
**WORLD REAL INTEREST RATE SHOCKS AND EXCHANGE RATE IN
AFRICAN COUNTRIES**

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Abstract

This study examined the impact of world interest rate shocks on exchange rate in African countries. In specific term, the study investigated the impact of world real interest rate on exchange rate, the impact of world commodity price shock on gross domestic product and also looks at the effects of shocks on African countries. The study sampled 20 Africa countries, over the period spanning from 1980 to 2018. Data were collected from world banks database, international monetary fund database. Data collated were analyzed using, panel unit root analysis, Panel var estimation, impulse response estimation. Result reflects that shock to world real interest rate has predominant negative impact on exchange rate of African countries and world commodity price shock also impact negatively on African Countries. Monetary policy committee across Africa countries should also take close cognizance of the role played by vagaries in world real interest rate when designing framework for monetary benchmark, this is necessary so that external shock effect will not undermine the potential of domestic monetary policy.

Keywords: world real interest rate, exchange rate, gross domestic product

1.0 Introduction

Shocks have been impacting negatively on African countries severely over time and the impact is being aggravated by the fact that, African economies are all developing economies. According to Ruzica (2012), no country is immuned to either internal or external economic shocks which can cause fluctuations of domestic macroeconomic variables like output, employment and inflation. Economic shocks may cause unpredictable changes in aggregate supply and demand, therefore requires some sort of macroeconomic policy response. In practice, no monetary or fiscal authorities has perfect information set, at the time it determines the monetary policy instrument. In a setting with imperfect information, Central Banks' expectations of supply and demand-side shocks may not equal their expected values. According to Nguyen, Dridi, Unsal& Williams (2017), the domestic demand pressures and global shocks especially shocks to the exchange rate and monetary variables are the driving force of inflation over the last 25 years. Usman (2015) discovered that African countries have suffered from the global oil shocks and persistent low prices of commodities which often deplete foreign reserves, strain budgets, trigger cuts in social spending and other austerity measures and ensnare oil producers in new debt hence impacting the exchange rate of the continent.

Over time, the world has witnessed five devastating financial shocks, others are less severe because they either occurred within a region or a country, and examples are the Asian crisis of mid-1997, Swedish financial crisis of 1990. It is important to note that the first two major global shocks occurred when almost all African countries were still being colonized. World Bank (2016) report that the plunge in commodity prices-particularly oil, which fell by 67 percent between June 2014 and December 2015 affected their drive for development. After fixing a certain amount (often in dollars) as benchmark for their annual budgets and development plans, the commodity price shock, often, reduce foreign exchange earnings and shrink money supply thereby impacting negatively on exchange rate, impeding the implementation of their annual budgets and development programmes, because they are heavily dependent on the sales to fund it, hence the account for the huge infrastructural deficit and inability to achieve sustainable growth in African countries. Also, this often results in the high exchange rate of all African Countries as against other currencies of the world.

Also, the world real interest rate which is proxy by US real Interest rate constitutes a serious issue to the economies of all African countries, which are all developing economies. It is often unpredictable and changes at random, though not annually, but once it changes, it moves like waves across the globe. According to Lacoviello and Navarro (2019), in response to a US monetary tightening, GDP in foreign economies drops about as much as it does in the United States, with a large decline in emerging economies than in advance economies. The responses do not depend on the exchange rate regime or trade openness, but are larger when vulnerability is high. Empirical findings show that world interest rate shocks spillover to foreign economies and this depends on three factors; the prevailing exchange rate against the dollar, trade openness with the United States and index of external vulnerability.

The currencies of many African Countries, like those of other developing countries suffered large depreciations with the onset of the global financial shocks and many struggled before returning to the path of progress (Ltaifa, Kaendera and Dixil, 2009). According to Oguntuase (2018) exchange rate is the medium through which external shocks like world inflation, oil price and commodity price volatilities transmit their effects to the macroeconomic variables of many African economies. Collapsed trade and financial flows led to substantial balance of payment problem gaps, triggering fast depreciations and exchange rate volatilities, since mid-2008. The spillover effects of higher US. Interest rate are large, U.S. rates of 100 basis points reduces GDP in advanced and emerging economies by 0.5 percent and 0.8 percent respectively (Lacoviello & Navarro, 2019). Lee (2014) believed that a significant part of business cycle fluctuations in small open economies could be explained by international interest rate shocks. He believed that exchange rate fluctuations implied by inflation targeting rate expose the monetary authority to a trade-off between total demand stabilization and increased volatility of inflation.

Zulkefly and Bakri (2016) discovered that about seven major African countries experienced large exchange rate losses at the onset of the global financial shock. Most currencies in the region have dropped in value relatively to the greenback (Regional Economic Outlook, 2016). The effects of the exchange rate losses include, increase in the cost of importing capital goods, increase in the cost of doing business, external official development assistance sharply lower, dollar interest rate

edge up and bonds spread widen, increasing the risk of sudden halts in private capital flows (ADB, 2018) and greater desire for debt to finance infrastructure and social sectors, because of external shocks, many African governments have turned to international capital markets to meet their financial need. No wonder most African countries belong to highly indebted countries. Recovery, despite macroeconomic policies like monetary policies and fiscal discipline has been a bit difficult over time. To this end, examining the nature of US interest rate shocks and its impact on exchange rate in African countries will not be out of place.

Africa currently has the highest population growth rate in the world, with over 3 percent per annum (CIA Factbook, 2018), hence, the need to increase the growth and development rate. This desire for growth is often hampered by world oil price shocks and world commodity price shocks because of the volatility. More so, that all African countries are either oil producers or commodities producers. Again, if African countries can understand, predict and overcome these shock issues, as it pertains to their economies, their economies will be better-off in terms of rapid growth and development. High level of budget implementation, execution of social security schemes, increases in exports, better value gain in terms of exchange rate and lastly citizen's well-being will be enhanced. Consequently, economic teams and monetary policy committee, saddled with the responsibilities of designing and implementing monetary policies will benefit immensely, from the findings of this study as this will help them come up with sound monetary policy framework that will be able to diversify the region from mono-products economies, boost diversified trade and withstand shocks at all times.

Effects of Shocks on African Countries

A thorough understanding of Shocks in African economies requires a good grasp of the impact of external shocks. African countries' underdeveloped financial systems and relatively limited links to the global market have not insulated the continent from the impacts of shocks, as low commodity prices, depressed external demand and declining remittances wreak havoc on the long awaited growth that characterized the last quinquennium and capital inflows, tourism receipts and remittances have also declined. The impact of the different forms of shocks have been transmitted to Africa countries not only through the credit crunches and liquidity freezes that are currently strangling advanced and emerging countries but also through the global oil price shock. African countries are highly dependent on the volatile prices of primary commodities, oil price and aid flow. Thus, the sources of such shocks may include fluctuations in the prices of exported primary commodities, imported capital products, intermediate inputs and financial shocks, especially the world real interest rate. Fluctuations in the price of staple commodities like crude oil in the global market tends to affect virtually every other commodities and/or service in African's domestic market. (Olomola and Adejumo, 2006).

With the continuous promotion of globalization all over the world and nations of the world becoming increasingly dependent on one another; external shocks are bound to continuously occur which is why this paper seeks to explain how pertinent it has become to understand the impact of external shocks, their effects on our economy and how we can respond to it. Ibrahim *et al* (2014) in their study found that oil price shocks do not have a positive impact on the economy (in contrary to the findings of some earlier studies) but oil price itself does. They claimed that

while increase in price positively affects the economy through its contribution to export revenues, surges in oil price often induce or worsen uncertainty in the economy through its effect on fiscal instability and vulnerability of budget implementation. They claimed, it negatively affects the economy, though not to a statistically significant extent, as their study found out.

According to Chea (2018), declining global commodity prices shocks impacted so much on Africa major exporters through four major sources; decline in trade, which translates to lower export revenues and trade credits, deteriorating foreign reserves and sovereign-wealth funds led to the reduction in credit supply, the price shocks led to unfavourable income effects on commodity-dependent countries, and decline in national savings and finally shock reduces economic growth in low-income economies. According to Gregson (2016), some countries like Nigeria, intervene by putting in place import substitution policies, while others seeks to raise output growth by attracting foreign direct investment. Yet the situation is far beyond the kind of growth witnessed elsewhere

Shocks by its nature, whether transitory or persistent affects both the “investment” side of macroeconomic balance and “savings” (WTR, 2014). They opined that Countries’ response to shocks can either be automatic adjustment or policy-induced adjustment, and that distortions caused by shocks will also make exchange rate policy ineffective as changes in exchange rate will lead to offsetting changes in real wages and that nothing can be done to address directly the origins of external shocks. Obstfeld and Rogoff (1995) indicated productivity shocks, which often affects investment decisions, but they raised a serious question of whether the shocks leads to a permanent change in savings behavior or not.

In conclusion, developing countries of the world are most vulnerable to the negative effects of macroeconomic shocks due to the lack of appropriate infrastructures, institutions and policy responses that they have failed to put in place. And globalization would not decrease but only intensify all over the world in years to come, which is what we believe will subject countries in Africa to greater vulnerability of negative macroeconomic shocks. The broad objective of the study is to examine the impact of world real interest rate on exchange rate in Africa countries

Literature Review

Theoretical Literature

The Asymmetric theory of economic growth

This theory was developed by Mark (1994), Federer, (1996) and Balke, (1996). The theory discusses the strength and the asymmetric in effect of oil price volatility on output growth. A member of this school of thought, Federer (1996) provides a sufficient detailed reports or asymmetric mechanism between the influence of oil price volatility and output growth by concentrating on three possible ways, counter-inflationary monetary policy, sectoral shocks and uncertainty. From the study, he discovered a statistically significant relationship between increase in oil price and counter inflationary policy responses. This position by Balke, (1996) was confirmed by the Federer opinion. The theory believed monetary policy alone cannot

adequately strengthen real impact of oil price dynamics on output growth and that fiscal policy should be incorporated.

The relevance of the theory to this study stems from the fact that output growth which is often proxy by gross domestic product (GDP) is one of the two dependent variables in the study, the other being exchange rate. It is a known fact the world over that whether you are an oil producer or not, the volatility of oil price constitute a serious shock to economies all over. Again, monetary policy which is believed to be inadequate to strengthen the real impact of oil price dynamics on output growth constitutes one of the two macroeconomic performance variables adopted in this study. For oil exporters, exchange rate will be affected because export will drop and foreign exchange earnings will surely go down. For oil importers, they have to spend more to maintain the same level of consumption, hence, chasing their saving/increasing spending.

The objective of the study is to examine the impact of United States of America real interest shocks on exchange rate, world crude oil price shocks and gross domestic product and also looks at the general effects of shocks on African countries. The study made use of panel data to examine the impact of external shocks on macroeconomic performances, which covers 1982 to 2018. The rest of the paper is structured thus; is followed by section two which discusses the literature review which contains both the theoretical issues and empirical literature. The third part contains the model specification, after which is Result and discussion, before summary and conclusion

Empirical Literature

Tweneboah & Adam (2008) estimated a vector error correction model to explore the long-run and short-run linkages between the world crude oil price and economic activities in Ghana, for the period 1970 to 2006. The results point out that unexpected oil price increase is followed by an increase in price level and a decline in output in Ghana. Kutu & Ngalawa (2016) employ an eight variable structural vector autoregression (SVAR) model to examine how monetary policy shocks affect industrial sector performances in South Africa. Their study finds no direct link between exchange rate and interest rate shocks and industrial output growth, but money supply shock exerts significant positive impact on industrial output growth.

Alba, China & Park (2011), highlighted the role of monetary policy regimes in cushioning small open economies from adverse external output shocks and find out that consumers price index inflation targeting minimizes welfare losses for import to GDP ratio is one while the Taylor-type rule minimizes welfare when the import-to-GDP ratio is 0.1. Again, Mehmet & Zekeriya (2013), who investigated both the effects of domestic monetary policies and external shocks on fundamental macroeconomic variables in six fast growing emerging economies; Brazil, Russia, India, China, South Africa and Turkey-denoted hereafter as BRICS_T. Their result revealed that a contractionary monetary policy in most countries appreciated the domestic currency, increases interest rate, effectively controls inflation rates and reduces output.

Montoro (2010) who investigated how monetary policy should react to oil shocks in a micro founded model with staggered price setting and with oil as an input in a CES production function. The result showed that oil price shock generates an endogenous trade-off between

inflation and output stabilization when oil has low substitutability in production. Rabee and Pedram (2014) who discussed oil price shocks and optimal monetary policy in a model of small open oil exporting economy using Iran as the case study, discovered that appropriate monetary policy can help to stabilize these unwanted variations towards optimal allocation.

Alessandro & Marco (2009), After adopting the Global VAR to examine the short-run inflationary effects of oil and food price shocks on a given set of countries. The result of the study shows that, the direct inflationary effects of oil price shocks affect mostly developed countries while less sizeable effects are observed for emerging economies. And food price increases also have significant inflationary direct effects especially for emerging economies. Tatjana & Garima (2014) who studied the impact of United States Monetary Policies Normalization on capital flows to emerging markets economies, the result indicated that the impact of this portfolio flows as a share of GDP is expected to be economically small.

Rudi, Stan Du & Smith (2004) in their study to determine the optimal response of a small open economy's central Bank to financial shocks, discovered that, financial shocks leads to an increase in non-performing loans, which in turn causes the financial intermediary to increase the spread over the policy rate at which it is willing to lend. Furceri, Loungani and Zdzienika (2016) provides new evidence of the effect of monetary policy shocks on income inequality in 32 advanced and emerging economies between 1990 and 2013. The study finds that contractionary (expansionary) monetary actions increases (reduce) income inequality.

Alba, Chin, & Park, (2011) based their study on East Asia's small open economies, during the global financial and economic crisis of 2008-2009. They find out that Consumer price index inflation targeting minimizes welfare losses for import-to-GDP ratios from 0.3 to 0.9. However, welfare under the pegged exchange rate regime is almost equivalent to CPI inflation targeting when the import-to-GDP ratio is one, while the Taylor-type rule minimizes welfare when the import-to-GDP ratio is 0.1. Also, Razmi, Azali, Chin Lee & MuzafaSha (2017) in their study looked at the role of monetary policy in protecting the economy against external shocks of US output and oil price during the 2007 – 2009 financial crisis. The result show that poor influence of monetary policy on monetary policy transmission channels (namely, interest rate, exchange rate, domestic credit and stock price) in the pre-crisis period could not shield these economies from oil price shocks and US output.

Bass & Belke (2018) in their study analyzed the impact of oil price shocks on current account imbalances within a currency union. The findings showed that oil price shocks can have a long-lasting impact on internal balances, as the exchange rate adjustment mechanism is not available. Knox, Jesus & Judi (2015) Study the macroeconomic performances of 19 OECD countries over the period 1970-1990. They measure performances using four variables; high level of real GDP per capital, a low rate of inflation, a low rate of unemployment and a favourable trade balance. Their study discovered that performance ranking do change and that the relative performance of the European countries declines, when the environmental dis-amenities are added to the service list.

Mackowick (2001), who study the extent of international dependence of several emerging markets in Asia and Latin America, revealed that only a modest portion of the variation in emerging markets is attributable to shifts in US monetary policy and a typical response in emerging markets to a tightening by the Federal Reserve is an exchange rate depreciation, inflation and output contraction. Nakibullah (2016) who examines the impact of foreign and domestic structural shocks on consumer prices of the GCC countries, found out that the consumer prices of these countries, except for Bahrain and Kuwait react positively to the exchange rate shocks, consumer prices also react positively to oil and foreign partners' price shocks and domestic credit.

Caraina (2008), who studied the impact of domestic and external shocks on Romanian economy, discovered that domestic shock has moderate impact on the domestic output. And that the Euro Area supply and interest rate shocks have significant and persistent impacts on the domestic inflation. Bhattacharaya & Kar (2016) who worked on shocks, economic growth and the Indian economy, Their result show that (different shocks have different impact on various aspect of the growth process) plausible rainfall and fiscal profligacy shocks have a strong growth retarding effect compared to plausible scenarios of the three external shock both in the long and short run. Senadheera (2016) wrote on external shock and monetary policy in the Sri Lankan economy, the result showed that domestic shocks are the primary sources of macroeconomic fluctuations in Sri Lankan. And foreign shocks also play a considerable role in explaining the variability in output growth and domestic inflation.

Besides, Siami-Namini(2018) believed that oil price is one of the most important factors that have affected the world economy since the 1970s. The result of FAVAR is consistent with theory and better than VAR model result which showed the existence of price and liquidity puzzle while FAVAR technique did not provide any evidence of puzzle. Alain,(2007), examined the effects of monetary policy shocks on the Philippine economy, the results of the study showed that monetary policy shocks impulse responses that showed that inflation rate, world oil price and narrow money supply showed significant impact on Philippine economy.

Ramsey theory of fluctuations

Ramsey model is the natural Walrasian baseline model of the aggregate economy; the model excludes not only market imperfections but also all issues raised by heterogeneity among households. Romar extended a variant of the Ramsey model to incorporate aggregate fluctuations, although this requires modifying the model in two ways, first, there must be a source of disturbances without shocks, the Ramsey model converges to a balanced growth path and then grows smoothly. The initial extension of the Ramsey model includes fluctuations emphasized shocks to the economy's technology i.e. changes in the production function from period to period and recently changes in government purchases. Both types of shocks represent real-as opposed to monetary or nominal disturbances, technology shocks change the amount that is produced from a given quantity of inputs and government purchases shocks change the quantity of goods available to the private economy for a given level of production, for this reason, the models are known as real-business-cycle (RBC) models.

Ramsey model allow for variations in employment, labour supply and is seen as exogenous and either constant or growing smoothly. Real-business cycle theory focuses on the question of whether a Walrasian model provides a good description of the main features of observed fluctuations, they allow for changes in employment by making households utility depends not just on their consumption but also on the amount they work, employment is then determined by the interception of labour supply and labour demand. Lastly, macroeconomist believe that the technology shocks and the propagation mechanism of real-business cycle models are of little relevance to actual fluctuations and that nominal disturbances and a failure of nominal prices and wages to adjust fully to those disturbances are central to fluctuations. In conclusion, one will not take away the fact that Ramsey's model has contributed to knowledge and that the aggregate fluctuations explained proxy shocks but unlike what Ramsey posited, the transmission mechanism cannot be neglected.

Model Specification

This study estimates the impact of external shocks on exchange rate in Africa using GDP, and exchange rate index to proxy it. All the objectives of the study were achieved using different estimating techniques as applicable. From Panel unit root test to Panel Structural VAR based on the work of Caputo (2009) who assessed external shocks and monetary policy in Chile and represented his model with three equations.

The model is hereby modified to suit the purpose of this study.

$$ER = f (WRIR, WI, WCOP, WCPS,) \quad (i)$$

$$GDP = f (WCOP, WI, WRIR, WCPS,) \quad (ii)$$

Where GDP stands for Gross domestic product and ER means exchange rate, other variables are WI= World inflation, WCOP= World crude oil price volatility and WRIR= World real interest rate and WCPS = World commodity price volatility.

Result and Discussion

This section discussed the result of the Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) and Breitung test (BT) panel unit root test conducted in the study.

Table 1: Panel Unit Root Test Result

Variables	TEST AT LEVEL			TEST AT DIFFERENCE			REMARK
	LLC	IPS	BT	LLC	IPS	BT	
GDP	3.51492	8.31207	4.84983	-4.74061*	-7.31391*	-4.21882*	I(1)
ER	-0.09042	0.51585	0.19707	-11.3680*	-11.0823*	-8.08814*	I(1)
WCOP	-0.69871	0.79877	-3.14172*	-5.73974*	-14.2098*	-3.10554*	I(1)
WI	-5.58016*	-4.71811*	-6.26162*	-9.14491*	-21.2420*	-15.2196*	I(0)
WRIR	-16.9049*	-15.6401*	-1.65964*	-20.0788*	-15.6248*	-13.1337*	I(0)
WCPS	1.46387	0.10665	-2.95077*	-2.44258*	-11.9510*	-6.19941*	I(1)

(*) connote rejection of unit root hypothesis at (5%) level of significance level

Source: Author's Computation, (2020)

Table 1 presents results of Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS) and Breitung test (BT) panel unit root test conducted in the study, both at level and at difference for each of the variables included in the study, based on the pooled observation of the Africa countries sampled in the study. As reported in table 1, World inflation rate (WI) and world real interest rate (WRIR) are stationary at level while gross domestic product (GDP), exchange rate (ER), world crude oil price (WCOP) and world commodity price index (WCPS) are not stationary at level, but become stationary after first differencing. Thus, WI and WRIR are integrated of order zero i.e. I(0), reflecting that these variables on the average do not retain innovative shock passed on them beyond the same period. On the other hand GDP, ER, WCOP, and WCPS are integrated of order 1 I(1), reflecting that on the average these variables retained innovative shock passed on them for a short while beyond the same period, though after a short while they tend to let go. Hence variables used in this study are combination of I(0) and I(1) variables.

Impulse Response Analysis

The panel VAR estimation as discussed in the light of impulse response focused on how innovative shock to world oil price impact economic performance of sample Africa countries measured in terms of gross domestic product. This section captures the position for all the sampled Africa countries as presented in figure 1.

Figure1: Impulse Response Analysis (*world real interest rate and exchange rate in Africa [ER]*)

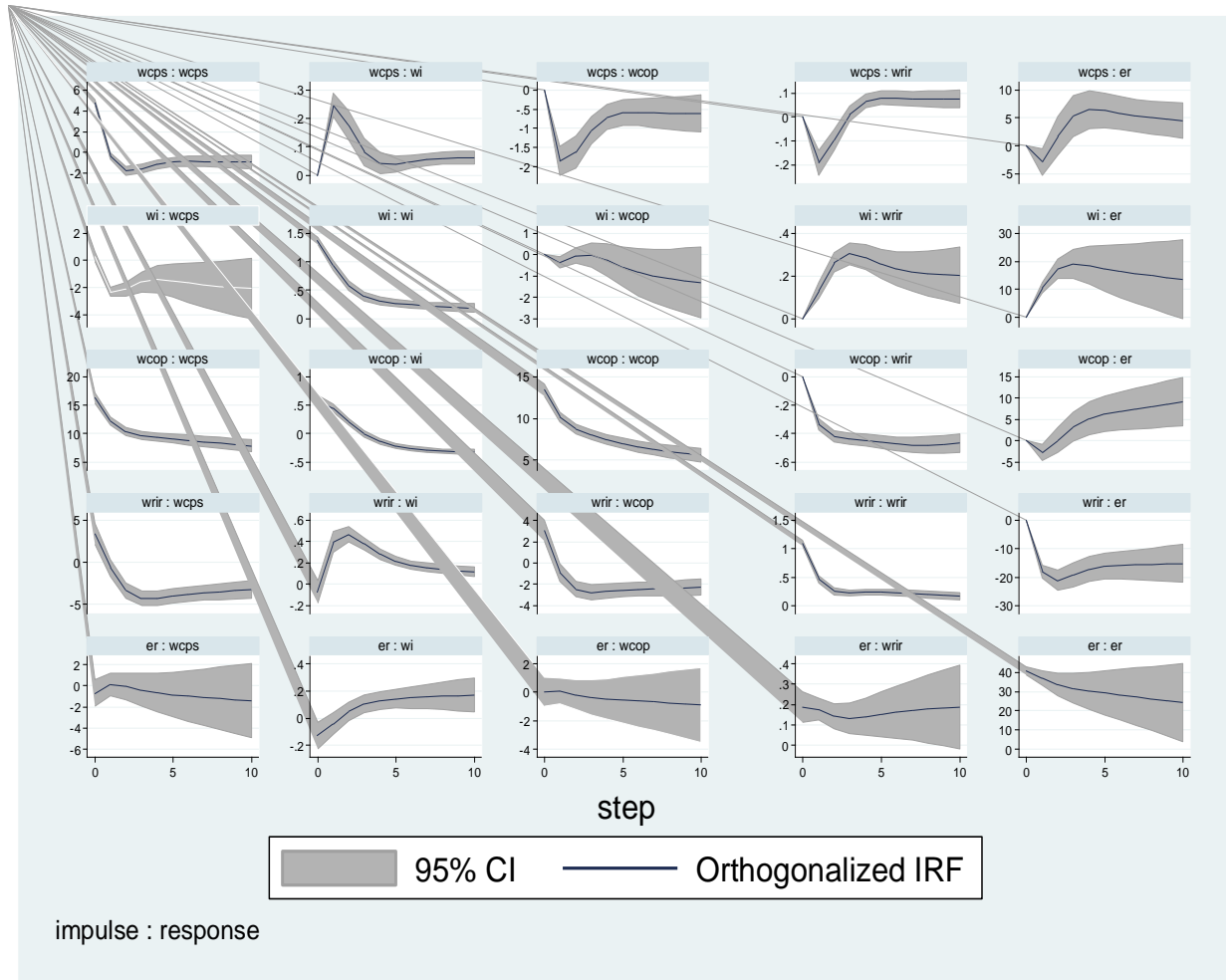


Figure 1 showed how each endogenous variable responded to innovative shock to other variables in the system, for this section the focus is on the response of exchange rate to innovative shock to world real interest rate in all the sampled Africa countries. As shown in figure 1, exchange rate showed a negative response to innovative shock to world real interest rate, falling sharply in period 1 through period 10 into the negative zone. The figure also showed that response of exchange rate is predominantly positive with respect to innovative shock from world inflation rate, world crude oil price and world commodity price index. Thus the result reflects that shock to world real interest rate has predominant negative impact on exchange rate of African countries sampled in the study.

Figure 2: Impulse Response Analysis (World oil price shock and Gross Domestic Products in Africa [GDP])

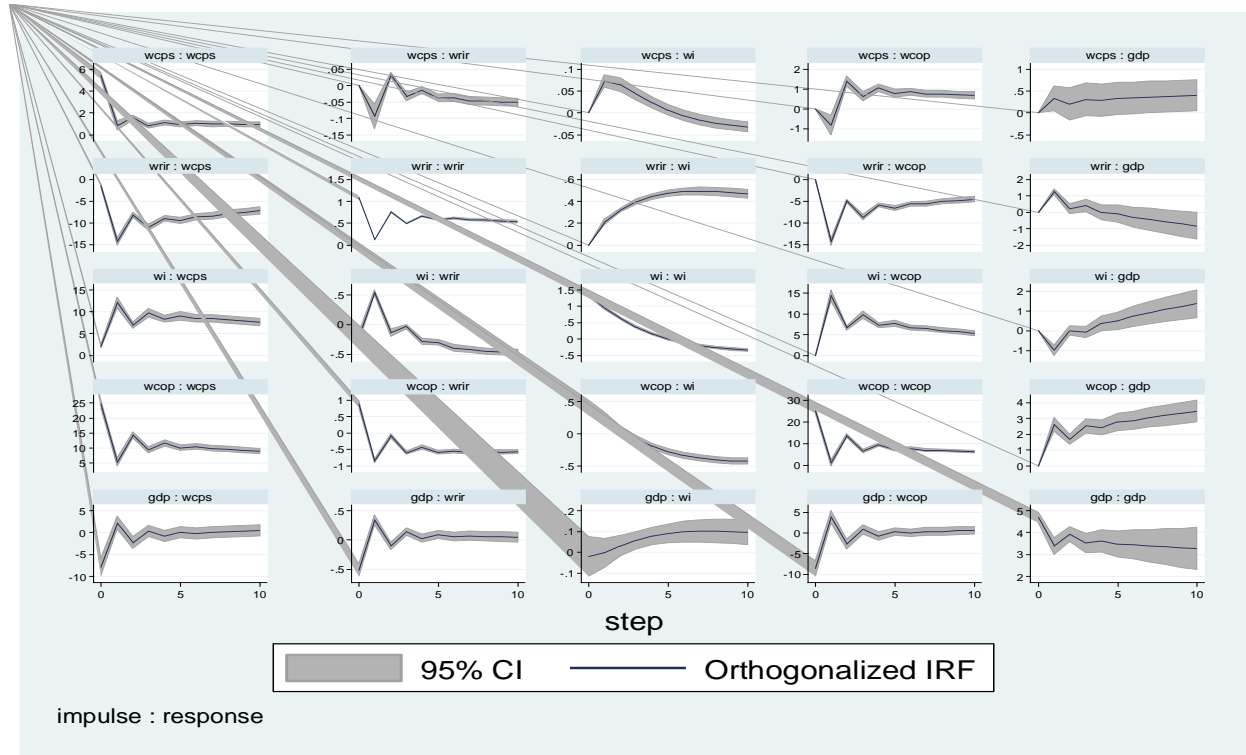


Figure 2 showed the response to innovative shock across the endogenous variables included in the VAR system. Notably the focus of objective one is centered on the response of gross domestic product to innovative shock in world crude oil price. As reflected in the last column of figure 2, following innovative shock to world oil price, gross domestic product showed a sharp upward movement from negative zone to the positive zone between the first two periods and the upward trend then continues in a progressive pattern over the intermediate period between period 3 and period 10. Thus the result showed that innovative shock to world oil price has profound positive impact on the gross domestic product of Africa countries sampled in the study.

Also the result shown in figure 2 revealed that response of gross domestic product to innovative shock in world real interest rate is predominantly negative as reflected by the downward trend in the last column of figure 1 for corresponding to world real interest rate (WRIR), on the other gross domestic product responded positively to innovation shock to world inflation rate, while the response is predominantly neutral and mild both over the short and intermediate period for innovative shock to world commodity price index.

Result showed that in the intermediate period world crude oil price among other external shock variable accounted for a substantial contribution to forecast error variance in gross domestic product of Africa countries sampled in the study, though there is no noticeable contribution in the short immediate term. Also in the case of oil rich and non-oil rich Africa countries world

crude oil price accounted for a substantial contribution to forecast error variance in gross domestic product however, comparing the non-oil rich African countries with oil rich Africa countries, it was observed that in the intermediate period world oil price accounted for relatively larger percentage of forecast error variance in gross domestic product in non-oil rich Africa countries (67.5%), than oil rich Africa countries (37.9percent)

Summary and Conclusion

Result of estimation conducted in the quest to investigate the impact of world real interest rate on exchange rate in Africa countries revealed that world real interest rate has predominant negative impact on exchange rate of African countries sampled in the study. Result also revealed that world real interest rate has no contribution to forecast error variance of exchange rate on the short period, but in the intermediate period it has mild contribution of about 17.4percent to forecast error variance in exchange rate of Africa countries sample in the study. Result also showed that in the short run, world real interest rate could not account for any percentage of forecast error variance in exchange rate

Premise on the findings, this study concluded that global oil price shock has profound positive impact on the gross domestic product of Africa countries. The formation of Producers Association by Africa can also help to stabilize price especially before and after shocks. African countries should build or increase their external reserves, which will often serve as back-up during shocks. Both oil rich and commodity rich African countries needs to improve their exchange rate policies in other to increases the value of their currencies. Recently, increasing foreign reserves has provided African countries with valuable resources to important countercyclical policies in response to global shocks, the main issues within the continent is that, previous accumulation has been uneven across countries. Increased reliance on domestic markets for government funding is one strategy most African countries should adopt (TDC, 2003) to reduce the impact of external shocks.

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