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### TESTING THE MARSHALL-LERNER CONDITION IN KENYA

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#### **Abstract**

In this paper we examine the Marshall-Lerner (ML) condition for the Kenyan economy. In particular, we use quarterly data on the log of real exchange rates, export-import ratio and relative (US) income for the time period 1996q1 – 2011q4, and employ techniques based on the concept of long memory or long-range dependence. Specifically, we use fractional integration and cointegration methods, which are more general than standard approaches based exclusively on integer degrees of differentiation. The results indicate that there exists a well-defined cointegrating relationship linking the balance of payments to the real exchange rate and relative income, and that the ML condition is satisfied in the long run although the convergence process is relatively slow. They also imply that a moderate depreciation of the Kenyan shilling may have a stabilizing influence on the balance of payments through the current account without the need for high interest rates.

Keywords: Marshall-Lerner condition, fractional integration, fractional cointegration

JEL Classification: C22, C32, F32

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### 1. Introduction

A lot of the literature on the balance of trade is based on the so-called "elasticity approach", namely on testing the extent to which trade flows are responsive to relative price changes, more specifically whether a devaluation improves the trade balance, which implies that the well-known Marshall-Lerner (ML) condition holds. The seminal empirical paper by Houthakker and Magee (1969) found inconclusive evidence. Several subsequent studies using least-squares methods to estimate price elasticities in import and export equations also produced mixed results (see, e.g., Khan 1974, Goldstein and Khan 1985, Wilson and Takacs 1979, Warner and Kreinin 1983, Bahmani-Oskooee 1986, Krugman and Baldwin 1987). More recently, the evidence obtained with more advanced econometric techniques taking into account non-stationarities in the data has been more supportive of the ML condition (see, e.g., Bahmani-Oskooee 1998, Bahmani-Oskooee and Niroomand 1998, Caporale and Chui 1999, Boyd, Caporale and Smith, 2001). Also, increasingly empirical investigations have been based on a reduced-form equation for the balance of trade, a method which allows to test directly for the response of trade flows to relative price movements using the real exchange rate (as opposed to the terms of trade) (see, e.g., Rose 1991, and Lee and Chinn 1998).

It is normally thought that a nominal devaluation or depreciation can only reduce trade imbalances if it translates into a real one and if trade flows respond to relative prices in a significant and predictable manner (Reinhart, 1995). A depreciation (or devaluation) of the domestic currency may stimulate economic activity through an initial increase in the price of foreign goods relative to home goods: by increasing the global competitiveness of domestic industries it diverts spending from the former to the latter (Kandil and Mirazaie, 2005).

Dornbusch (1988) shows that the effectiveness of a depreciation in improving the balance of payments depends on redirecting demand in the right direction and by the correct amount and also on the capacity of the domestic economy to meet the additional demand through increased supply. Bird (2001) argues that there is no mechanism for keeping the real exchange rate at an equilibrium level if inflation is rising quickly or for changing equilibrium rates in the case of permanent real shocks. In his opinion, this is the reason why many developing countries have chosen flexible exchange rates, although this is not an ideal solution since demand and supply elasticities may be relatively low: even when they satisfy the Marshall-Lerner conditions, their response to exchange rate changes may not be as big as in developed economies. Moreover, with thin foreign exchange markets floating exchange rates may be unstable and vulnerable to speculative attacks as the Kenyan exchange rate crisis of 2011 illustrated (Mudida, 2012): if the balance of 93(a)-.7(3 0 TDA-19.85):.003.1( uicienallfor Mudr(I 7(r4(a,ITJa0 TO fost J-(eness o99ates, all

exclusively on integer degrees of differentiation and have not been previously used to analyse the Marshall-Lerner condition in an African context.

The layout of the paper is as follows. Section 2 discusses the importance of the Marshall-Lerner condition in the Kenyan case. Section 3 briefly describes the theoretical framework, whilst Section 4 presents the econometric analysis. Finally, Section 5 summarises the main findings and offers some concluding remarks.

## 2. The Marshall-Lerner condition and the Kenyan economy

The International Monetary Fund (IMF) classifies Kenya as having operated an independent float between 1992 and 1997 and a managed float since 1998. Prior to that, the Kenyan shilling was pegged first to the British pound, then to the US dollar, and finally to the IMF's Special Drawing Rights (SDRs) before a crawling peg based on a trade-weighted basket was introduced. The Marshall-Lerner condition should therefore be analysed in Kenya in the context of the current exchange rate system, which is a managed float system, and indeed the data set used in this study covers the floating period. Consequently, we consider a depreciation rather than a devaluation of the Kenyan shilling since this is what is relevant for the period under investigation. The existing empirical evidence on the operation of Kenya's managed float system suggests that at times of relative tranquillity in foreign exchange markets the Central Bank of Kenya can smooth out exchange rate volatility with relatively modest interventions; by contrast, more active policies are required in the presence of more volatile exchange rates (O'Connell et. al, 2010).

Testing the Marshall-Lerner condition is particularly important in the Kenyan case because, as in many other developing countries, the current account of the Kenyan balance of payments is persistently in deficit. The issue of whether a depreciation of the

of supply-side shocks, which are prevalent in the Kenyan economy (Adam et. al, 2010). Therefore analysing the Marshall-Lerner condition in Kenya is also important in view of the concerns facing the Kenyan monetary authorities.

## 3. Theoretical Framework

The balance of trade can be expressed as the ratio of nominal exports to nominal imports, B, which is equal to the ratio of the volume of exports, X, multiplied by domestic prices, P, to the volume of imports M, multiplied by foreign prices, P, and the nominal spot exchange rate S:

$$B_t = \frac{P_t X_t}{P_t^* S_t M_t},$$

or using lower case letters for logarithms:

$$b_t = x_t - m_t - (s_t - p_t + p_t^*) = x_t - m_t - e_t,$$
 (1)

where  $e_t = s_t - p_t + p_t^*$  is the real exchange rate. Long-run import and export demand are given by:

$$x_t = \alpha_x + \beta^* y_t^* + \eta_x e_t + \gamma_x t,$$
 (2)  
 $m_t \quad m \quad y_t \quad m e_t + \gamma_m t$ 

needs to be statistically significant and positive for the ML condition to be satisfied, which means that the sum of the demand elasticity for imports and the foreign demand elasticity for the nation's export exce

nonstationary, while the sample autocorrelations for the first differences suggest once more the presence of seasonality, especially in the case of relative income. Finally, Figure 3 displays the periodograms. For the series in levels the highest value corresponds to the smallest frequency, which indicates that they may require differencing. However, the periodogram of the first differenced export/import ratio series has a value close to zero at the smallest frequency, suggesting that this series may now be overdifferenced.

As a first step we check the order of integration of the three series by means of

where  $y_t$  is the observed (univariate) time series; and are the coefficients on the intercept and a linear trend respectively, and  $x_t$  is assumed to be an I(d) process. Thus,  $u_t$  is I(0) and given the parametric nature of this method its functional form must be specified. We assume that  $u_t$  is a white noise, autocorrelated and seasonally autoregressive respectively. In the case of autocorrelated

in all cases. The upper part of the table refers to the case of white noise disturbances. Focusing on the case of a linear trend, we see that the estimated value of d for the log(export/import) ratio is 0.373, and the confidence interval excludes the cases of

 $\sqrt{\phantom{a}}(\hat{\phantom{a}})$  (0, 1/4)  $\rightarrow \infty,$ 

$$\begin{array}{lll} y_t = -0.4073 - \ 0.0081t \ + \ x_t \,, & (1-L)^{0.573} x_t \ = \ u_t \,, \\ & (-5.09) & (-3.00) \end{array}$$
 
$$\begin{array}{ll} u_t \ \approx \ \text{Bloomfield} \, (\tau = -0.291) \end{array}$$

for the export/import ratio. (t-values in parenthesis).

For the real exchange rate, the selected model is

$$\begin{array}{lll} y_t &=& 4.6981 - & 0.0064t & + & x_t \,, & & (1-L)^{0.728} x_t &=& u_t \,, \\ & & & (135.12) & & (-3.71) & & & \\ & & & u_t \; \approx \; \text{Bloomfield} \, (\tau = \; 0.208) \end{array}$$

Finally, for relative income,

$$\begin{array}{lll} y_t = -3.8257 - \ 0.0106t \ + \ x_t \,, & (1-L)^{0.963} x_t \ = \ u_t \,, \\ & (-204.33) & (-5.19) & \\ & u_t \ = \ 0.893 u_{t-4} + \ \epsilon_t \end{array}$$

The fact that the confidence intervals for the fractional differencing parameters in the selected models overlap for the three series<sup>5</sup> implies that the null of equal orders of integration cannot be rejected. This is important since it makes it legitimate to run an OLS regression with the three variables to check if the estimated errors are I(0) or at least mean-reverting with a smaller order of integration than the three parent series.<sup>6</sup>

We follow a two-step procedure, similar to that of Engle and Granger (1987), but specifically designed to allow for fractional integration. In the first step, we compute the following regression,

$$y_t = \alpha + \beta_1 z_{1t} + \beta_2 z_{2t} + x_t,$$
 (10)

fitted model and may not give sufficient attention to their long-run properties (see, e.g. Hosking, 1981, 1984).

<sup>&</sup>lt;sup>5</sup> These intervals are (0.267, 0.975) for the export/import ratio, (0.441, 1.124) for the real exchange rate,

where y <sub>t</sub> stands	for the bala	ance of trade	e, z <sub>1t</sub> for	the real	exchange	rate and z	z <sub>2t</sub> for re	ative

5. Conclusions and Policy Recommendation	5.	<b>Conclusions</b>	and Policy	Recommendation
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Our findings support the existence of a well-defined cointegrating relationship between

Given that at present the primary objective of the Central Bank of Kenya is price stability, the focus recently has been on maintaining high interest rates so as to reduce the inflation rate and also to avoid a significant depreciation of

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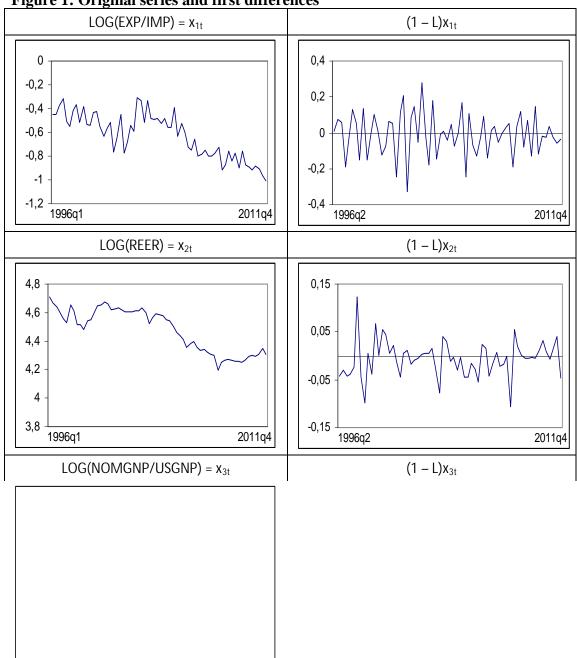
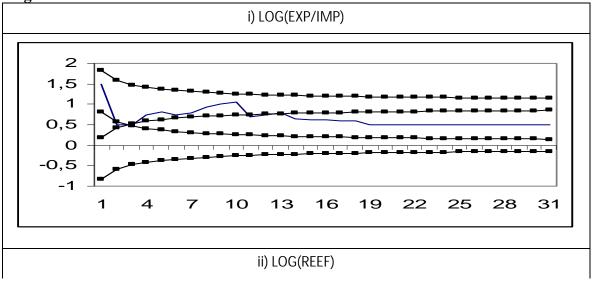


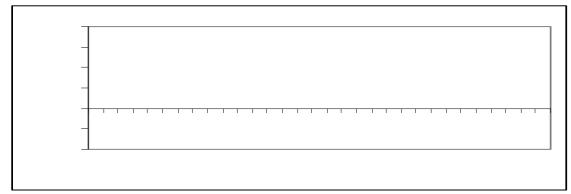
Figure 3: Periodograms of the original series and first differences						
$LOG(EXP/IMP) = x_{1t}$	(1 – L)x <sub>1t</sub>					

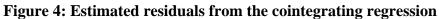
Table 1: Estimates of d and 95% confidence bands for the three individual series

i) White noise disturbances					
No regressors An intercept A linear time tren					
LOG(EXP/IMP)	0.511	0.493	0.373		
	(0.372, 0.714)	(0.413, 0.605)	(0.258, 0.536)		
LOG(REER)	0.934	0.883	0.888		
	(0.787, 1.148)	(0.742, 1.129)	(0.740, 1.129)		









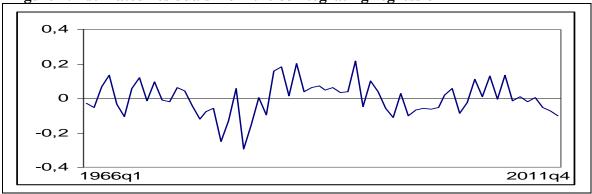


Table 2: Estimates of d and 95% confidence bands for the three individual series

i) White noise disturbances						
	No regressors	An intercept	A linear time trend			
White noise	0.239	0.239	0.241			
	(0.089, 0.435)	(0.089, 0.434)	(0.091, 0.436)			
Bloomfield 0.255		0.258	0.259			
( 0.046,  0.575)		( 0.050,  0.579)	( 0.048,  0.579)			
Seasonal AR	0.244	0.244	0.246			
	(0.072, 0.453)	(0.071, 0.452)	(0.072, 0.455)			