t is the weighting matrix assumed to be non-singular.

We estimate Equation (1) using a GMM technique with transformation of variables based on forward orthogonal deviation. Given that VAR models rely mostly on impulse response functions and variance decomposition to expalin the different effects of economic shocks, this paper identifies these shocks by applying contemporaneous identification restrictions based on choleski decomposition. Shocks are identified following Bonga-Bonga (2008) and Kim and Roubini (2008) by ordering government expenditure before interest rates in that fiscal adjustments are likely to be endogenously affected by economic activity (GDP) but do not respond to monetary policy. We order the current account balance the last to assure that it is endogenously affected by monetary and fiscal policies, as well as the nominal exchange rate. It is important to emphasise that although the main aim of the pape ris to assess how monetary and fiscal policy affect external balance (the current account) in the three major African countries, in addition, this paper will assess how

nominal exchange rate affects the external balance in these countries. In doing so, the paper will contribute to the debate on whether change in the value of currencies the NSE countries has contributed to large internal and global imbalances (Bergsten, 2008 ; Cline, 2005)

3. Data

The data used in this paper are collected from the International Financial Statistics (IFS) database for the NSE countries: Nigeria, South Africa and Egypt, and supplemented by the World Economic Outlook (WEO) database, both available from the International Monetary Fund (IMF). Quarterly data is collected from the year 1997 to 2015 due to data availability.
The short-term nominal interest rate, government expenditure and external balances are the main variables of interest. However real GDP growth and the nominal exchange are used as control variables.

Although the paper makes use of variables at first difference as in Equation 2, there is a need to ascertain that the VAR system used is stationary. It is in that context that this paper proceeds by testing the stability of the PVAR model. Juselius and Johansen (1990) show that *the necessary and sufficient conditions for the stability* of the VAR system is that all characteristic roots lie outside the unit circle. These conditions guarantee that all the variables are stationary and the impacts of the shocks (the impulse response functions) will die out rather than explode.

Table 1 reports the results of the stability test of the PVAR (2) process used in this paper. The results show that the eigenvalues and the modulus (the absolute value of the root) of the PVAR process's characteristic equation are less than unity. The results guarantee the stationarity of the VAR system and the variables used. We could then proceed with the PVAR estimation.

Table 1 PVAR stability test

Eigenvalue	**Modulus**
0.813432	0.887592
0.813432	0.887592
0.660553	0.73535
0.660553	0.73535
0.694692	0.71502
0.694692	0.71502
0.503538	0.503538
0.333932	0.481561
0.333932	0.481561

Note: all the eigenvalues lie inside the unit circle.
PVAR satisfies the stability condition

4. *Empirical estimation and discussion of results*

Given the stability of the PVAR (2) model, the model is estimated using GMM after the fixed effects have been removed by using the forward orthogonal deviation (see Arellano and Bover, 1995). As from the stability test, the Akaike information criterion (AIC) suggests that two lags be included in the estimation of the PVAR. Table 2 below presents the estimated coefficients from the PVAR model. Although we are aware that the interpretation of these coefficients may be meaningless due to the a-theoretical nature of the VAR models, nonetheless, we opted to report them in Table 2 and briefly discuss the significance of the estimated coefficients.

Table 2. Coefficients of the PVAR (2) model

	ΔGDP_{t-1}	ΔGB_{t-1}	ΔE_{t-1}	ΔCA_{t-1}	IM_{t-1}	ΔGDP_{t-2}	ΔGB_{t-2}	ΔE_{t-2}	ΔCA_{t-2}	IM_{t-2}
ΔGDP_t	1.332***	0.000899	-0.00511	-0.209	7.895	0.5**	0.00923	0.00154	-0.000126	0.0931
ΔGB_t	0.156	1.309	-0.0293	-0.011	0.0973	0.401	-0.535	-0.0627	0.116	0.445
ΔE_t	-0.209	-0.0323	1.278	-0.0061	-0.154	0.0565	-0.144	-0.529	0.126	-0.618
ΔCA_t	7.895	0.219	-0.148	0.965	30.906	8.715	-1.139	-3.0456	-0.209	-7.354
IM_t	-0.00511	0.0221	0.00639	-0.000463	1.542**	0.178	-0.00076	-0.0051	0.00021	0.565**

The P VAR model is estimated using the generalised method of moments (GMM) once the fixed effects have been removed. The endogenous variables included in the estimation are the log differences of real GDP, ΔGDP_t, real government expenditure, ΔGB_t, nominal exchange rates, ΔE_t. In addition, the short-term interest rate, INT_t and the percentage change in the current account, ΔCA_t are used in the 5-variable PVAR. * denotes significance at 10%, ** at 5%, and *** at 1%, respectively.

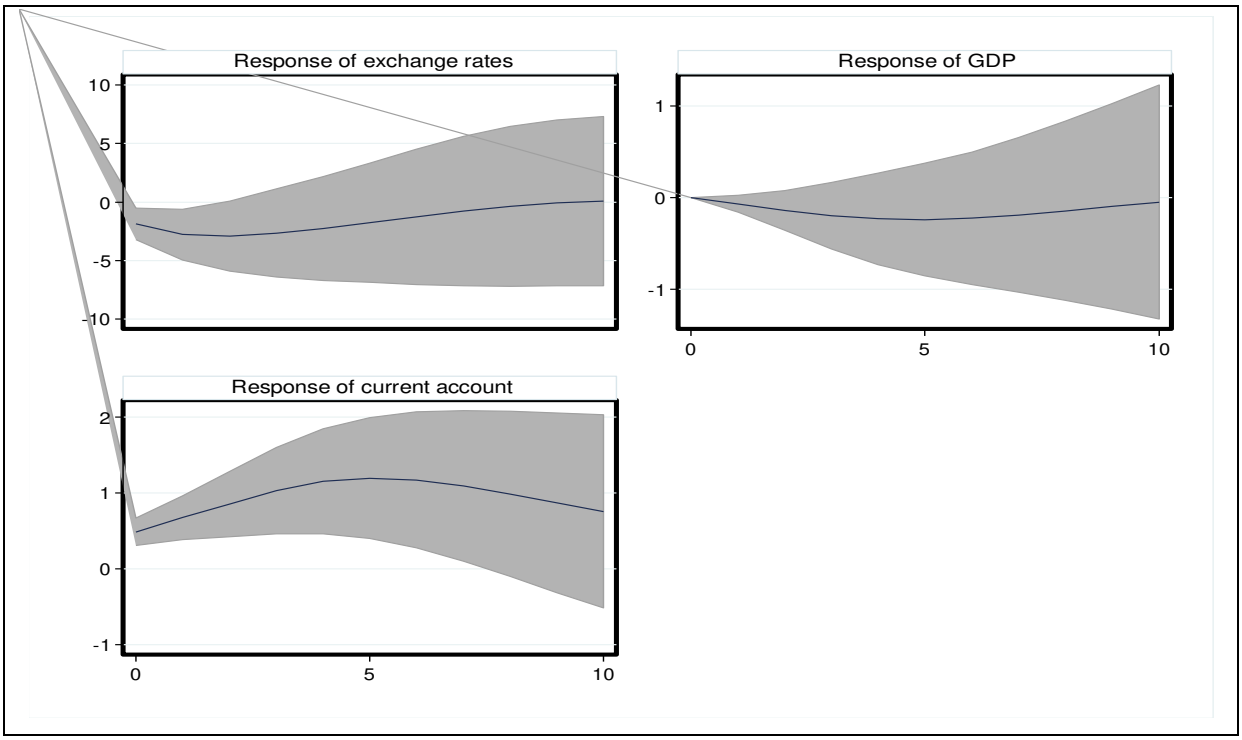
The results reported in Table 2 show that the current account responds positively to exchange rate and the change in the GDP after two quarters. Moreover, exchange rate is positively related to the current account after two quarters.

As said earlier, more insightful interpretations are provided with the results obtained from the impulse response functions (IRF) displayed in Figures 1 to 3. The results of the IRF are obtained by imposing the identification restrictions on the system of dynamic equations based on the Choleski decomposition. The paper follows the identification restriction suggested by Bonga-Bonga (2008) and Kim and Roubini (2008). For example, Bonga-Bonga (2008) orders fiscal balance before the interest rate in South Africa to show that monetary authority in South Africa, like in many countries, responds to fiscal shocks in order to control possible inflationary pressure that stems from expansionary fiscal policy. Moreover, based on a number of studies that support the fact that central banks monitor many variables in the conduct of monetary policy (see Bernanke and Boivin, 2005), we opted to order interest rate as the last variable in Equation 2.

Figure 1 shows the responses of real GDP growth, exchange rates and current account to shocks to interest rates with the 95% confidence interval. The responses are computed for a period of ten quarters. The results reported in Figure 1 show that exchange rate responds negatively to the increase in interest rate. Put differently, contractionary monetary policy leads to the appreciation of the exchange rates in NSE countries at the impact. This appreciation is delayed for two quarters before the NSE currencies start depreciating. This phenomenon is known in international finance literature as delayed overshooting puzzle. A number of authors attribute this phenomenon to the failure of the uncovered interest parity (UIP) hypothesis (Faust and Rogers, 2003; Kim, 2005 and

Scholl and Uhlig, 2008). It is important to note that the failure of the UIP hypothesis implies the possibility of strong predictability of foreign excess returns. Thus, the occurrence of the delayed overshooting phenomenon as reported in Figure 1 should suggest that NSE currencies excess returns are strongly predictable and that there is a possibility of arbitrage-free profit by short-selling these currencies.

Figure 1. shocks to interest rates



Moreover, Figure 1 shows that contractionary monetary policy leads to surplus in the current account. This reaction of the current account from the contractionary monetary policy can be explained by the interaction of the monetary policy and exchange rate. In fact, as observed in Figure 1, exchange rate appreciates on impact from contractionary monetary policy and the appreciation of the currency leads to current account surplus. This outcome is contrary to a number of studies conducted in developed economies where the appreciation of the currency, as a result of contractionary monetary policy, often leads to current account deficit (Kim and Kim, 2011; Mussa, 2007; Ono, 2006). The high dependency to imports of many African countries should explain the reason why the appreciation of their currencies lead to current account surplus. Due to high propensity to import by a number of African countries, the appreciation of their currencies reduces the cost of import and help improve their current account and balance of payments. A number of African countries rely solely and excessively on raw material exports while importing variety of products including food items that could be produced locally (Heidhues and Obare, 2011; Mkandawire and Soludo, 1999). Contrary to countries like Chine that rely on the weakness of their currencies to boost their exports, the poor development of the manufacturing sector in several African countries has crippled any positive strategy for export. A number of studies show that import substitution policy adopted by many African countries to curb their import

dependency failed to provide positive results due to poor production capacity (Dibua, 2006; Adewale, 2012).

Figure 1 shows that contractionary monetary policy decreases output in the NSE economies. However, the results are not statistically significant.

Figure 2. shocks to government expenditure

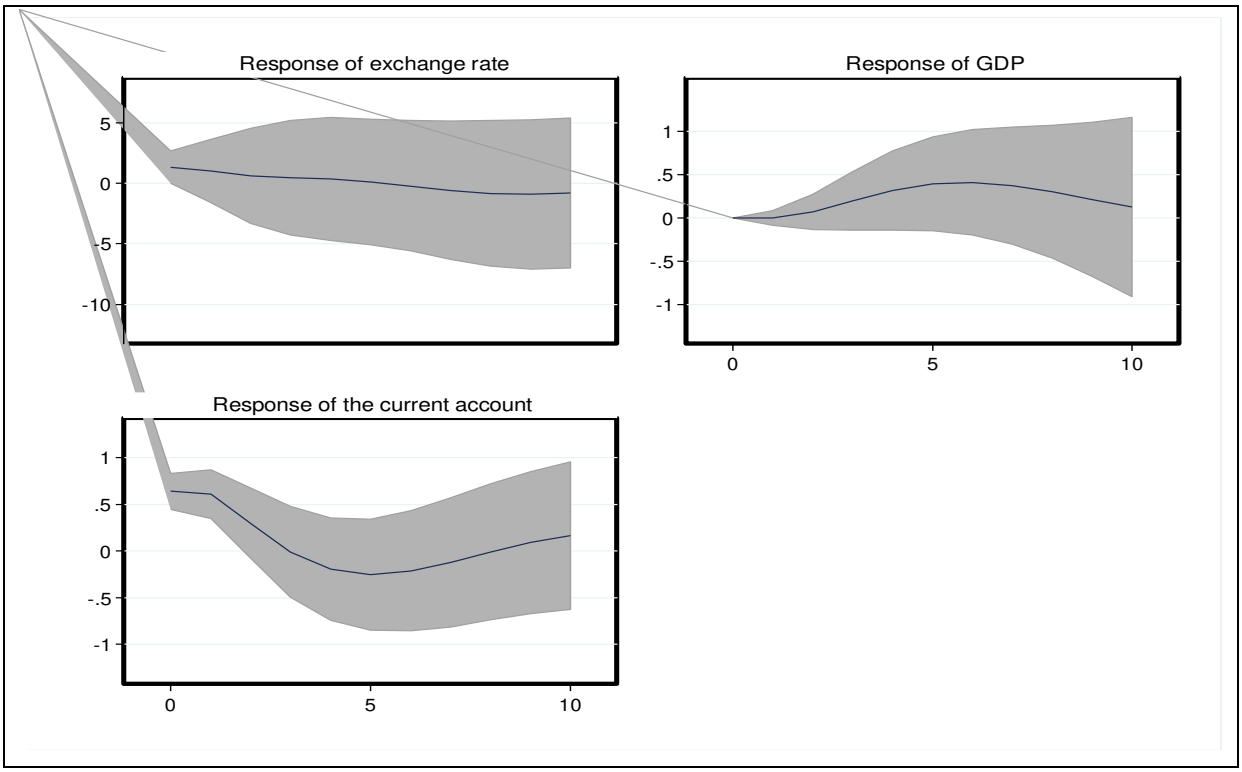
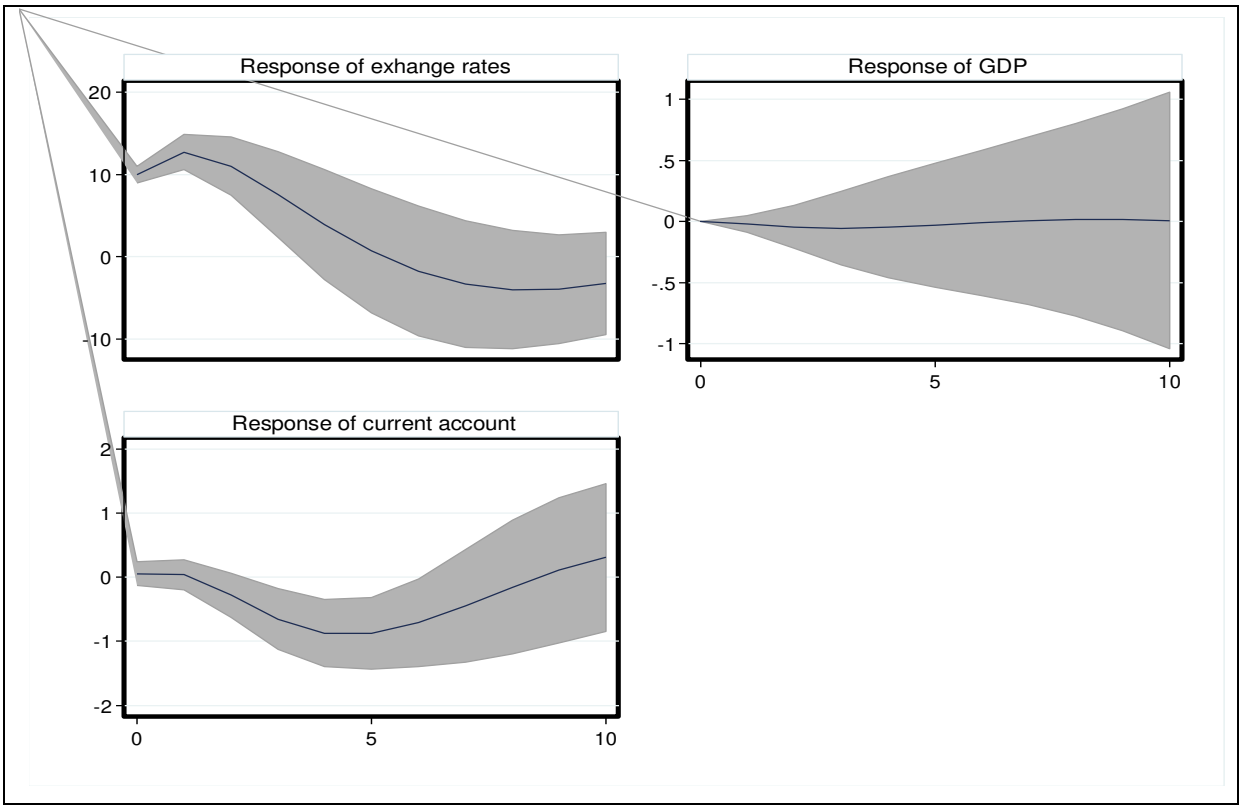


Figure 2 shows the responses of the current account, exchange rate and GDP to shocks to government expenditure. The results reported in figure 2 show that expansionary fiscal policy lead to a slight depreciation of the exchange rate at impact in the NSE countries, although the effects are not statistically significant. Moreover, expansionary fiscal policy leads to the improvement of the current account. These outcomes contradict the prediction of many theoretical models, including the traditional Mundell-Fleming-Dornbusch model. While Mundell-Fleming-Dornbusch model predict the change in exchange rate due to demand shocks, Kim (2015) showed that the effect of government expenditure shocks on the exchange rate is likely to be relatively weak in countries with a low degree in international capital mobility, as in the case of some emerging and developing economies. On the positive reaction of the current account to government expenditure shocks, Ravn at al. (2012) show that expansionary fiscal policy leads to expenditure switching and consequently improves the current account. This is due to the fact that the increase in government expenditure (consumption) stimulates the demand for domestic goods compare to foreign goods. Moreover, the results repoted in Figure 2 show that expansionary fiscal policy leads to the increase in GDP growth, but the results are not statistically significant. This reality shows that demand side policies are not grow enhancing in the three African countries.

Figure 3 reports the responses of GDP growth, exchange rate and current account to exchange rate shocks in the NSE countries. Figure 3 shows that the current account responds positively to positive shocks to exchange rates. Put it differently, the depreciation of the exchange rate in the NSE countries leads to current account surplus. This outcome confirms the previous findings that depreciation of the exchange rates in the NSE countries lead to the current account surplus rather than the current account deficit as found in many of studies on the developed and emerging economies (see Arslan et al., 2015; Kim and Kim, 2011; Mussa, 2007). Moreover, the results reported in figure 3 show that the response of GDP growth to exchange rate shocks is neutral.

Figure 3 Shocks to exchange rates



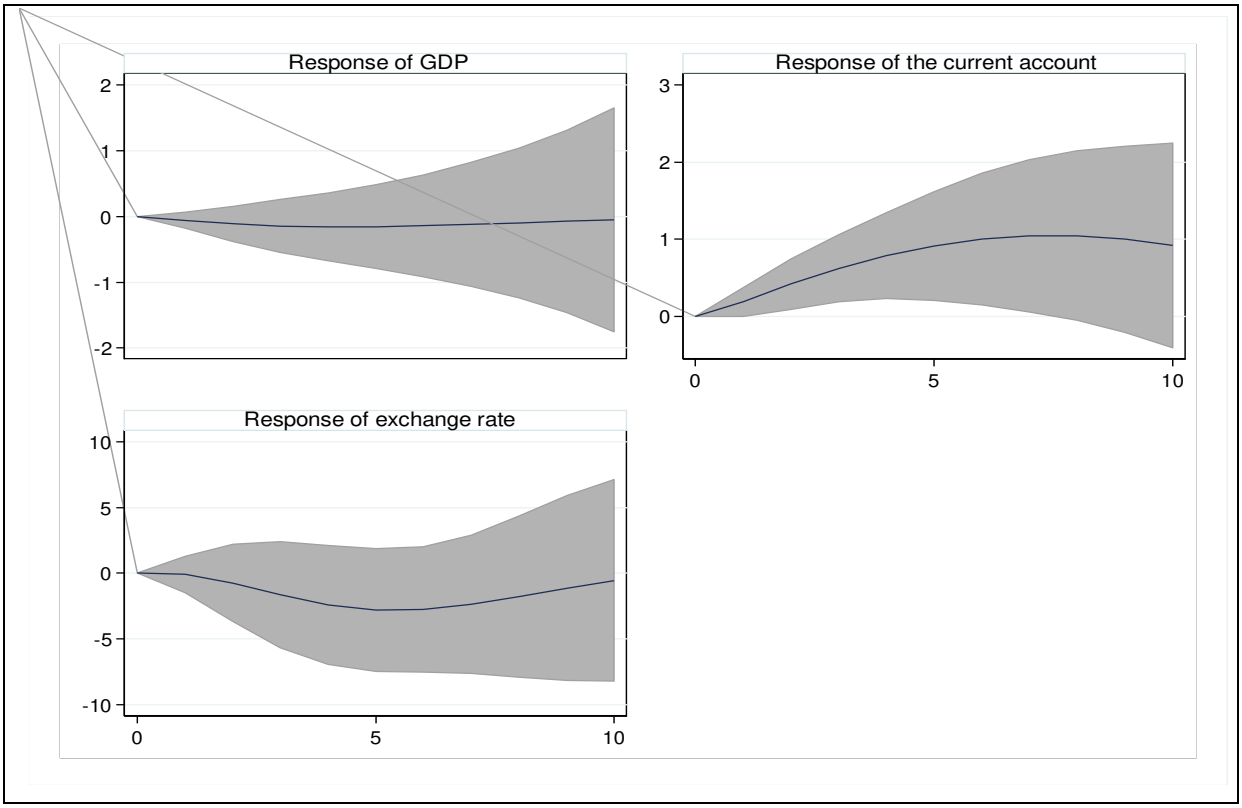
The results of the empirical analysis reported in this paper show that exchange rate policy as well as macroeconomic policies, especially fiscal and monetary policies, play important roles in the rebalancing of current account in the three biggest economies in Africa. Contrary to a number of studies that have found a limited influence of macroeconomic policies in addressing external imbalances in developed and emerging economies (Mundell, 1962; Nickel and Vanbsteenkiste, 2008), this paper shows the prospect of NSA countries to use a range of policies to address international imbalances. It is worth noting that the ability of NSE countries to correct international balances from a range of policies is due to a number of inefficiencies present in these countries. Moreover, these inefficiencies inform the outcomes of policy reactions discussed above. For example, the fact that currency appreciation triggers current account surplus is explained by

import dependency of NSE countries, like many African economies, and their reliance to export raw material products while importing final products. This has led to stalled industrialization of several African countries in some cases and de-industrialisation in others. The positive reaction of the current account to expansionary fiscal policy in the NSE countries is an exceptional case when compare to many developed economies. For example, Nickel and Vanbsteenkiste (2008) show that in developed countries with high debt ratio, the reaction of the current account to fiscal stimujlus is often neutral as economic agents are Ricardian, i.e., they increase their saving rather than consumption to anticipate any possible tax increase. However, such as Ricardian reaction cannot be expected from many African economies. Bonga-Bonga (2008) shows that many African economies experience a continual decrease in private savings at the time their debt ratio escalate considerably. The findings of this paper vindicate studies that attribute the failure of the IMF and World Bank structural adjustment programme (SAP) applied in many African countries in the 90s to the inability to customize the programme to the reality of African countries (Easterly, 2005; Loxley, 1990; Rodrick, 1990). For example, exchange rate devaluation was the key policy by the IMF to achieve one of the important aims of the SAP which consist to reduce the current account deficit. However, the findings of this paper show that currency devaluation could not reduce current account in the most advanced African countries.

Robustness test

To test the robustness of the findings reported above, we re-estimated the PVAR model with different identifications. With this current identification, we order interest rate as the last variables in line with many factor augmented vector autoregressive (FAVAR) models that postulate that monetary authorities react to many economic and financial variables in the conduct of monetary policy (see Bernanke, et al., 2005). Figure 4 reports the reaction of GDP, current account and exchange rates to interest rates shocks. The results reported in Figure 4 are not different to those reported in Figure 1, although we made use of different identification. This shows that the results are robust and consistent with different identifications.

Table 4 shocks to interest rate, different identification



The increase in the exchange rates denotes the depreciation of the currency. The results reported in Figure 1 show that the effects of exchange rate on the current

Conclusion

This paper sets out to determine which of the policies, between fiscal, monetary and exchange rate policies can adjust external imbalances in the three largest African economies, namely, Nigeria, South Africa, Egypt (NSEA). The paper makes use of the panel VAR (PVAR) method to this end. The results of the empirical analysis show the effectiveness of macroeconomic policies (fiscal and monetary policies) and exchange rate policy in redressing external balances, especially the current account imbalances, in the NSE countries. Moreover, the results reported in the paper show that, contrary to a number of emerging and developed economies, contractionary monetary policy leads to current account surplus in NSE countries. Another finding of this paper is that currency appreciation in NSE countries causes surplus in the current account. This outcome is mostly attributed to the high import dependency of those economies. Regarding the reaction of the current account to expansionary fiscal socks, the paper shows that expansionary fiscal shocks lead to current account surplus in the NSE countries. This outcome is contrary to many studies in developed economies where it is shown that expansionary fiscal policy is unable to redress current account imbalances mainly since economic agents are Ricardian in these economies. However, given the low saving rates and consumer behaviour in many African economies, including the NSE

countries, the positive reaction of the current account to expansionary fiscal shocks indicates that economic agents are not Ricardian in those economies.

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