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Enjeux du développement et croissance économique en Afrique dans une perspective du rééquilibrage des comptes courants internationaux

(Development Challenges and Economic Growth in Africa: a global rebalancing perspective)

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Resumé

Sur la base de plusieurs faits stylisés, cet article recours à deux approches auto-régressif vectoriels (VAR) sur données de panel ainsi que sur une représentation à effet de seuil (M-TAR et M-SETAR) dans le but d'analyser l'interdépendance/dépendance des économies africaines envers principalement les États-Unis dans le cadre du rééquilibrage des comptes courants mondiaux. Nos résultats montrent que le revenu national (RN) de l'Afrique est susceptible de réagir négativement aux effets de la réduction des déséquilibres des comptes courants des USA et de la Chine, pendant que les chocs inhérents peuvent représenter une fraction significative de la variance du RN de l'Afrique. Bien que la présence de la Chine devrait compenser la baisse de la demande des États-Unis, nos résultats indiquent toujours que le rééquilibrage des comptes courants présente des risques pour les perspectives de croissance de l'Afrique. Les résultats montrent aussi que l'investissement représente l'une des composantes du revenu national le plus affecté par le rééquilibrage des comptes courants. Il s'ensuit que pour mitiguer les risques et autres effets inattendus sur les économies Africaines, les partenaires du développement Africain devront promouvoir des mesures visant à réorienter davantage les flux d'investissement des pays à compte courant excédentaire (tel la Chine) vers ceux en deficit du development comme la region Afrique. Ceci a le double avantage de répondre à l'une des actions requises en vue d'une résorption ordonnée des déséquilibres internationaux tout en relançant le développement de l'Afrique sur des bases qui ne compromettent pas le progres réalisé depuis la dernière décennie.

Abstract

Based on several stylized facts, this paper resorted to a Panel VAR and TAR (threshold auto-regression) to African economies in their interdependence/dependence with mainly United States in the context of the ongoing global rebalancing of current accounts. Our findings confirmed that Africa's aggregate income is likely to respond

[1] L'opinion exprimée dans ce document est celle de l'auteur et ne reflète pas nécessairement celle de la JICA.

negatively to the global current account rebalancing and related shocks may well account for a significant fraction of the variance of GNI in Africa. Although the presence of China is expected to compensate for the fall in US demand, our findings still indicate that current account rebalancing presents downward risks for Africa's growth prospects. Given that impulse analysis found investment as the most affected factor among the components of aggregate income, the implication is that the expected capital redirection from current account surplus economies (i.e., such as China) to capital starving Africa may well meet one of the required actions aiming at reducing the global imbalances while ensuring that development progress achieved since the last decade is preserved.

Key Words: Economic growth, global rebalancing, Africa,
JEL codes : E66, F41, O55

1. Introduction

Global current account imbalances widened sharply since the early 2000s and triggered the financial crisis of 2007-08. Although the global imbalances have narrowed somewhat in the aftermath of the crisis, global macroeconomic rebalancing is still under way. Furthermore, global current account rebalancing may have longer-lasting effects on the economy that result in structural breaks in trend GDP growth. Such reversals tend to be disruptive, at least as far as developing and emerging-market economies are concerned, because they are often accompanied by sudden stops in capital flows and large exchange rate depreciations. (de Mello et al. 2011). Clearly, ddevelopmental and economic implications of this global rebalancing are of great interest to policy makers and development stakeholders. While concern about the impact of the global rebalancing, as led by the U.S. external account correction, seems intuitive and plausible, it has received inadequate coverage in the African development literature compared to the general perspective of the role of external factors in Africa's growth experience (for a summary on the tragedy of Africa's growth, see Collier and Gunning, 1999; Easterly and Levine, 1997). Most of the empirical research in these issues has concentrated on OECD countries and little is known about the relative importance of links in African economies.

For developing countries such as those in Africa the direct economic and financial impacts are

manifold. First, the adjustment needed in various regions is substantial and the asymmetry of current account adjustment implies important consequences for trade and capital flows between regions as well as commodity price adjustments, especially primary commodity prices. Second, over the buildup of the ongoing current account rebalancing, dynamics has been much stronger in African exports to emerging economies, especially to the East Asian region, with China at the center. Yet, Africa's major export destinations are still OECD economies; most of which are engaged in fiscal adjustment. The need for more fiscal spending on infrastructure in emerging economies and the need for fiscal consolidation in advanced economies leads naturally to the question of what this asymmetric fiscal adjustment might do to global trade balances as well as global economic growth over the coming decades. Third, since the upturn in China's imports early in 2010, African commodity export prices have enjoyed an extended rally, which has triggered growth in Africa. Hence, the key concern for Africa over the next few years is the impact of the aforementioned asymmetric adjustment in world current accounts on the region's economic growth prospects.

Based on the above considerations, we explore how much of each of the node of global imbalances require adjustments in African growth and its short-run components. Our second question, whether the effects of world current account dynamics on Africa's growth differ in times of current account expansion or reduction.We assume that external shocks that sway current account balances will also affect aggregate output in similar proportion, ceteris paribus. More specifically, we use a modified Keynesian national income framework, in which net trade is successively replaced by Africa's bilateral trade balance with China, USA and Japan. Though simple, this framework enables us to assess how much of each of the node of global imbalances require adjustments in African growth and its short-run components. Stepwise, we first examine the cross-country determinants of growth by applying Panel Autoregressive (PVAR) estimation for the 1990-2010 period. Second, in order to project responses of Africa's GDP to world current account dynamics, we use VAR impulse response functions derived from the PVAR estimated in the previous step. Third, we use Threshold Autoregressive (TAR) estimation for the 1960-2011 period

to assess the long-run relationships between Africa's aggregate national income and current accounts of selected world current accounts. Our specification allows for the conditional expectation of future national income to depend on whether the US (or any other major world economy) current account balance is above or below its previous level.

Our findings confirmed that Africa's aggregate income is likely to respond negatively to the global current account rebalancing and related shocks may well account for a significant fraction of the variance of GNI in Africa. Although the presence of China and other emerging economies is expected to compensate for the fall in US demand, our findings still indicate that current account rebalancing presents downward risks for Africa's growth prospects. Also, impulse analysis found investment as the most affected factor among the components of aggregate income. The result is potentially important for macroeconomic policy since it suggests that the expected capital redirection from current account surplus economies (i.e., such as China) to capital starving Africa may well meet one of the required actions aiming at reducing the global imbalances.

The rest of the paper is structured as follows. Sections 2 and 3 present stylized facts and a theoretical setting, respectively. Section 4 introduces the methodology and the following section presents empirical results, with conclusions in Section 6.

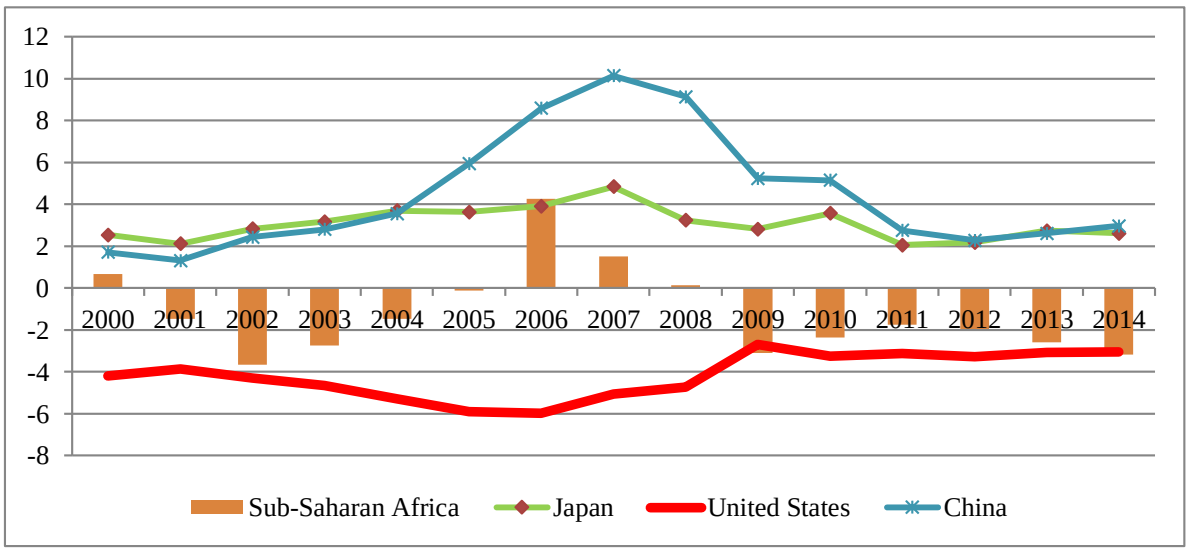
2. Stylized facts in regard to African growth and world current accounts

As it can be seen from Figure 1, the impacts of US subprime crisis on the world economies have provided even firm evidences of global interdependence. While US output growth fell to zero in 2008 and to -2.6 percent in 2009, world output growth in 2009 also turned negative in 2009 (IMF, 2010). Still, in 2012, the U.S. fiscal and external positions are serious enough to generate profound external concern. The US continues to struggle on budget balance as the private sector is deleveraging. Need not to mention, the U.S. is traditionally more important as a destination for African exports than as a source of imports. Assuming an elastic current account elasticity of demand for African imports on the part of the U.S., one percent reduction in the U.S. current account ratio via imports (roughly equivalent to 14 percent of 2006 GDP of sub-Saharan Africa,

which stood at 712 billion current US$) would be damaging to African economies.

Although the global imbalances have narrowed somewhat in the aftermath of the crisis, global macroeconomic rebalancing is still under way. By global imbalances it is meant that the fast-growing emerging economies and the developing countries finance the current account deficits of the slow-growing advanced economies. This definition reflects the pattern of global imbalances currently observed but global imbalances could result from the current account deficits and surpluses of any groups of countries. In fact, the current global imbalances are mainly a current account imbalance between the United States and the rest of the world (Artige and Cavenaille, 2011).

Figure 1. World current account (percent of GDP; from 2012, projections)



Source: International Monetary Fund, World Economic Outlook Database, April 2012

Based on previous episodes of US current account and growth in Africa, there is an uncanny mirror image between growth rates in Africa and the annual change in the U.S. trade account balance, especially in the 1970s and mid-1980s. As the U.S. trade account deficit improved from 3.4% of GDP in 1986 to 0.8% in 1992, African growth eased from 2% to –1.1%. Apparently, an adjustment in the U.S. trade account implies some shift in African economic growth via trade channels (Maswana, 2010).

Although it is impossible to accurately pinpoint all the underlying forces in play, the

available data show that African economic growth has been higher, on average, in years in which the U.S. current account deficit grew sharply compared to those years in which it actually declined. Table 1 shows the years from 1970 through 2006, grouped according to the change in the U.S. current account balance as a percentage of GDP. The first group in Table 1 (regime 1) consists of the 12 years in which there was an increase in the U.S. current account balance as a percentage of GDP (i.e., the deficit shrank relative to GDP); during those years, real GDP growth in Africa averaged 2.69%. The second group (regime 2) consists of the 12 years in which the ratio of the current account balance to GDP shifted by at most 0.5 percent (i.e., the deficit underwent a modest increase relative to GDP). And the third group (regime 3) consists of the 11 years in which the ratio of the current account balance to GDP turned sharply negative, by more than 0.5%. During the years included in the second and third regimes, real GDP growth in Africa averaged 3.06% and 3.59%, respectively.

Table 1. U.S. current account (CA) and GDP growth in Africa, 1970–2006

Regime 1[a]			**Regime 2[b]**			**Regime 3[c]**		
Year	Change in CA/GDP, U.S. (%)	Real GDP growth, Africa (%)	Year	Change in CA/GDP, U.S. (%)	Real GDP growth, Africa (%)	Year	Change in CA/GDP, U.S. (%)	Real GDP growth, Africa (%)
1973	0.6	4.1	1971	–0.3	6.3	1976	–0.8	4.5
1975	0.9	1.1	1972	–0.3	2.6	1977	–0.9	1.7
1978	0.9	1.1	1974	–0.4	7.2	1983	–0.9	–0.99
1979	0.1	3.9	1982	–0.3	1.27	1984	–1.3	2.39
1980	0.1	4.18	1985	–0.4	3.93	1998	–0.8	3.20
1981	0.1	1.80	1986	–0.5	2.45	1999	–0.8	3.85
1988	1.0	4.37	1987	–0.1	2.10	2000	–1	3.88
1989	0.6	3.33	1992	–0.2	–1.15	2002	–0.7	3.91
1990	0.5	1.1	1993	–0.5	0.58	2004	–0.9	5.49
1991	0.7	0.76	1994	–0.4	2.05	2005	–0.7	5.92
1995	0.2	2.91	1996	–0.1	5.76	2006	–0.7	5.65
2001	0.4	3.61	1997	–0.1	3.68			
			2003	-0.3	2.6			
Average growth		**2.69**			**3.06**			**3.59**

Source: Author's calculations and adaptation from an early version by Griswold (2007). Data on U.S. current account prior to 1980 from the IMF's BOP Database (2009); data on Africa's growth rates from IMF's IFS Database (2009).

[a]Years in which U.S. current account (CA) deficit declined relative to U.S. GDP

[b]Years in which U.S. CA deficit grew by at most 0.5% of U.S. GDP

[c]Years in which U.S. CA deficit grew by more than 0.5% of U.S. GDP

In theory, current account deficit can be reduced through export stimulus without a concurrent fall in import growth. However, if history is any guide, this mechanism has not been the case in previous episodes of world rebalancing since the 1970s. To illustrate this story line from the bilateral trade side, Table 2 presents data on the trade balance between the U.S. and selected African countries in the 1980s. As shown in Table 2, African countries experienced significant losses in terms of exports to the U.S. in the early 1980s over the then world current account rebalancing built up since the aftermath of the first oil shock of a decade early. Even though these calculations are mere indications, they suggest some possible effects of U.S. economic adjustment on Africa. This trend is consistent with U.S. current account rebalancing episodes of the 1970s and 1980s and suggests that the route to lowered U.S. trade deficits has consisted mainly of import reductions (Hong, 2001; Karmin, 2007).

Table 2. Africa's Trade balance with the U.S. in the 1980s

	Peak	Trough	Value in "peak" year (U.S.$ millions)	Value in "trough" year (U.S.$ millions)	Change (U.S.$ millions)	Change (%)
Cameroon	1982	1986	314.53	–57.375	–371.905	–118.24
Congo, D.R.	1983	1986	–21.289	–73.8579	–52.5689	–246.93
Côte d'Ivoire	1982	1983	207.15	186.66	–20.49	–9.89
Ghana	1981	1983	55.159	–23.282	–78.441	–142.21
Kenya	1984	1989	–13.446	–60.3393	–46.8933	–348.75
Nigeria	1981	1984	4176.9	891.2	–3285.7	–78.66
Senegal	1982	1985	–36.141	–61.29391	–25.15291	–69.60
Tanzania	1982	1986	–18.996	–30.913	–11.917	–62.73
Zambia	1981	1982	–20.139	–67.9402	–47.8012	–237.36

Source: Author's calculations based on data from IMF (2009) and DOTS (October 2009)

Although the weight of the US in world trade, with respect to Africa, the ongoing global rebalancing does present some new characteristics. One is the emergence of China as major trading partners of Africa as it is for Asian economies. The other is the fact that while the final manufacture is perhaps in China, the bits and components come from other parts of Asia while raw materials from Africa, among others. In 2010, 19 percent of Africa's exports headed to China, up from negligible levels in 2000. In little more than ten years, Africa's exports to its traditional trade partners —Europe, North America, and Japan—have dropped from three-quarters to just one-half of the region's total exports. Africa's trade reorientation has been beneficial because it has broadened

the region's export base and linked Africa more strongly to rapidly growing parts of the global economy, especially with current account surplus economies in East-Asia and in emerging economies. This trend departs from previous episodes of world rebalancing. However, economic growth among these emerging economies has been particularly resource intensive.

While primary commodity prices have been a godsend for African economies so far (see Figure A) growth-based on primary resource intensive does not suggest a good prospects under the US fall in imports. Clearly, in a sluggish economy, as the ongoing condition in the US dominated by deleveraging and low consumption, the demand for imports of primary commodities would tend to be weak. Ceteris paribus, for the US would tend to reduce current account deficit while it is likely to create a trade deficit in trading partners, especially among developing countries' trading partners. This conclusion is supported by both economic theory and empirical observation.

3. Does the US current account matter? What the literature says

The basic theory of macroeconomic open economy indicates that a national economy is linked to the rest of the world primarily through three key linkages: international trade in goods and services, international mobility of capital, and international exchanges of national currencies (Frankel, 1986). In recent years, without being mutually exclusive, these explanations have especially focused on the global "saving glut" hypothesis (Bernanke, 2005). It has been argued that the "global savings glut" generated in Asia kept American long-term interest rates unnaturally low and helped to propagate mortgage lending and private consumption, which in turn sustained economic growth in the US. The implication of this was a huge global demand for African commodities (either indirectly through China or otherwise).

Need not to say, the idea of "saving glut" implies that macroeconomic at home can be significantly determined by internal macroeconomic dynamic in foreign countries. Hence, given developing countries' fragilities, their current account can be regarded as purely a by-product of advanced countries macroeconomic dynamics. This line of argument has been at the core of no-structuralist view of international interdependence.

In the Structuralist perspective output growth in the developing countries (the Periphery) closely follows changes in foreign demand for their exports (Prebisch, 1949). Thus, when boom conditions build up in the developed countries (the Center) the increasing demand will bring a rise in the relative prices and in the value of exports of the Periphery. The export rise increases demand and stimulates domestic expenditure and investment through the multiplier. It may also induce more foreign capital inflows to the developing country. Also, the fiscal and monetary policy stance becomes more expansionary when the balance of payments conditions improve. Alternatively, Lopez et al. (2011) observe that Structuralist economists argue that the trade balance entirely determines the cycle of the Periphery. Thus for example, a slowdown in foreign demand weakens the relative prices and volume of exports, making the balance-of-payments constraint dramatically binding for the aggregate national income.

While there are large domestic components in the fluctuation of national aggregate income, international current accounts have significant importance through business cycles. Business cycles seem to be driven by a strong trade (especially export) channel (Selover 1999, Moneta and Ruffer 2009), rather than by consumption or investment (Moneta and Ruffer 2009). Similarly, Baxter and Kouparitsas (2005) also confirmed that international bilateral trade is the most important channel. Moreover, interdependent influences in a group of countries can be accounted for by several distinct factors. First, interdependence can occur either via current account transactions (that is, changing the volume and price of traded goods) or through capital markets (that is, provoking a reaction in domestic capital markets; see Goldfajn and Valdes (1996), and Levy-Yeyati and Ubide (1998), among many others). In any case, if the speed of transmission is relatively fast, we would expect to observe a synchronized movement in macroeconomic variables among the countries involved (Loayza et al., 1999), particularly when output data are given at low frequency (annual, for instance). Also, using a VAR framework, Hoffmann (2003) finds that long-run output growth was driven by external factors and that country-specific shocks were less persistent especially for small economies.

Given the diversity of theoretical assumptions behind studies on the current account

reversals and their macroeconomic effects it is not surprising that the empirical results for the long-run equation are somewhat mixed[2]. Yet, the vast majority of these studies use used a bivariate VAR framework. The question we ask, and attempt to answer with the help of a Panel VAR framework, is whether the US current account effects should be seen as a major contributing factor to the national income in developing Africa? In doing so, we build on a modified Keynesian analytical model of national income in open economy (in fact a modified Mundel-Fleming framework).

The model assumes two countries, Africa, *A* and the foreign country, *W*. Also, there is no capital mobility. Moreover, output is demand-determined and expenditure is insensitive to interest rates. This implies that demand is independent of the money supply. How does this assumption square with the conventional view that exchange rate and interest rate play a crucial role in the transmission of negative shocks in other countries? The answer is that the dollar exchange rate is an endogenous variable and therefore cannot be considered a cause of movements in the trade balance. As in the standard Mundell-Fleming model, the small economy (here Africa) is a dependent economy in which the direction of macroeconomic influence runs in a single direction from the US.

$$Y_A = C_A + \bar{I}_A + G_A + (X_A - M_A) \qquad [1]$$

$$Y_w = C_w + \bar{I}_w + G_w + (X_w - M_w) \qquad [2]$$

where Y is aggregate, C is consumption, $\bar{I}$ is investment, G government spending, X is exports and M is imports.

As it can be seen Africa's exports are US imports ($X_A = M_W$) while the US exports are Africa's imports ($X_A = M_A$). This implies that trade balance of both countries are reflects the same dynamic. In other words, $(X_A = M_A) = (X_W - M_W)$.

Then, Equation (1) can be rewritten as:

[2] For a comprehensive review of the theoretical and empirical literature on current account reversals and interdependent world, see Li et al. (2011).

$$Y_A = C_A + \bar{I}_A + G_A + (X_W - M_W) \qquad [3]$$

Importantly, traditionally, savings is the only autonomous variable that enters into the basic Keynesian model. However, we assume here that consumption, investment [3] and government spending are all autonomous while net exports is a linear function of world trade account. Following Bortis (1997), in the long run dynamic in Y_A can be taken as a function of foreign current account changes; which leads to the following approximation, which is similar to a joint representation of current account and output determination in Hoffmann (2003; equation 8):

$$\Delta Y_A = \Delta(X_W - M_W) \qquad [4]$$

This simple and data-driven empirical setup follows Hoffmann (2003) in that it focuses on the foreign current account as the key variable of international macroeconomic transmission, which is assumed to summarize enough economics unobserved variables to avoid the risk of "measurement without theory". [4]

By virtue of the aforementioned accounting identity [3], the following short-run growth form in a panel data framework can be derived:

$$y_{i,t} = c_{i,t} + \bar{i}_{i,t} + g_{i,t} + (x_{W,t} - m_{W,t}) \qquad [5]$$

where y is output, c is consumption, $\bar{i}$ is investment, g government spending, x is exports and m is imports. t is time while i is a country and the sub-script W is the foreign country.

The motivation for the estimation of a regression of this type is policy driven. Specifically, we assume that a policymaker is interested in suing this equation to advise some country i on

[3] If the long run is considered, investment, like consumption, must be induced, depending upon the capital stock required to produce long-period output (Bortis, 1997, pp. 81–9, 144). Moreover, Turbulences caused by abrupt changes in the terms of trade and other prices can induce changes in these four components of aggregate output.

[4] Nevertheless, theories remain the basis for the model assumptions. For instance, relative to autonomous components of aggregate income, it is recognized that investment is autonomous under the Keynesian theoretical notion that investment can be undertaken regardless of the state of the country's GDP, but may be a function of world interest rates. Still, it can be argued that current account rebalancing triggers the world interest rates and as such the above assumption can hold.

whether it should change some policy instruments such as *c,* $\bar{i}$ or $\bar{i}$.

For Eq. [5] to hold, any changes in foreign current account will have a corresponding effect on aggregate output of the national economy through one or all of its components. That is, shock transmission occurs through current account transactions (Frenkel and Schmuckler, 1996) while components of the domestic absorption adjust to the new equilibrium.

Given the interdependent nature of these economies, related analyses have mainly made use of the same types of measurement techniques such as correlation analysis, VAR analysis (impulse response functions) (Li et al., 2011; Campbell, 1994). The VAR models pioneered by Sims (1980) have been widely used to measure the response of macroeconomic variables to shocks and the degree to which each shock accounts for their variability through time. Sims (1980) introduced VAR to study economic data in forecasting macro time series, testing economic models and studying the source of economic fluctuation.

The forecasts generated by VAR model are often better than 'traditional structural' models. Kuszczak and Murray (1986) notes that, provided the error terms in a VAR structure are not auto-correlated, a VAR structure helps avoid the necessity of costly systems estimation. However, the drawback with VAR is that uses little theoretical information about the relationship to guide the specification. AVAR model suggests which of the variables in the model have statistically significant impacts on the future values of each of the variables in the system, but give no information on the sign and how long these effects require to take place. This information can be examined through impulse response analysis. Impulse responses trace out the responsiveness of the dependent variables in the VAR to shocks to the error term. A unit shock is applied to each variable and its effects are noted.

As previously stated we use a Panel VAR (PVAR), which combines the traditional VAR approach, which treats all the variables in the system as endogenous, with the panel-data approach, which allows for unobserved individual heterogeneity, the VAR methodology squares well with our purposes here. A thoroughly discussion on the economic interpretation of and the relationship between estimates of the AR coefficient in linear (Wooldridge) and threshold models (Taylor, 2001)

is available in the literature. For tractability, it is assumed that external disturbances are common to all African countries and affect all countries in a similar way. Although country-specific characteristics do matter in practice, this assumption can be justified by the fact that in response to external shocks various African countries have been implementing similar policy measures as the result of advices/recommendations from the one-fit-all Washington Consensus that dominated policy making over the study period.

Hence, in its basic form the PVAR model is specified as follows:

$$\boldsymbol{B}_{j,t} = \alpha \sum_{i=1}^{p} \boldsymbol{B}_{j,t-i} + \boldsymbol{u}_t \qquad [6]$$

where B is a k vector of endogenous variables. α and β are matrices of coefficients to be estimated. p is the maximum lag length; j represents an individual country and u_t is the error-term.

Incidentally, the VAR testing framework used here has the added advantage that it preserves the preferred linear long-run relationship in the existing theoretical framework, whilst also permitting the use of nonlinear relationship such as the asymmetric 'momentum threshold auto-regressive (M-TAR) model introduced by Enders and Granger (1998) and Enders and Siklos (2001). The TA approach allows us to check for the responses of African growth to changes in world current account and verify the old claim that reaction of growth of African countries to external shocks "fall faster than they rise".

To test for M-TAR, we first estimated the following long-run relationship (for a technical discussion of the procedure, see Enders and Siklos, 2001) derived from [4]:

$$y_t = \alpha + \beta_1 Z_{w,t} + u_t \qquad [7]$$

where y_t is aggregate income and $Z_{w,t}$ is foreign current account. Then, following Stevans (2004), we estimated the following M-TAR process from the residuals $\hat{u}_t$ obtained in [7]:

$$\Delta\hat{u}_t = I_t \rho_1 \hat{u}_{t-1} + (1 - I_t)\rho_2 \hat{u}_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta\hat{u}_{t-1} + \varepsilon_t \qquad [8]$$

defining the indicator function as:

$$I_t = \begin{cases} 1 if \Delta\hat{u}_{t-1} \geq 0 \\ 0 if \Delta\hat{u}_{t-1} < 0 \end{cases} \quad [9]$$

We set the value of the threshold at zero. Also, it should be noted that in M-TAR the two regimes are determined by the linear combination of the two variables (cointegration). Moreover, the M-TAR model is adjusted by $\rho_1\hat{u}_{t-1}$ if there is an expansion in foreign current account deficit Z_w, i.e. if $\Delta Z_w \geq 0$ and by $\rho_2\hat{u}_{t-1}$ if there is a decrease in such deficit, i.e. if $\Delta Z_w < 0$. We aim to test whether a change (expansion or reduction) in foreign current account deficit causes a different adjustment to the long-run relationship between Africa's aggregate income and foreign current account, that is, if $|\rho_1| > |\rho_2|$, the adjustment would be faster in the case of current account expansion and vice versa.

If Africa's aggregate income and foreign current account were not cointegrated, $\rho_1 = \rho_2 = 0$. Therefore, if we reject the null hypothesis $H_0 : \rho_1 = \rho_2 = 0$, we can imply that these two variables are cointegrated. The distribution of the F -statistic to test this hypothesis, F_C , does not follow a standard distribution so it has to be simulated. The critical values depend on sample size, the number of variables in the cointegration relationship and the number of lags considered in the adjustment process. Finally, in addition to reporting the calculated values of the test statistics, Monte Carlo simulation over 10,000 replications is undertaken to derive their associated p-values.

The M-TAR specification derived above provides a structure for estimating the relationship between foreign current account and Africa's aggregate income in the long run (cointegration). However, as specified it does not allow for that relationship to change with the direction of foreign current accounts. One approach to do so would be to specify the indicator function in terms of positive or negative changes in foreign current account. This type of model is known as the M-SETAR (Momentum Self-Exciting Threshold Auto-Regressive; Million, 2008) and is specified as follow:

$$I_t = \begin{cases} 1 if \Delta Z_{w,t-1} \geq 0 \\ 0 if \Delta Z_{w,t-1} < 0 \end{cases} \quad [10]$$

The idea of M-SETAR (Momentum Self-Exciting TAR) specification is appropriate to our purpose since we are analyzing the adjustment to the equilibrium after an increase or decrease in the US current account balance. Understandably, the estimation of SETAR models requires the application of least-squares procedure only, more specifically, sequential conditional least square (Zapata and Gautier, 2003). Finally, it should be noted that the M-TAR and M-SETAR estimations will include only the US current account in addition to Africa's aggregate income insofar as only the US current account can be considered a credible proxy for World current accounts over the entire period 1960-2011.

4. Estimation Strategy and Data Sources

Before moving to estimation strategies, three remarks are noteworthy. First, insofar as African countries are "small economies", they are assumed not to affect external variables such as current accounts of USA, Japan and China. We are thus not concerned with the causality investigation commonly associated with most VAR studies. Second, the issue of whether the variables in a VAR need to be stationary has not yet been satisfactorily solved in the literature. To avoid this controversy, we resort to annual change variables. Third, as argued by Sims (1980) and Harvey (1990), the goal of VAR is to determine the interrelationship among the variables, and not to exactly estimate the coefficients.

The above being said, the estimation strategy follows five steps: (i) identify the model (linear and non-linear relationship, lag selection, and restrictions); (ii) estimate PVAR models and compute individual impulse response functions; (iii) estimate M-TAR models and (iv) M-SETAR models before (v) providing economic interpretation of the results. This estimation strategy has been applied to the sample of 40 African countries and their three world economic major economies, mainly USA, Japan and China. Although a major trading partner of Africa, the UE is not included as the region aggregate current account has been mostly balanced over the period of this

study (see Figure A1).

For the PVAR analysis, the model considers two sets of interdependent variables over the 1990-2010 period. Firstly, variables common for all African countries are those of a standard closed-economy national income; namely, annual percentage changes in GNI, private consumption, investment and in government expenditures. All sourced from the World Bank World Development Indicators (2012). Secondly, the variable specific to USA, China and Japan is annual changes in current account balance ratio to GDP (in current US$, sourced from the IMF IFS, 2012).

For the TAR analysis, variables include aggregate GNI for the African region (in current US$ and sourced from World Bank World Development Indicators, 2012) for the 1960-2010 period and the US current account series (in current US$ and sourced from the US Bureau of Economic Analysis, 2012). Both indicators are in level.

5. Econometrics results and interpretation

Our results are reviewed in the following steps. First, a quick look at the Panel OLS of Model 1 is done. As a second step, to clarify the state of the long-run relationship the standard OLS while TAR model helped in assessing the dynamics of the transition. Next, the lag-length selection is selected using the Akaike Information Criterion (AIC) (Akaike 1974). Finally, we used Lagrange Multiplier (LM) Test (Breusch-Pagan, 1980) to certify the number of lags is in accord with Hamilton (1994) and the Jarque-Bera Test to test the error normality.

Tables A1 through A4 present the descriptive statistics and results from the standard Panel OLS regression of [5] for the cases of US, Japan's and China's current accounts. From Table A2 through A4, it can be seen that the coefficient for the US current account is significant and negatively signed. However, coefficients for Japan and China are both positively signed. Yet the coefficient for Japan's current account is not significant even at 10% significance level.

Before presenting the PVAR estimation results, in table A6, diagnostic tests were conducted using the Lagrange Multiplier Test (LM) to test the null hypothesis that there is no second order autocorrelation in the panel. The results indicate no serial correlation up to the 5th order lag given

the probability values. The test clearly rejects the null hypothesis of independence among the residuals for PVAR model 1 and 2. Also, According to Baltagi, cross-sectional dependence is a problem in macro panels with long time series (over 20-30 years). This is not much of a problem in micro panels (few years and large number of cases).

Table 3 summarizes results from impulse functions as detailed in Figures A4 through A6. Broadly, the dynamic adjustment to a reduction in US current account impulse administrated to aggregate income of an average African country reveals the trends broadly consistent with stylized facts presented in Section 2. Interesting enough, Figure A4 shows that US current account shock leads to an immediate decline of GNI growth by about 1,1 percentage point in the third year and it takes more than six years to revert to the steady state.

Table 3: Summary of impulse responses

	National Income	Consomption	Investment	Public spendings
US	↓	↓	↓	↓
China	↑↓	↑↓	↓	---

First, bilateral VAR impulse responses of Africa's GNI to US current account indicates that with a 2-3 years lag, into a moderate decline in growth rate of output, which broadly reverts to the steady state after 4 years. Interesting enough, it is worth noting that the absolute size and persistency of a unitary shock from US current account to Africa's GNI is larger than that of similar shocks from China as indicated by the a short-term negative impact of about -0.8 (Figure A4, top-right panel) after a year for the US shock against a -0.2 for China's shock (Figure A5 top-left panel).

Second, the findings also shed light on the reaction of aggregate income components, especially the large fall in investment -2 percentage points and -1 percentage point in reaction to US and China's current account reversals, respectively (Figures A5 and A6). In addition, US current account reversal has also sharp depletion effect on government spending in Africa (Figure A5). The lagged fall of the government expenditures is not only sharp but also persistent, as the fiscal situation does not revert to the baseline trend even in the medium term. In contrast, following

China's current account changes, effects on Africa's governments expenditures remain ambiguous (Figure A6).

Overall, it can be admitted that the current account shocks originated from the US are likely to have downward effects on African aggregate income and its components while ambiguity rules the effects of similar shocks coming from China, except for the case of Africa's investment. Obviously, regardless of the origin of the current account reversal, the size and persistence of the shocks on Africa's macroeconomic structure may well depend on the government's policy response and their efforts to isolate investment.

Although the impacts of the US current account shocks on the other components of Africa's income mostly conform to theoretical predictions, however, impacts of similar shocks from China are mostly ambiguous since they reverse to the state quickly than what would be expected (see Table 3). Surprisingly, the response of government spending shows that the variable remains mostly unaffected by the shock from China's current account movement (bottom-panel of Figure A5). Without the inclusion of capital flows, there is no way to explain such a behavior as it may well be explained by official assistance to fragile States, as it is often the case.

Moreover, impulse responses of Africa's GNI to Japan's current account variation were not reported as the specification of base PVAR indicated specification concerns while most coefficients failed to pass significance tests. Abstracting from the econometrics mishaps, perhaps, African countries might have become insulated from exogenous shocks from Japan; which may well reflect the level of their bilateral trade and trade diversion towards China. It could also imply that characteristics of African growth largely diverge from trade patterns of the Japanese economy.

Before turning to M-TAR results, as it can be expected for series in levels, on the basis of the ADF-tests, both Africa's GDP and the US current accounts are integrated of order 1, which led to the series turning stationary after the first difference. The TVAR results presented in Table A6, it can be seen that the tests of Enders and Siklos (2001) for asymmetric adjustment (Table A6) reject no cointegration in favor of the M-TAR. The F-test for $\rho_1 = \rho_2$ does also reject the null hypothesis. The coefficient for the reduction of the current account deficit (above threshold) is nearly half that

of current account expansion, -0.15 and -0.32, respectively. Both coefficients are significant at the conventional 10 percent and 5 percent significance level.

On the M-SETAR estimation, the results are quite similar to those for the M-TAR since, once again, the long-run cointegration is evidenced. However, the error-correction mechanism shows that African aggregate income responds to a one percent negative deviation from the equilibrium in the previous period by 8%. Clearly, the point estimates of adjustment coefficients suggest that negative deviations from the long-run equilibrium are eliminated much slower than positive deviations. One of the reasons to explain this outcome can be found in the structural rigidities of African economies. Relatedly, another reason could be that it takes some time for African countries to fully record the impact of external shocks and get both policy recommendations and financial resources required for the subsequent structural adjustment.

Granted, we acknowledge two limitations in our analysis. First, we do not explicitly consider the possibility of transmission of shocks involving capital flows. However, as demonstrated over the 2008-2009 global financial crisis, African region is weakly connected to world financial shock transmission. The second limitation of our work is that, owing to data constraints, our analysis excludes factors such as terms of trade, exchange rates and interest rates. Hence, while we have gained in tractability, our analysis may underestimate (without invalidation) the degree of integration of African economies under consideration.

6. Concluding remarks

The aim of this paper was to investigate how the US current account changes affect the growth rate of output of a subset of African countries using a PVAR and TAR to African economies in their interdependence with United States in the context of the ongoing global rebalancing of current accounts. Our findings indicated that Africa's aggregate income is likely to respond negatively to the global current account rebalancing and related shocks may well account for a significant fraction of the variance of aggregate income in Africa. Although the presence of China and other emerging economies is expected to compensate for the fall in US demand, our findings

still indicate that current account rebalancing presents downward risks for Africa's growth prospects. In sum, effect from foreign current accounts generates important asymmetries in the propagation of shocks on Africa's aggregate income, mainly negative effects.

These findings imply that, if deployed appropriately, macroeconomic policy in Africa can minimize the longer-term adjustment costs generated by the US current account reversals. In particular, in spite of its external dependence on the US current account dynamics, the Africa's government spending can exert a certain degree of resilience (possibly, in association with external assistance), which often compensate for the fall in investment and private consumption. Understandably, our results imply that counter-cyclical policies relative to the US current account dynamics are likely to represent the best strategy susceptible to prevent experiences of 1970s and 1980s during which current account rebalancing in industrialized world led to negative unintended effects on African growth performance. Furthermore, our findings are also are instructive since they suggest that the expected capital redirection from current account surplus economies (i.e., such as China) to capital starving Africa may well meet one of the required actions aiming at reducing the global imbalances.

While admitting that precise identification of possible unintended effects that Africa is likely to incur as a result of the global rebalancing is beyond the scope of this paper, we stress that the primary motivation has been to open up areas for discussion and encourage others who may wish to probe particular countries or specific risks more thoroughly. Hence, our observations should be regarded as hypotheses rather than firm conclusions. In this perspective, this simple framework can be considered as a "benchmark" model because of the simplifications made for analytical purposes. The model can be refined and extended with the inclusion of capital flows and more detailed consideration of prices, interest rates, exchange rates factors. They will be considered in the follow up of the current paper.

REFRENCES

1. Akaike, H. 1974. "A New Look at the Statistical Model Identification", *IEEE Transaction on Automatic Control,* Vol.19, pp.716-723.

2. Artige, L. & L. Cavenaile (2011). A Calibrated Growth Model of Global Imbalances; CREPP WP No 2011/06.

3. Balke, N.S. 2000. Credit and Economic Activity: Credit Regimes and Nonlinear Propagation of Shocks; *The Review of Economics and Statistics*, *82*, 2 , 344-349.

4. BEA . 2012.Bureau of Economic Analysis, http://www.bea.gov/index.htm.

1. Bernanke, B. 2005. *"The Global Saving Glut and the U.S. Current Account,"* remarks at the Sandridge Lecture,Virginia Association of Economics, Richmond,VA, 10 March.

5. Chudik, A., & M. H. Pesaran. 2007. In_nite Dimensional VARs and Factor Models," IZA Discussion Papers 3206, Institute for the Study of Labor (IZA).

6. Collier, P. & Gunning, J.W. 1999. Explaining African economic performance, *Journal of Economic Literature*, 37, 64-111.

7. Easterly W. and Levine R. 1997. Africa's growth tragedy: A retrospective, 1960-1989, *Quarterly Journal of Economics*, 112, 4, 1203-1250.

8. Enders, W. & Granger, C. W. 1998. Unit-root tests and asymmetric adjustment with an example using the term structure of interest rates, *Journal of Business and Economic Statistics* 16: 304–311.

9. Enders, W. & P.L. Siklos. 2001. Cointegration and Threshold Adjustment; *Journal of Business & Economic Statistics*, Vol. 19, No. 2, pp. 166-176.

10. Enders, W. & Siklos, P. L. 2001. Cointegration and threshold adjustment, *Journal of Business and Economic Statistics* 19: 166–176.

11. Frenkel, J. A. 1986. International Interdependence and the Constraints on Macroeconomic Policies. In: Federal Reserve Bank of St. Louis. How open is the U.S. Economy? 171—205.

12. Griswold, D. 2007. Are trade deficits a drag on U.S. economic growth? Free Trade Bulletin no. 27, Center for Trade Policy Studies, Cato Institute., Washington, D.C.

13. Hull, L. 2002. Foreign-owned banks: implications for New Zealand's financial stability. *Reserve bank of New Zealand discussion paper series,* DP2002/05.

14. Karmin, D. 2007. The Facts on Trade Deficits and Jobs; Policy Report October 2007, Progressive Policy Institute, Washington, DC.

15. Loayza, N., Lopez, H., & Ubide, A. 1999. Sectoral macroeconomic interdependency; IMF Working paper WP99/11.

16. Maswana, J.C. 2010. The global financial crisis and recession: impact on and development prospects for Africa; JICA-Research Institute, WP no. 15.

17. Obstfeld, M. & Taylor, A. M. 1997. Nonlinear aspects of goods-market arbitrage and adjustment: Heckscher's commodity points revisited, *Journal of the Japanese and International Economies* 11: 441–479.

18. Sachs, J. 1988. "Global Adjustment to a Shrinking U.S. Trade Deficit," *Brookings Papers on Economic Activity*, No. 2.

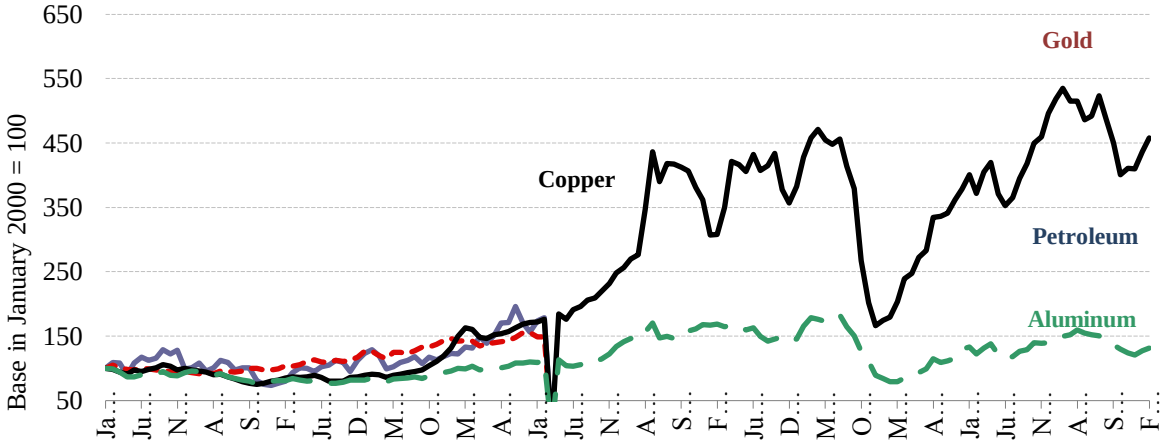
19. Sanchez, L.J., A., & Spanos, A. 2011. Macroeconomic Linkages in Mexico; *Metroeconomica, Vol. 62, No. 2, pp. 356-385.*

20. Sims. 1980. Macroeconomics and Reality, Econometrica, 48, pp.1-48

21. Taylor, A. M. 2001. Potential pitfalls for the Purchasing-Power-Parity puzzle? Sampling and specification bias in mean-reversion tests of the law of one price, *Econometrica* 69: 473–498.

22. Zapata, H. O. & W. M. Gauthier. 2003. Threshold Models in Theory and Practice, *Journal of Agricultural and Applied Economics, 35*, 2(2003):432.

Figure A1. Commodity prices (base January 2000 = 100



Source: World Bank, 2012

Figure A2.

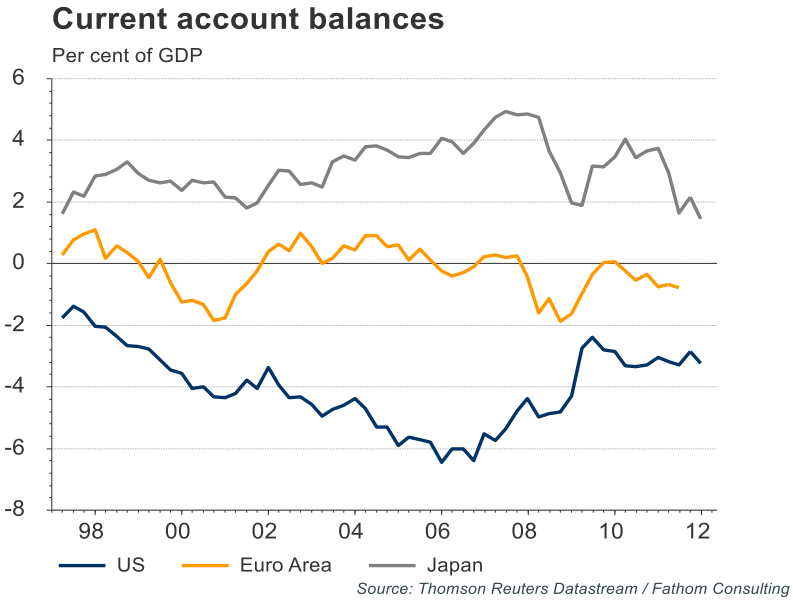
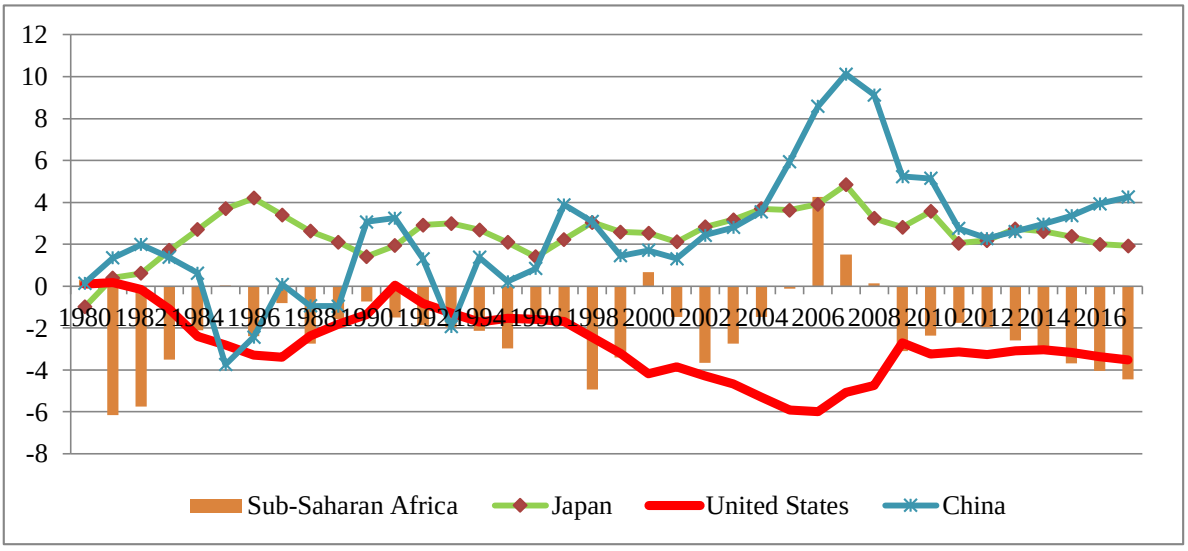


Figure A3. World current account (percent of GDP; from 2012, projections)



Source: International Monetary Fund, World Economic Outlook Database, April 2012

Table A1. Description statistics

	GNI	CONSUMPTION	GOVERNMENT	INVESTMENT	US_CA
Mean	3.775595	3.806140	4.167031	7.559175	-3.114547
Median	4.020160	3.658637	3.412390	6.047657	-3.228290
Maximum	35.22408	61.25364	293.5895	493.5283	0.048072
Minimum	-50.24807	-33.20183	-68.23793	-81.77223	-6.003348
Std. Dev.	5.340563	7.881530	18.53840	29.48321	1.749791
Skewness	-1.161264	0.699334	6.067490	7.498219	-0.057360
Kurtosis	19.96454	10.94195	96.96811	118.4739	1.806457
Jarque-Bera	10334.94	1744.992	239393.7	363835.9	50.85883
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	3194.154	2451.154	2666.900	4868.109	-2644.250
Sum Sq. Dev.	24100.76	39942.21	219606.5	558933.8	2596.380
Observations	846	644	640	644	849

Table A2. Panel OLS (US current account included)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSUMPTION	0.313670	0.021766	14.41119	0.0000
INVESTMENT	0.053157	0.005741	9.259517	0.0000
GOVERNMENT	0.028471	0.009210	3.091367	0.0021
US_CA	-0.278304	0.096472	-2.884833	0.0041
C	1.083037	0.332336	3.258867	0.0012

R-squared	0.372345	Mean dependent var	3.612120
Adjusted R-squared	0.368353	S.D. dependent var	5.345303
S.E. of regression	4.248245	Akaike info criterion	5.738744
Sum squared resid	11351.93	Schwarz criterion	5.773855
Log likelihood	-1814.182	Hannan-Quinn criter.	5.752378
F-statistic	93.28555	Durbin-Watson stat	1.917650
Prob(F-statistic)	0.000000		

Table A3. Panel OLS (China's current account included)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSUMPTION	0.314007	0.021825	14.38724	0.0000
GOVERNMENT	0.028086	0.009237	3.040584	0.0025
INVESTMENT	0.054099	0.005736	9.431742	0.0000
CH_CA	0.147641	0.059570	2.478437	0.0135
C	1.442433	0.257239	5.607366	0.0000

R-squared	0.370191	Mean dependent var	3.612120
Adjusted R-squared	0.366185	S.D. dependent var	5.345303
S.E. of regression	4.255528	Akaike info criterion	5.742170
Sum squared resid	11390.89	Schwarz criterion	5.777281
Log likelihood	-1815.268	Hannan-Quinn criter.	5.755804
F-statistic	92.42873	Durbin-Watson stat	1.912025
Prob(F-statistic)	0.000000		

Table A4.Panel OLS (Japan's current account included)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONSUMPTION	0.317644	0.021810	14.56393	0.0000
GOVERNMENT	0.028702	0.009263	3.098685	0.0020
INVESTMENT	0.054109	0.005755	9.402511	0.0000
JP_CA	0.328787	0.214554	1.532420	0.1259
C	0.968806	0.615888	1.573024	0.1162

R-squared	0.366406	Mean dependent var	3.612120
Adjusted R-squared	0.362376	S.D. dependent var	5.345303
S.E. of regression	4.268296	Akaike info criterion	5.748162
Sum squared resid	11459.34	Schwarz criterion	5.783273
Log likelihood	-1817.167	Hannan-Quinn criter.	5.761796
F-statistic	90.93715	Durbin-Watson stat	1.907935
Prob(F-statistic)	0.000000		

Table A5. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC
0	-1923.288	NA	1.30e+33	81.92714	82.00587
1	-1787.485	254.2694	4.79e+30	76.31850	76.55469
2	-1769.269	**32.55607***	**2.62e+30***	**75.71357***	**76.10721***
3	-1766.723	4.332513	2.79e+30	75.77547	76.32657
4	-1762.831	6.294054	2.82e+30	75.78005	76.48861

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table A6 Lagrange multiplier (LM) test for panel data

Total panel observations: 634
Probability in ()

Null (no rand. effect) Alternative	Cross-section One-sided	Period One-sided	Both
Breusch-Pagan	7.638546 (0.0057)	0.851792 (0.3560)	8.490338 (0.0036)
Honda	2.763792 (0.0029)	0.922926 (0.1780)	2.606903 (0.0046)

Figure A4. (1 lag imposed)

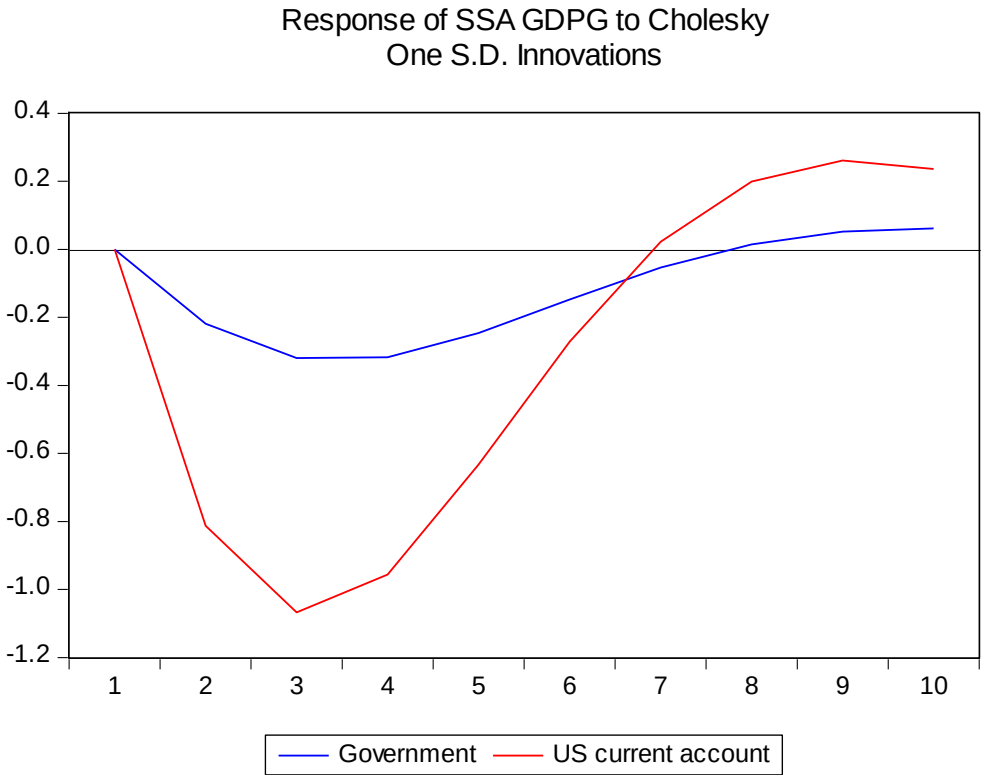


Figure A5. SSA-US current account

Response to Cholesky One S.D. Innovations ± 2 S.E.

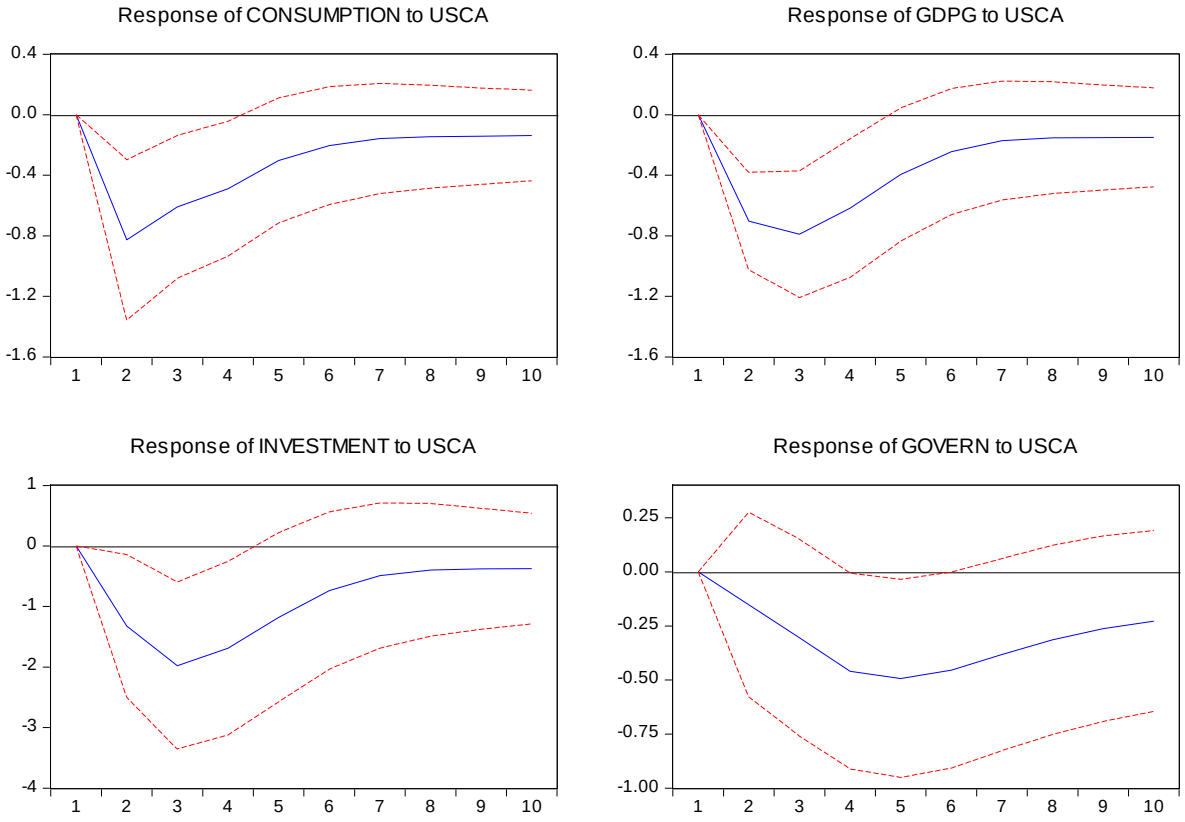


Figure A6. SSA-China's Current account

Response to Cholesky One S.D. Innovations ± 2 S.E.

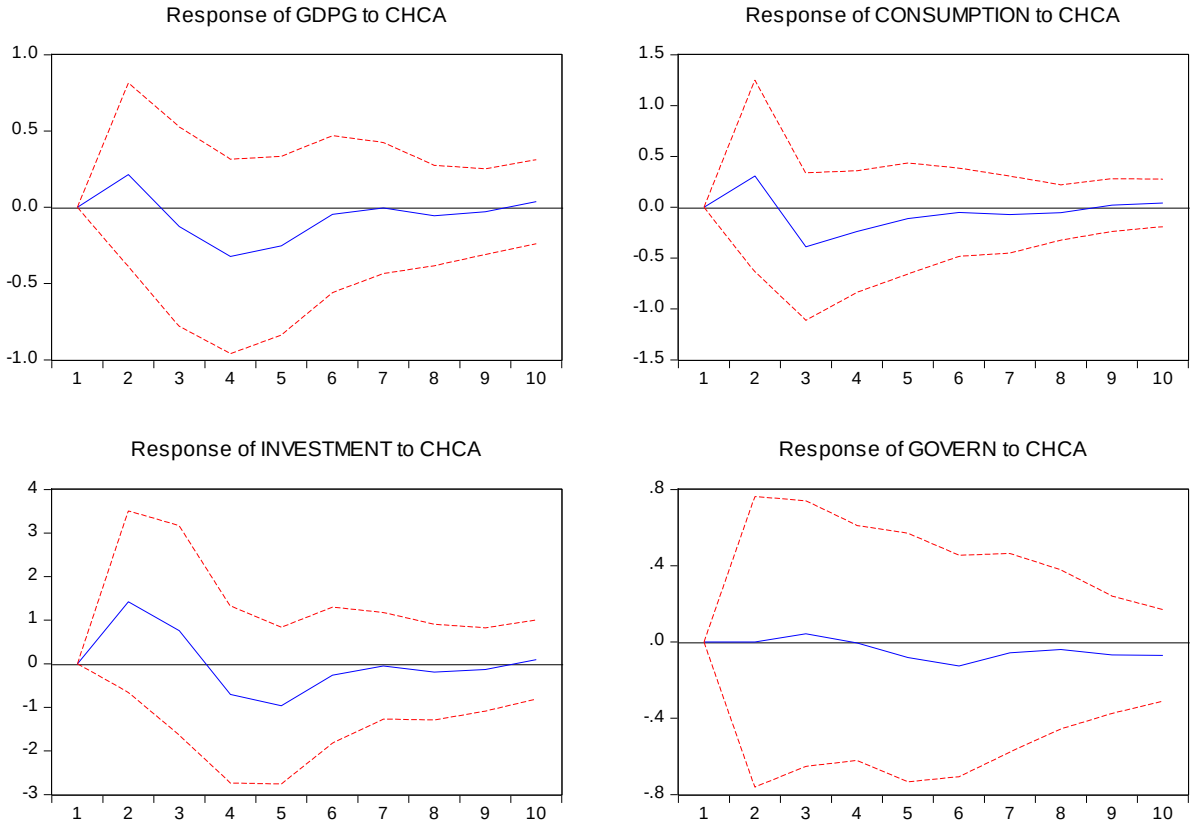


Table A7. M-TAR

Sample (adjusted): 1961 2011

Variable	Coefficient	Std. Error
Above Threshold	-0.150129	0.076448
Below Threshold	-0.320407	0.004107
Differenced Residuals(t-1)	0.692296	0.040685
Differenced Residuals(t-2)	0.279656	0.179675
F-equal:	3.009360	(2.551196)*
T-max value:	-1.963803	(-1.813136)*
F-joint (Phi):	5.927552	(5.165748)*

*Simulated critical values for 10% significance level.
Number of simulations: 10000
Lags (determined by data): 2 (based on AIC)

Table A8. M-SETAR

Sample (adjusted): 1961 2011

Variable	Coefficient	Std. Error
Above Threshold	-0.022630	0.096395*
Below Threshold	-0.086613	0.002642***
Differenced Residuals(t-1)	-0.045298	0.608310
Differenced Residuals(t-2)	0.200384	0.048533**

Lags (determined by data): 2 (based on AIC)

Breusch-Godfrey LM	6.804987	Prob. (0.0028)
F-equal (Wald)	4.937094	Prob. (0.0000)
F-joint (Wald)	9.089296	Prob. (0.0000)