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# Threshold Cointegration and the Short-run Dynamics of Twin Deficit Hypothesis in African countries

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## Abstract

This paper examines the relationship between the fiscal deficit and the current account deficit using the threshold cointegration approach of Hansen and Seo (2002). Using quarterly data for nine African countries for the period 1980-2009, a long-run positive cointegrating relationship is established for six out of the nine countries examined, while the relationship is negative for the other three. This provides qualified support for the twin convergence hypothesis. Threshold error correction effects show some diversity in the speed of adjustment of the current account relative to the speed of adjustment of the fiscal deficit. This may be a reflection of differences in the way fiscal policy issues are handled across the countries.

**Key Words:** Fiscal deficits, Current account deficits, Threshold cointegration, African countries.

**JEL Classification:** H60, H62, C22,

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# 1 Introduction

Persistent fiscal and current account deficits are a major policy concern, irrespective of whether the country affected is developed or developing. This is because large fiscal deficits may lead to crowding-out of private investment if they cause interest rates to rise. Similarly, a large current account deficit could lead to a decline in competitiveness, a transfer of wealth to foreign nationals and a depletion of foreign exchange reserves, possibly triggering a currency crisis. From the traditional open-economy macroeconomic perspective, there are three main reasons to expect a positive relationship between the fiscal deficit and the current account deficit, the "Twin Deficit" hypothesis. First, an increase in the fiscal deficit may induce an increase in the interest rate that causes capital inflows and an appreciation of the exchange rate, with unfavourable effects on the current account. Second, an increase in the fiscal deficit may lead to an increase in the demand for imports, causing a worsening of the current account. And third, a worsening of the current account deficit will reduce tax revenue and thus increase the fiscal deficit. In contrast to the traditional Keynesian view, the Ricardian equivalence hypothesis of Barro (1974, 1989) argues that the fiscal deficits and the current account deficits are unrelated. Kim and Roubini (2008) argue for a negative relationship, a "Twin Divergence" hypothesis.

Existing empirical evidence on the twin convergence hypothesis is mixed. Early work, based on simple single equation models, includes Milne (1977), Bernheim (1987), Bryant *et. al* (1988) and Ziets and Pemberton (1990). These authors report a positive relationship between the two deficits, supporting the hypothesis. More recent studies often use vector autoregressive (VAR) models. Abell (1990), Bechman (1992) and Rosensweig and Tallman (1993) support the hypothesis. However Enders and Lee (1990) find no significant association between the deficits. Kim and Roubini (2008), Corsetti and Muller (2006) and Muller (2008) report a negative relationship.

Another strand of the literature examines the cointegrating relationship between the current account deficit and the fiscal deficit that is implied by the twin convergence hypothesis. Bechman (1992) and Dibooglu (1997) were able to detect such a cointegrating relationship. However more recent evidence is less supportive. For example, Holmes *et. al* (2010a) and Holmes *et. al* (2010b) find that the fiscal deficit is stationary in a sample of the EU countries when allowance is made for cross-sectional dependence and structural breaks and that the current account deficits of these countries are sustainable in the long-run. Grier and Ye (2009) also stress the importance of accounting for structural breaks; they find no long-run relationship between the fiscal deficit and the current account balance when this is done.

The objective of this paper is to investigate the possibility of a long-run but non-

linear relationship between the fiscal deficit and current account deficit in a sample of African countries, where we model nonlinearity within the context of threshold cointegration. Previous studies have neglected this issue by assuming symmetric adjustment: the failure to reject the null of no cointegration in some of these studies could be attributed to the neglect of threshold effects (Holmes, 2011). Pragidis *et. al* (2015) have found that adjustments to fiscal shocks could be asymmetric. A notable exception is Holmes and Panagiotidis (2009) who used a flexible technique to look into the asymmetric adjustments of the US current account and found that adjustment to equilibrium was mainly driven by the US exports.

In contrast to all of the previous work cited above, apart from Holmes and Pangi-otidid (2009), this study considers the possibility of a long-run relationship between the twin deficits that is characterised by threshold cointegration. There is a strong rationale for considering these effects. The relationships between the fiscal deficit and the interest rate and between the interest rate and the exchange rate may be nonlinear, so the impact of a given fiscal expansion may differ according to the size of the deficit; in particular, the impact may be larger if the deficit exceeds a critical threshold level. This implies a different relationship between the twin deficits depending on whether the fiscal deficit exceeds this threshold. More generally, financial markets in most African countries are imperfect and underdeveloped. Adjustment in such environment may well be irregular and *ad hoc*, implying a non-linear relationship between the two series. To investigate these non-linearities and asymmetric adjustments between these deficits, this paper employs the Hansen and Seo (2002) threshold cointegration methodology, where the short-run dynamics reflect two regimes, which reflect deviations from the long-run relationship between the current account balance and the fiscal deficit, relative to a threshold. This approach allows for asymmetric adjustment dynamics between the series.

Another contribution of the paper is that it is investigating relationship between the fiscal deficit and the current account deficit for a sample of African countries, which have been largely overlooked by the previous studies. This is important as the countries in the sample have experienced both fiscal and current account deficits during the sample period, except Botswana, which has enjoyed relatively favourable current account balance for most of the sample period until the recent financial crisis. Therefore, establishing dynamic relationship between these deficits will shed more light on the appropriate policy measures needed to be adopted.

The rest of the paper is structured as follows. Section 2 outlines the methodology of the Hansen and Seo (2002) bi-variate threshold approach used in this analysis. Section 3 discusses the sources and the definitions of the data. Section 4 outlines our estimation strategy and discusses our empirical results. Section 5 concludes.

## 2 Methodology

In order to test the validity of the twin deficits hypothesis within the context of cointegration theory, the empirical literature has typically used a linear model that takes the following form:

$$CAB_t = \alpha + \beta FD_t + \varepsilon_t \quad (1)$$

where  $CAB$  is the current account,  $FD$  is the fiscal deficit and  $\varepsilon$  is an error term. This relationship can be embedded in the following linear VECM model of order  $l$ :

$$\begin{pmatrix} \Delta CAB_t \\ \Delta FD_t \end{pmatrix} = \mu + \alpha \omega_{t-1} + \Gamma(L) \begin{pmatrix} \Delta CAB_{t-1} \\ \Delta FD_{t-1} \end{pmatrix} + \varepsilon_t \quad (2)$$

where  $\omega_{t-1} = CAB_{t-1} - \beta FD_{t-1}$  defines the long-run relationship and  $\Gamma(L) = \Gamma_1 + \Gamma_2 L + \dots + \Gamma_l L^{l-1}$  is a matrix polynomial in the lag operator,  $L$ . This model implies a constant speed of adjustment towards the long-run equilibrium. Hansen and Seo (2002) relaxed this assumption using a two-regime threshold non-linear VECM:

$$\Delta x_t = \begin{cases} A'_1 X_{t-1}(\beta) + u_t & \text{if } \omega_{t-1}(\beta) \leq \gamma \\ A'_2 X_{t-1}(\beta) + u_t & \text{if } \omega_{t-1}(\beta) > \gamma \end{cases} \quad (3)$$

with

$$X_{t-1}(\beta) = \begin{pmatrix} 1 \\ \omega_{t-1}(\beta) \\ \Delta x_{t-1} \\ \Delta x_{t-2} \\ \vdots \\ \Delta x_{t-l} \end{pmatrix} \quad (4)$$

where  $x_t$  is a  $p$ -dimensional  $I(1)$  time series (in our case,  $p = 2$ ) which is cointegrated with a unique  $p \times 1$  cointegrating vector  $\beta$ , and  $\omega_t(\beta) = \beta' x_t$  is the  $I(0)$  error-correction term.  $u_t$  is an error term,  $A_1$  and  $A_2$  are coefficient matrices, and  $\gamma$  denotes the threshold parameter. The threshold model in equation (3) has two regimes, depending on whether deviations from the equilibrium (defined by the value of the error-correction term) are below or above the threshold,  $\gamma$ .  $A_1$  and  $A_2$  describe the dynamics in each of the regimes. It is possible that the relationship is cointegrated in only one regime, implying that there is no inherent tendency for the variables  $x_t$  to move towards equilibrium in the other regime (indicated by a zero entry in the second row of the relevant  $A$  vector).

Hansen and Seo (2002) proposed two heteroscedastic-consistent  $LM$  test statistics for the null hypothesis of linear cointegration (i.e., there is no threshold effect), against the alternative of threshold cointegration. The first test is used when the true cointegrating vector is known *a priori*, and is denoted as:

$$SupLM = SupLM(\beta, \gamma)_{\gamma L \leq \gamma \leq \gamma U} \quad (5)$$

where  $\beta_0$  is the known value of  $\beta$  (in the case analyzed below,  $\beta_0 = 1$ ). The second test is used when the true cointegrating vector is unknown and is represented as:

$$SupLM = SupLM(\tilde{\beta}, \gamma)_{\gamma L \leq \gamma \leq \gamma U} \quad (6)$$

where  $\tilde{\beta}$  is the estimate of  $\beta$  under the null hypothesis *{is that correct?}*. In both equations (5) and (6),  $[\gamma_L, \gamma_U]$  is the search region, set so that  $\gamma L$  is the  $\pi_0^{th}$  percentile of  $\tilde{\omega}_{t-1}$  and  $\gamma U$  is the  $(1 - \pi_0^{th})$  percentile. Andrews (1993) suggested setting  $\pi_0$  between 0.05 and 0.15. Bootstrapping methods are used to calculate the asymptotic critical values and the *p-values*.

### 3 Data and the Estimated Results

The data set is obtained from the IMF Government Finance Statistics (GFS) and the Balance of Payment Statistics (BOP) databases as well as the World Bank Development Indicators. For some countries, data is also sourced from the Central Bank. The fiscal deficit ( $FD$ ) is constructed as the difference between total revenue and the total expenditure expressed as a percentage of the GDP. The current account balance ( $CAB$ ) is the sum of the balance of trade (exports minus imports of goods and services), net factor income (such as interest and dividends) and net transfer payments (such as foreign aid) expressed as a percentage of the GDP. The data-set is quarterly, covers the period 1980:1 to 2009:4 and contains data for Botswana, Cameroon, Egypt, Ethiopia, Ghana, Kenya, Morocco, Nigeria, South Africa, Tanzania, Tunisia, and Uganda. Figure 1 plots the fiscal deficit and current account balance for each country, where the volatility of these series is apparent.

The results of Augmented Dickey–Fuller (ADF) and Phillips and Perron (PP) tests for stationary are reported in Table 1. Non-stationarity of either deficit cannot be rejected at 5% significance level in nine of the twelve countries considered. But at least one of our test statistics indicates that the fiscal deficit is stationary in Ghana and Tunisia while the current account is stationary in South Africa. Since

threshold cointegration tests are only valid on non-stationary series of the same level of integration, we exclude these countries from the remainder of our analysis.<sup>1</sup>

To assess the evidence for threshold cointegration, we use the sup  $LM$  test where the true cointegrating vector is assumed to be unknown as stated in equation (6). The  $p$ -values for this test were calculated using a parametric bootstrap computed with 10,000 simulation replications<sup>2</sup>. The results are presented in Table 2. They point to the presence of threshold cointegration for each of the nine countries. However, rejection of linearity is only at 10% for Egypt, Ethiopia and Morocco. The parameters of the threshold cointegration model in equation (3) are calculated over a  $200 \times 200$  grid on both the threshold parameter ( $\gamma$ ) and the cointegrating vector, ( $\hat{\beta}$ ). The estimated threshold parameter that defines the two regimes in each country are reported in column 4 of Table 2<sup>3</sup>. Estimates of  $\beta$  are reported in column 5 of Table 2. In a majority of countries, Botswana, Cameroon, Egypt, Morocco, Nigeria and Tanzania, there is a positive threshold cointegrating relationship between the current account deficit and the fiscal deficit. This positive relationship supports the twin deficits hypothesis. In a minority of the countries, Ethiopia, Kenya and Uganda, the estimated relationship is negative, supporting the twin divergence hypothesis proposed by Kim and Roubini (2008).

We next investigate dynamic adjustment, considering the full set of estimated parameters, contained in Tables 3 - 7. Adjustment is asymmetric if the coefficient on the error-correction term differs between regimes. We investigate this by plotting the estimated regression functions of  $\Delta CAB_t$  and  $\Delta FD_t$  as a function of the estimated cointegrating relationship,  $w_{t-1}$ , holding other variables constant. These are reported in Figures 2(a) - 2(i). It is evident from Table 3 and Figure 2(a) that there is a near zero error correction effect on the left hand side of the threshold parameter for both the  $FD$  and the  $CAB$  equations in Botswana. However, on the right hand side of the threshold parameter, the responses of both variables to the error correction term are statistically significant. Results for Cameroon indicate that the fiscal deficit and the current account balance equations have positive error effects below the estimated

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<sup>1</sup>We have also undertaken Engle-Granger and Gregory-Hansen Tests of cointegration and accounting for a structural break in the mean of the series. However, the results indicate that there is no evidence of linear cointegration between the current account deficits and the fiscal deficits in these countries. The results are not reported in this paper, but available on request.

<sup>2</sup>The optimum lag length was determined using the information criteria. The Schwarz information criterion suggests 2 lags for the countries, which were used.

<sup>3</sup>The Hansen and Seo (2002) methodology can only define the system into two regimes separated by an estimated threshold. The two regimes imposed on all the countries by the technique is an apparent limitation of this paper. Consequently, this calls for further investigation with an approach that can accommodate more than two regimes.

threshold but a near zero response of both variables above it.

The error-correction effect for Egypt, as plotted in Figure 2(c), shows that the current account balance equations and the fiscal deficit equations have near zero effects on the left side of the threshold, implying persistent divergence between the *FD* and the *CAB* (and no response to the error-correction term), whereas on the right side of the threshold, only the current account balance has a negative error correction effect. Therefore, both the *CAB* and the *FD* decrease as the error-correction term increases.

Figure 2(d) reports the results for Ethiopia, where it is shown that the current account balance has a strong negative error correction effect on the left side of the threshold and also has a slight decline on the right side. In contrast, the fiscal deficit equation shows strong positive error effects on the left side of the threshold and declines slightly on the right side. Figure 2(e) reports the error-correction effect for Kenya, which shows that the current account balance equation is positive and there is a near zero error-correction and fiscal deficits equations have a strong positive error correction effect on the left side of the threshold. There is a near zero error-correction effect for both equations on the right side of the threshold. In Morocco, there are asymmetric effects indicated the positive (negative) error correction term for the *FD* (*CAB*). There is a near-zero error correction effect for the current account balance equations on the right side of the threshold and the fiscal deficit equations have a slightly positive error correction effect.

In the case of Nigeria and Tanzania, the fiscal deficits equation showed a strong positive error correction effects, while the current account balance equation has a strong negative error correction effect on the left side of the estimated threshold. However, on the right side there is a slight positive error correction effect for both the current account balance and the fiscal deficits equations. Results for Uganda indicate that the current account balance has near zero error correction effects and the fiscal deficit has a strong negative error correction effect on the left side of the threshold, whereas both equations display slight negative effects on the right side of the threshold.

In every country, the estimated thresholds are large, implying substantial persistence of disequilibrium in the system. This may reflect both specific factors (eg use of revenue from the sale of diamonds in Botswana to finance fiscal deficits or sub-optimal allocation of revenue from crude oil exports in Nigeria) and general factors (eg the impact of commodity price volatility in largely agrarian economies, tax evasion and the effects of a large informal sector, political instability and labor unrest, with consequent negative impacts on capital inflows negatively and a decline in FDI, remittance and aid flows). These factors highlight the importance of structural



fiscal reforms in these countries as was recommended by Neaime (2015) for some EU countries.

## 4 Conclusion

This paper has examined the twin deficits hypothesis in a sample of African countries using a threshold cointegration technique. The methodology allows for investigating the long-run relationship between the fiscal deficit and current account balances while exploring the existence of a threshold that defines two distinct regimes. This means that cointegration is only obtained within one of the regimes. Hansen and Seo *supLM* tests rejected the null of linear cointegration in favour of a two-regime threshold cointegration.

We found a positive cointegrating relationship between the current account and the fiscal balances for six of the nine countries considered: Botswana, Cameroon, Egypt, Morocco, Nigeria and Tanzania. These results are consistent with twin deficits hypothesis. A negative cointegrating relationship is found for a minority of countries: Ethiopia, Kenya and Uganda, consistent with the twin divergence hypothesis proposed by Kim and Roubini (2008). On balance, these results provide qualified support for the twin convergenc hypothesis.

Estimated error correction effects reveal a complex pattern of dynamic adjustment. In some cases (e.g. Botswana, Kenya and Uganda), the current account adjustst faster than the fiscal deficit. In others (e.g. Cameroon and Egypt), we find the opposite is the case, adjustments are higher in the fiscal deficits. These differences reflect marked differences in the way fiscal issues are dealt with across the countries.

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Table 1: Unit Root Tests

Country	ADF				PP			
	<i>FD</i>	$\Delta FD$	<i>CAB</i>	$\Delta CAB$	<i>FD</i>	$\Delta FD$	<i>CAB</i>	$\Delta CAB$
Botswana	-1.80	-3.61*	-3.16	-3.38	-1.70	-5.08**	-2.00	-7.87**
Cameroon	-3.17	-5.01**	-3.36	-3.43*	-2.91	-8.88**	-2.51	-8.75**
Egypt	-0.62	-6.15**	-2.63	-2.24	-2.90	-6.71**	-3.04	-5.05**
Ethiopia	-2.63	-4.09**	-2.54	-3.07	-2.48	-5.34**	-2.88	-5.60**
Ghana	-5.87**	-5.63**	-3.79*	-4.97**	-2.78	-5.97**	-4.18**	-4.84**
Kenya	-2.55	-3.80*	-2.47	-2.64	-2.32	-3.89*	-2.56	-5.43**
Morocco	-2.09	-3.83*	-2.37	-2.99	-2.12	-4.57**	-1.88	-4.85**
Nigeria	-3.34	-4.36**	-2.42	-5.58**	-2.66	-4.39**	-2.82	-4.76**
South Africa	-2.34	-4.08**	-3.03	-16.06**	-2.3	-4.02**	-6.12**	-16.43**
Tanzania	-1.66	-4.13**	-2.43	-3.87*	-2.56	-4.56**	-2.05	-4.94**
Tunisia	-4.06**	-5.31**	-3.75*	-3.16	-4.45**	-6.29**	-2.67	-5.09**
Uganda	-2.75	-4.12**	-2.61	-3.43*	-1.99	-6.35**	-3.39	-4.69**

**Note:** Note: \*and \*\* denote significant at 5 and 1 per cent levels respectively.

Table 2: Tests for Threshold Cointegration

Country	supLM value	Bootstrap <i>p-value</i>	Threshold Parameter ( $\gamma$ )	Cointegrating vector ( $\hat{\beta}$ )
Botswana	21.27***	0.01	5.95	0.37
Cameroon	23.46***	0.01	-6.49	0.22
Egypt	16.38*	0.08	6.50	0.99
Ethiopia	15.81*	0.09	-38.78	-5.00
Kenya	18.25**	0.02	-13.62	-6.64
Morocco	19.19*	0.09	-6.55	3.04
Nigeria	18.60***	0.01	-53.26	2.97
Tanzania	21.83***	0.01	24.49	7.07
Uganda	19.84***	0.01	-14.38	-4.07

Note: The *p-value* for the sup LM test are obtained from a parametric residual bootstrap with 5000 replications. For both sup LM and  $\hat{\beta}$ , the value of  $\gamma$  is derived from a grid search procedure where the significance of  $\gamma$  is addressed through the sup LM test which rejects the null of cointegration with no threshold in favour of the alternative of cointegration with a threshold.

\*, \*\*, and \*\*\* denotes significance at the 10, 5 and 1 per cent significance level respectively. Nine countries were examined because the fiscal deficits and the current account deficits variables were integrated of order one, and it is a condition for cointegration analysis. The results were generated using the GAUSS software. The codes were obtained from Hansen's web page for the Hansen and Seo (2002) threshold cointegration.

Table 3: Botswana and Cameroon Threshold VECM

<i>Botswana</i> Variables	1 <sup>st</sup> Regime ( $\hat{\omega}_{t-1} \geq 5.95$ )		2 <sup>nd</sup> Regime ( $\hat{\omega}_{t-1} < 5.95$ )	
	CAB Model	FD Model	CAB Model	FD Model
Intercept	0.917** (0.359)	0.215 (0.138)	3.769** (1.767)	-1.413** (0.562)
$\hat{\omega}_{t-1}$	-0.033 (0.036)	0.004 (0.009)	-0.516*** (0.179)	0.097** (0.041)
$\Delta cab_{t-1}$	0.326*** (0.074)	0.067** (0.027)	0.555*** (0.156)	0.019 (0.040)
$\Delta cab_{t-2}$	0.100 (0.166)	0.560*** (0.156)	-0.178 (0.145)	0.525*** (0.141)
$\Delta fd_{t-1}$	0.077 (0.052)	0.051** (0.025)	0.496*** (0.174)	-0.028 (0.045)
$\Delta fd_{t-2}$	0.122 (0.157)	0.125 (0.097)	0.102 (0.147)	0.087 (0.071)
% of Observation	59		41	
<i>Cameroon</i> Variables	1 <sup>st</sup> Regime ( $\hat{\omega}_{t-1} \leq -6.49$ )		2 <sup>nd</sup> Regime ( $\hat{\omega}_{t-1} > -6.49$ )	
	CAB Model	FD Model	CAB Model	FD Model
Intercept	2.046*** (0.685)	25.992** (10.037)	-0.458*** (0.125)	0.171 (0.150)
$\hat{\omega}_{t-1}$	0.201** (0.084)	3.445*** (1.307)	-0.101** (0.044)	0.039 (0.051)
$\Delta cab_{t-1}$	0.403*** (0.109)	0.457 (0.643)	0.475*** (0.102)	-0.053 (0.087)
$\Delta cab_{t-2}$	0.004 (0.006)	0.493*** (0.157)	-0.053 (0.041)	0.421 (0.297)
$\Delta fd_{t-1}$	0.087 (0.064)	-0.375 (0.627)	0.127** (0.058)	-0.042 (0.050)
$\Delta fd_{t-2}$	0.016 (0.018)	0.685** (0.305)	-0.023 (0.019)	0.039 (0.098)
% of Observation	21		79	

**Notes:** Notes: Eicker-White standard errors given in parentheses. The selection of a lag length of 2 in the threshold VECM is based on the use of the SIC applied to an unrestricted VAR comprising the CAB and FD \*, \*\*, and \*\*\* denotes significance at the 10, 5 and 1 per cent significance level respectively.

Table 4: Egypt and Ethiopia Threshold VECM

<i>Egypt</i>		1 <sup>st</sup> Regime	( $\hat{\omega}_{t-1} \geq 6.50$ )	2 <sup>nd</sup> Regime	( $\hat{\omega}_{t-1} < 6.50$ )
Variables		CAB Model	FD Model	CAB Model	FD Model
Intercept		0.086 (0.061)	-0.319*** (0.109)	1.169* (0.638)	1.948 (1.692)
$\hat{\omega}_{t-1}$		-0.008 (0.013)	-0.015 (0.022)	-0.128** (0.056)	-0.044 (0.130)
$\Delta cab_{t-1}$		0.777*** (0.161)	-0.203 (0.213)	0.434*** (0.160)	0.826*** (0.293)
$\Delta cab_{t-2}$		-0.014 (0.029)	0.364*** (0.091)	0.107 (0.104)	1.242*** (0.299)
$\Delta fd_{t-1}$		0.048 (0.069)	0.017 (0.102)	0.071 (0.117)	-0.648** (0.312)
$\Delta fd_{t-2}$		0.032 (0.021)	0.185** (0.076)	-0.038 (0.104)	-0.061 (0.211)
% of Observation		78		22	
<i>Ethiopia</i>		1 <sup>st</sup> Regime	( $\hat{\omega}_{t-1} \leq -38.78$ )	2 <sup>nd</sup> Regime	( $\hat{\omega}_{t-1} > -38.78$ )
Variables		CAB Model	FD Model	CAB Model	FD Model
Intercept		-16.892*** (6.342)	9.945*** (1.462)	-0.399* (0.213)	-0.549*** (0.152)
$\hat{\omega}_{t-1}$		-0.388** (0.151)	0.204*** (0.033)	-0.017 (0.011)	-0.021*** (0.006)
$\Delta cab_{t-1}$		-0.093 (0.210)	0.154*** (0.058)	0.477*** (0.114)	0.039 (0.046)
$\Delta cab_{t-2}$		-0.527 (0.224)	0.823*** (0.106)	0.108 (0.090)	0.466*** (0.088)
$\Delta fd_{t-1}$		-0.043 (0.165)	-0.058 (0.047)	0.081 (0.063)	0.067* (0.036)
$\Delta fd_{t-2}$		-0.096 (0.296)	0.375*** (0.092)	0.066 (0.071)	0.188*** (0.063)
% of Observation		10		90	

**Notes:** Notes: Eicker-White standard errors given in parentheses. The selection of a lag length of 2 in the threshold VECM is based on the use of the SIC applied to an unrestricted VAR comprising the CAB and FD \*, \*\*, and \*\*\* denotes significance at the 10, 5 and 1 per cent significance level respectively.

Table 5: Kenya and Morocco Threshold VECM

<i>Kenya</i> Variables	$1^{st}$ Regime ( $\hat{\omega}_{t-1} \leq -13.62$ )		$2^{nd}$ Regime ( $\hat{\omega}_{t-1} > -13.62$ )	
	CAB Model	FD Model	CAB Model	FD Model
Intercept	5.789 (3.771)	2.659 (1.647)	-0.188 (0.226)	-0.027 (0.097)
$\hat{\omega}_{t-1}$	0.265 (0.218)	0.153* (0.093)	0.012 (0.037)	-0.002 (0.013)
$\Delta cab_{t-1}$	0.785*** (0.250)	0.001 (0.121)	0.341*** (0.071)	-0.004 (0.022)
$\Delta cab_{t-2}$	0.276 (0.575)	0.765* (0.387)	-0.273 (0.202)	0.589*** (0.122)
$\Delta fd_{t-1}$	0.805*** (0.257)	-0.081 (0.099)	0.049 (0.047)	0.002 (0.013)
$\Delta fd_{t-2}$	1.931*** (0.668)	-0.213 (0.274)	-0.440* (0.244)	0.257** (0.100)
% of Observation	16		84	
<i>Morocco</i> Variables	$1^{st}$ Regime ( $\hat{\omega}_{t-1} \leq -6.55$ )		$2^{nd}$ Regime ( $\hat{\omega}_{t-1} > -6.55$ )	
	CAB Model	FD Model	CAB Model	FD Model
Intercept	-2.588 (2.251)	3.018* (1.551)	0.022 (0.075)	-0.079 (0.065)
$\hat{\omega}_{t-1}$	-0.231 (0.213)	0.382** (0.151)	0.004 (0.006)	0.015*** (0.004)
$\Delta cab_{t-1}$	0.439* (0.239)	-0.037 (0.114)	0.538*** (0.114)	-0.048 (0.061)
$\Delta cab_{t-2}$	-0.002 (0.255)	1.013*** (0.341)	-0.134 (0.098)	0.529*** (0.097)
$\Delta fd_{t-1}$	0.102 (0.157)	-0.332* (0.197)	0.097 (0.066)	-0.007 (0.046)
$\Delta fd_{t-2}$	-0.275 (0.320)	0.778** (0.317)	-0.071 (0.088)	0.154*** (0.066)
% of Observation	9		91	

**Notes:** Notes: Eicker-White standard errors given in parentheses. The selection of a lag length of 2 in the threshold VECM is based on the use of the SIC applied to an unrestricted VAR comprising the CAB and FD \*, \*\*, and \*\*\* denotes significance at the 10, 5 and 1 per cent significance level respectively.



Table 6: Nigeria and Tanzania Threshold VECM

<i>Nigeria</i>				
	1 <sup>st</sup> Regime ( $\hat{\omega}_{t-1} \leq -53.26$ )		2 <sup>nd</sup> Regime ( $\hat{\omega}_{t-1} > -53.26$ )	
Variables	CAB Model	FD Model	CAB Model	FD Model
Intercept	-11.253*** (2.709)	9.164* (5.31)	0.703** (0.297)	1.555** (0.593)
$\hat{\omega}_{t-1}$	-0.151*** (0.041)	0.142** (0.069)	0.027** (0.012)	0.066*** (0.020)
$\Delta cab_{t-1}$	0.171** (0.084)	0.568 (0.369)	0.572*** (0.138)	0.009 (0.118)
$\Delta cab_{t-2}$	-0.140 (0.077)	0.895** (0.379)	-0.011 (0.071)	0.549*** (0.144)
$\Delta fd_{t-1}$	0.189** (0.091)	-0.171 (0.218)	0.143 (0.100)	0.058 (0.093)
$\Delta fd_{t-2}$	-0.058 (0.086)	0.129 (0.156)	0.028 (0.056)	0.166* (0.092)
% of Observation	16		84	
<i>Tanzania</i>				
	1 <sup>st</sup> Regime ( $\hat{\omega}_{t-1} \geq 24.49$ )		2 <sup>nd</sup> Regime ( $\hat{\omega}_{t-1} < 24.49$ )	
Variables	CAB Model	FD Model	CAB Model	FD Model
Intercept	0.124 (0.096)	-0.155** (0.078)	-4.726*** (1.668)	-1.783 (1.336)
$\hat{\omega}_{t-1}$	-0.014** (0.006)	0.018*** (0.006)	0.138*** (0.045)	0.070* (0.037)
$\Delta cab_{t-1}$	0.469*** (0.089)	0.009 (0.054)	1.258*** (0.276)	-0.902 (0.340)
$\Delta cab_{t-2}$	0.107 (0.097)	0.431*** (0.105)	-0.205 (0.227)	1.392*** (0.333)
$\Delta fd_{t-1}$	0.065 (0.064)	-0.003 (0.039)	0.791** (0.350)	0.329 (0.293)
$\Delta fd_{t-2}$	-0.032 (0.079)	0.177** (0.084)	0.151 (0.125)	0.049 (0.119)
% of Observation	90		10	

**Notes:** Notes: Eicker-White standard errors given in parentheses. The selection of a lag length of 2 in the threshold VECM is based on the use of the SIC applied to an unrestricted VAR comprising the CAB and FD \*, \*\*, and \*\*\* denotes significance at the 10, 5 and 1 per cent significance level respectively.

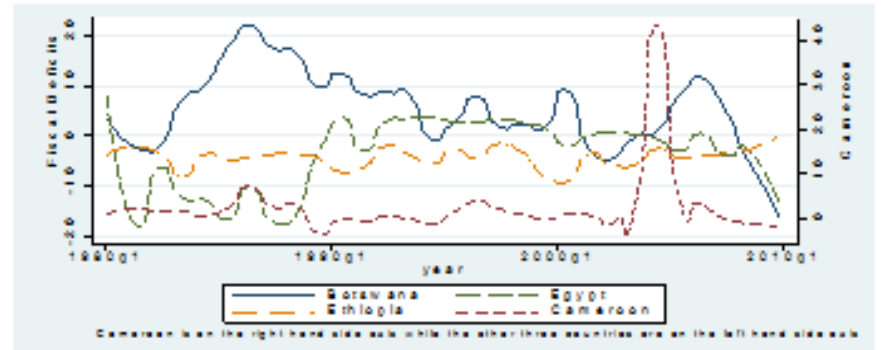
Table 7: Uganda Threshold VECM

<i>Uganda</i> Variables	$(\hat{\omega}_{t-1} \leq -14.38)$		$(\hat{\omega}_{t-1} > -14.38)$	
	1 <sup>st</sup> Regime CAB Model	FD Model	2 <sup>nd</sup> Regime CAB Model	FD Model
Intercept	0.439 (0.704)	-1.538*** (0.464)	-0.111 (0.074)	-0.058 (0.042)
$\hat{\omega}_{t-1}$	0.056 (0.042)	-0.118*** (0.027)	-0.033*** (0.013)	-0.010 (0.007)
$\Delta cab_{t-1}$	0.031 (0.114)	0.015 (0.125)	0.526*** (0.123)	0.034 (0.046)
$\Delta cab_{t-2}$	-0.816 (0.179)	0.684*** (0.197)	0.063 (0.148)	0.382*** (0.102)
$\Delta fd_{t-1}$	-0.267 (0.112)	0.005 (0.124)	0.178** (0.077)	0.005 (0.032)
$\Delta fd_{t-2}$	-1.046 (0.208)	0.479** (0.217)	-0.026 (0.087)	0.075 (0.051)
% of Observation	18		82	

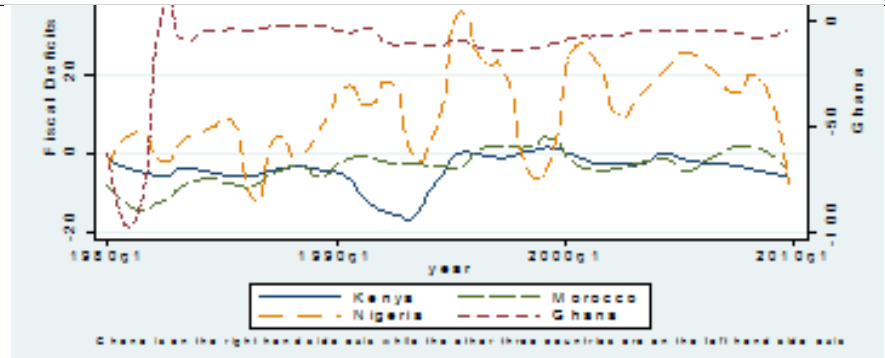
**Notes:** Notes: Eicker-White standard errors given in parentheses. The selection of a lag length of 2 in the threshold VECM is based on the use of the SIC applied to an unrestricted VAR comprising the CAB and FD \*, \*\*, and \*\*\* denotes significance at the 10, 5 and 1 per cent significance level respectively.

Figure 1

Fiscal Deficits: Botswana, Egypt, Ethiopia, Cameroon



Fiscal Deficits: Ghana, Kenya, Morocco and Nigeria



Fiscal Deficits: Tanzania, Tunisia, Uganda and S/Africa

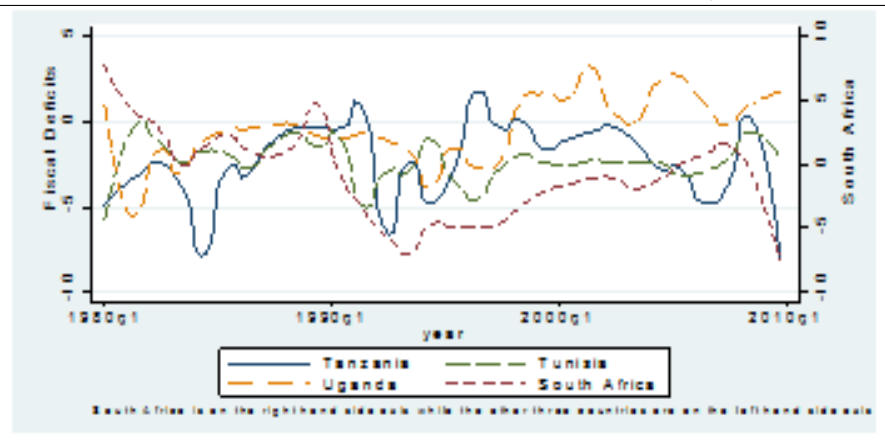
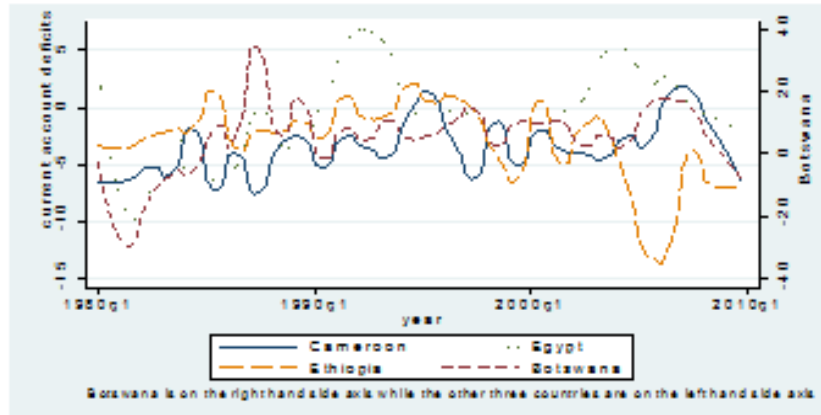
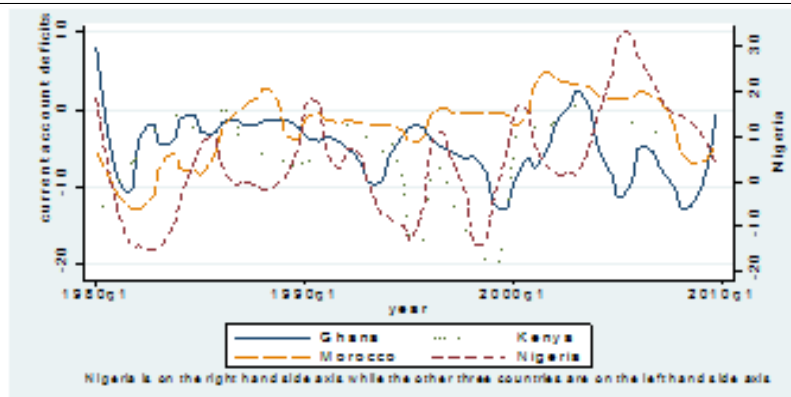


Figure 1 Cont'd

Current Account Deficits: Botswana, Egypt, Ethiopia, Cameroon



Current Account Deficits: Ghana, Kenya, Morocco and Nigeria



Current Account Deficits: Tanzania, Tunisia, Uganda and S/Africa

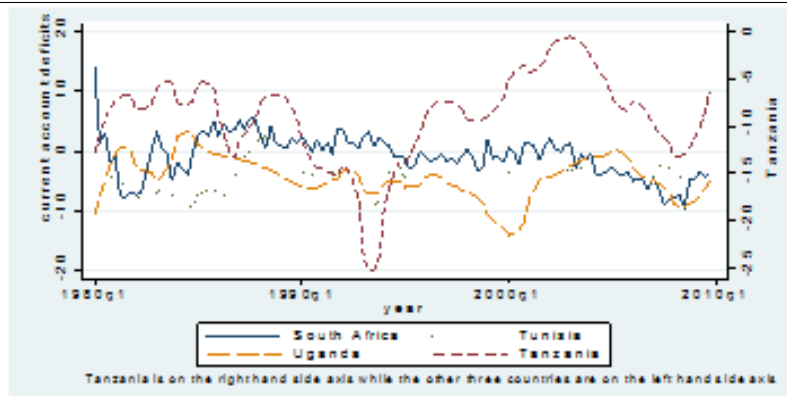
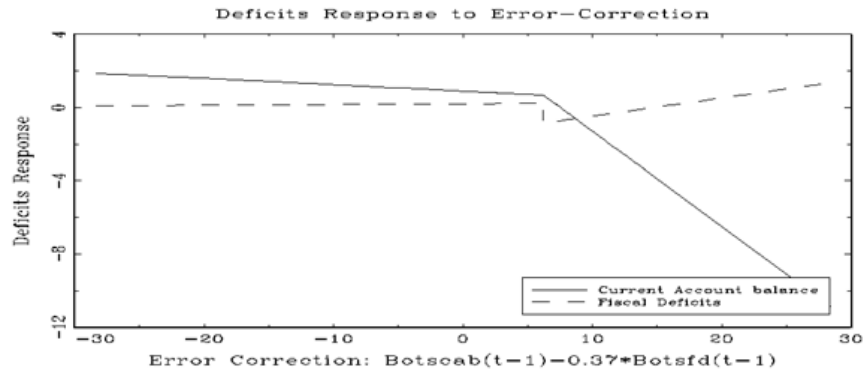
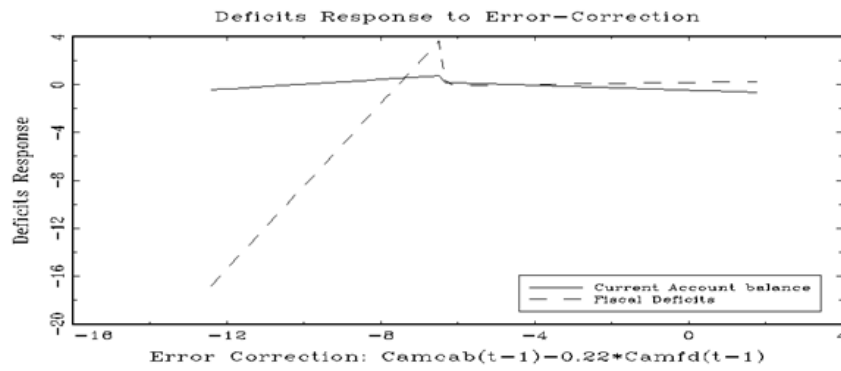


Figure 2

2(a) Botswana



2(b) Cameroon



2(c) Egypt

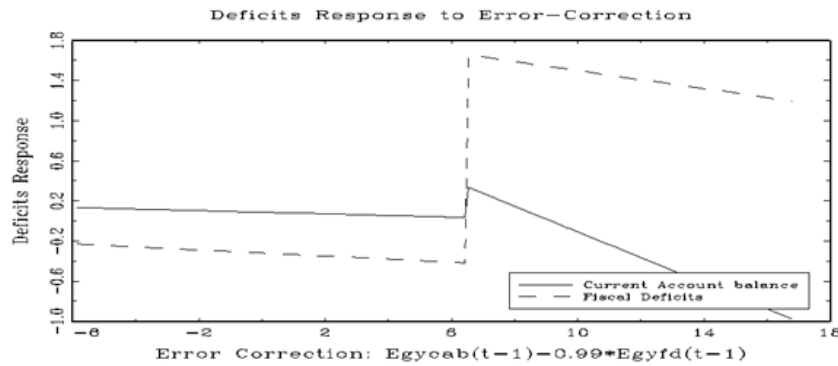
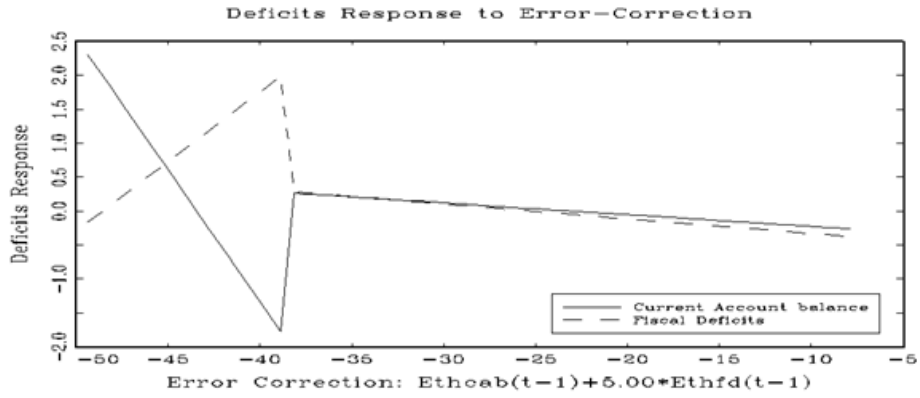
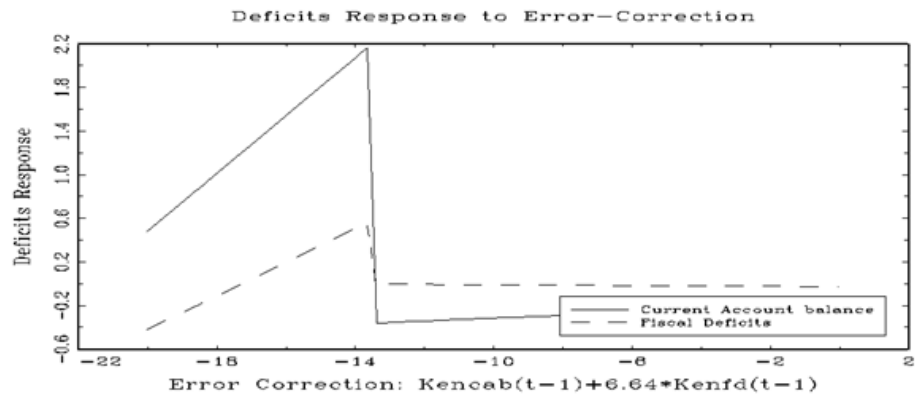


Figure 2 Con'd  
2(d).Ethiopia



2(e) Kenya



2(f) Morocco

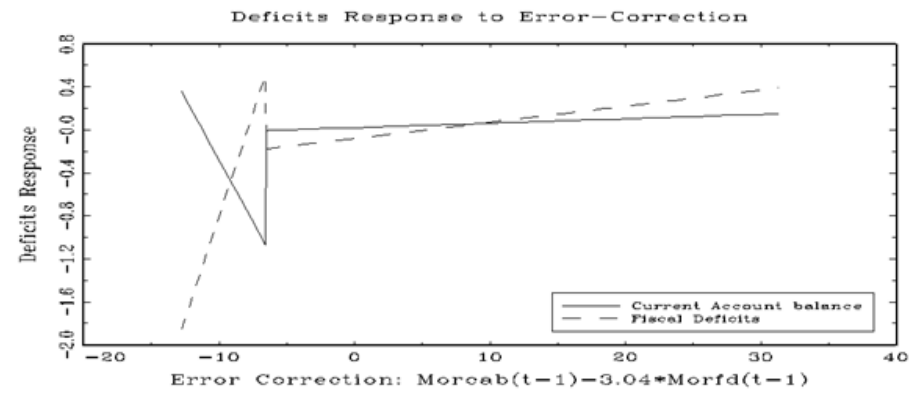
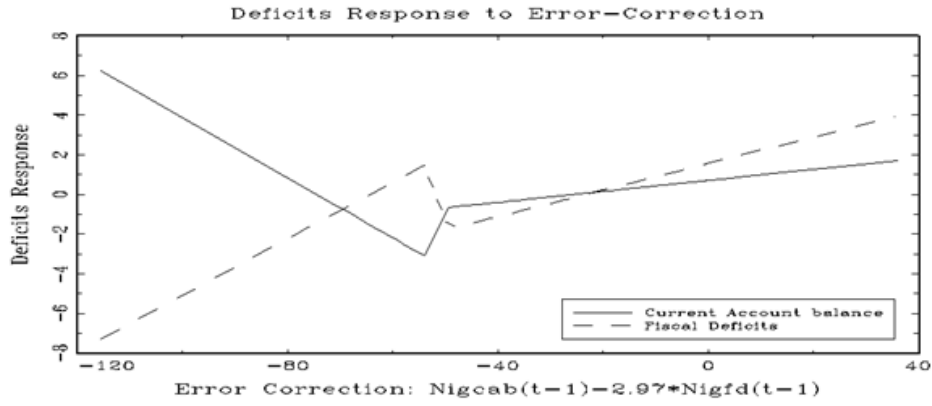
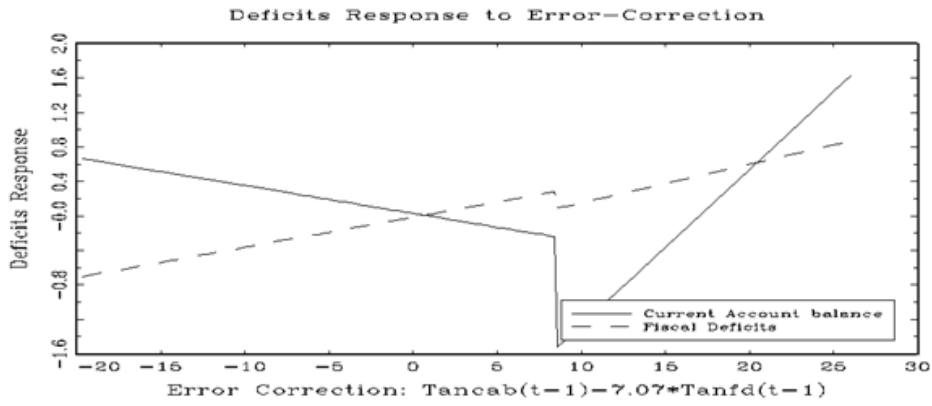


Figure 2 Con'd

2(g) Nigeria



2(h) Tanzania



2(i) Uganda

