

A Cointegration and Error Correction Modeling of Export Sector Performance in Kenya

Bunde Aggrey Otieno
Department of Economics, Moi University, Kenya
aggreyotieno@yahoo.com

Abstract

Real exchange rate is an active source of discussions in Kenya. Whereas the export sector performance has improved since 2002, it continues to fall short of the ambitions of the vision 2030. In developing countries, misalignment in the exchange rate has often taken the form of overvaluation, which adversely affects the export sector. Overvaluation results in a real decline in the price of foreign goods relative to domestic goods. The general objective of this study was to investigate the behavior of exports in the presence of aid inflows and real exchange rate volatility in Kenya. The study hypothesized that exports do not respond positively to aid inflows and real exchange rate volatility. This study was guided by the trade theory and adopted Error Correction Model. Inferential statistics were applied using PC Give Ox-metrics, unit root, co integration and granger causality tests were done prior to estimation. The results confirms the dominant role played by economic prosperity of the export destination countries as demonstrated by the significant positive co-efficient of output growth of trading partners. Real exchange rate has a profound effect on export sector performance and the potential for export supply response is evident given by its positive co-efficient. The negative coefficient on the real exchange rate misalignment term highlights the adverse effect this has on export performance. A positive relationship is seen to exist as indicated by positive co-efficient of Aid in the model. The results of this study will be very important to macroeconomic policy analysts and researchers when designing policies that respond to macroeconomic challenges facing export sector performance in Kenya.

Key Words: Modeling, Export Sector, Performance, Kenya

INTRODUCTION

During much of Kenya's post-independence history, a strong anti-export bias existed. The flat rebate export compensation scheme put into place in 1974 was ineffective and only benefited large exporters. It was only in the late 1980s that some schemes started to be introduced to strengthen the incentive to export. In 1988, a manufacturing under bond was instituted to allow customs authorities to waive import duties on imported inputs used in the production of export goods. In 1990, a duty import exemption was applied to firms with export contracts and past export performance; and the Export Promotion Zones were approved. The role of exports in economic development has been widely acknowledged. Ideally, export activities stimulate growth in a number of ways including production and demand linkages, economies of scale due to larger international markets, increased efficiency, adoption of superior technologies embodied in foreign-produced capital goods, learning effects and improvement of human resources, increased productivity through specialization (Basu *et al.*, 2000; Fosu, 1990; Santos- Paulino, 2000; Giles & Williams, 2000) and creation of employment. In developing countries, misalignment in the exchange rate has often taken the form of overvaluation, which adversely affects the export sector. Overvaluation results in a real decline in the price of foreign goods relative to domestic goods. A decline in the price of foreign goods in terms of domestic goods has two primary effects on the export sector. First, on the production side, fewer resources will be allocated towards producing goods that can be exported, since these goods will be expensive for foreigners; at the same time, production of substitutes for foreign goods will also decline. These both destroy the current account. Second, on the consumption side, a fall in the price of foreign goods relative to domestic goods will stimulate domestic spending on foreign goods. The net effect is making exports less competitive in foreign markets, while stimulating imports, hence a current account deficit. Consequently, domestic manufacturer's incentives and profits will be lowered leading to declining investment and export volumes. In other words, this situation lowers the growth and international competitiveness of an economy.

Problem Statement

Kenya experienced an export surge from 2 to 8 percent of GDP between 1988 and 1993 but this coincided with the sharp depreciation of the Kenya shilling exchange rate, a fall in real wages, and the abolition of

trade licensing and foreign exchange allocations. Export performance deteriorated thereafter. Manufactured products have been on a falling trend as a share of both GDP and total exports. The decline represents a loss of competitiveness of Kenyan products. The sector has been hurt by high real interest rates, low investment, antiquated technology, low productivity, and rising labor costs. Overall exports of goods and services have also fallen since 1994. Droughts have been mainly responsible for the fall in export volume. A loss in competitive position, including rising labor costs and a fall in the price of tradables relative to nontradables, has contributed to the decline. Delays in the agricultural reforms and changes in commodity pricing affected export composition. Coffee lost a 5 percent share from the year 1995 to 2000, whereas tea and horticultural goods gained. In term of destination, Kenya shifted away from trade with the European Union toward increased trade with EAC and COMESA partners. In 1990-2000, the EU share of Kenyan exports fell by a third while EAC and COMESA export share grew fourfold and by one half respectively. Uganda and Tanzania alone now represent for Kenya more than a quarter of its exports. This happened despite the fact that Uganda and Tanzania imposed suspended and excise duties on some Kenyan goods (20% and 10% respectively) contrary to the East African Community, by which they were expected to grant duty free access to Kenyan goods already in the mid 1990s (Ng'eno, 2002). Exports to the US had also steadily fallen from 1990 to 2000. In the latter year, Kenya became eligible for duty- and quota-free textile and apparel exports to the US under the US African Growth Opportunity Act. This may revive some trade with the US although Kenya has no comparative advantage on these goods. Indeed many cotton mills have closed unable to compete with cheap second-hand imports. Real exchange rate is an active source of discussions in Kenya, where exports performance has improved since 2002, but continues to fall short of the ambitions of the vision 2030. This study attempts to examine factors that are likely to have influenced trends in Kenya's exports sector performance from a macroeconomic perspective. Specifically it sought to investigate the behavior of exports in the presence of aid inflows and real exchange rate volatility. The researcher hypothesized that:

H_{01} : Exports do not respond positively to aid inflows and real exchange rate volatility.

Literature Review

Sackey (2001) analyzed the impact of aid on the RER in Ghana during 1962–96 and found out that aid has a dampening effect on the RER. The estimation and export performance model is important because of the tendency to characterize real exchange rate appreciations associated with booms as the Dutch disease. He found that appreciations in the real exchange rate affect export performance negatively, in line with the standard theory; his analysis undermines the applicability of the Dutch disease economics to Ghana during the period under examination. He concludes that, with a good policy environment, aid could contribute to the realization of Ghana's vision of becoming a middle income country. Elbadawi (1999) investigated whether external aid helped or hindered export orientation in Africa and estimated the relationship between ODA, real exchange rates and non-traditional exports for a panel of 62 developing countries including 28 from Africa. He found out a substantial partial real exchange rate overvaluation in many African and non-African countries. Moreover, he found that high aid dependent African countries had either experienced or likely to experience overall real exchange rate overvaluation. Conditional on absence of real exchange rate overvaluation a proxy for good policy environment was of relevance to export performance. He also found a robust Laffer curve type relationship between aid and non-traditional exports through the misalignment of real exchange rates relative to its equilibrium. Rajan and Subramanian (2005) argue that systematic adverse effects of foreign aid on the competitiveness of a recipient country's exports may explain the lack of any robust positive correlation between aid and growth. The evidence supporting their argument is that the share of labor intensive and tradable industries in the manufacturing sector declines as foreign aid increases. This is consistent with the Dutch disease mechanism whereby real exchange rate overvaluation hurts export industries and overall productivity growth.

MATERIALS AND METHODS

Time Series Properties of Macroeconomic Data

The last three decades 1970 – 2000, witnessed a revolution in time series econometrics. This followed the classic work of Engle and Granger (1987) and its subsequent development by important contributors that include the econometric team in UK which was led by David Hendry. Their fundamental contribution was

to question the validity of the stationarity assumption of classical regression technique, in light of the time series property of macro-variables. The classical regression technique, the Ordinary Least Squares, assumes that the variables under consideration are stationary which means in simple terms, their mean, variance and covariance are time invariant. It is found that almost all macroeconomic variables are non-stationary. It has been acknowledged that the application of simple OLS using time series data is likely to produce spurious regression results (Charemza & Deadman, 1992; McKay *et al.*, 1998; Alemayehu, 1999). However, modern time series modeling techniques provide a better way of addressing these problems. Cointegration analysis can be used to avoid spurious regressions while at the same time providing a means of explicitly distinguishing between long-run and short-run elasticities through the error correction formulation.

Model Specification

$$\text{Log EXP} = \alpha_1 \text{Log RER} + \alpha_2 \text{Log YTP} + \alpha_3 \text{Log REMIS} + \alpha_4 \text{Log AID} \dots \dots \dots 3.1.$$

Where:

Log EXP	-	Logarithm of Growth of real exports
Log RER	-	Logarithm of Real Exchange Rates
Log YTP	-	Logarithm of output growth of the trading partners
Log REMIS	-	Logarithm of Real exchange rate misalignment
Log AID	-	Logarithm of external aid inflows.

Error Correction Model (ECM)

Empirical studies have shown that the Error Correction Model is best suited model estimation when economic variables are individually non-stationary and co integrated, that is, when there is a meaningful long-run relationship between them. The error-correction methodology is appealing because of its ability to induce flexibility by combining the short-run dynamic and long-run equilibrium models in a unified system. At the same time, it ensures theoretical rigour and data coherence and consistency. This modeling strategy was adopted in this study it involves the following steps:

Stationary/Unit Root Test

The presence of unit root in the time series data generates unreliable results regarding hypothesis testing, the non-stationary time series data was differenced until stationarity was achieved. This study deployed the Augmented Dicky Fuller [ADF] to test for the presence of unit root in the level data. Additional terms or length of the lags in the first differences was based on the Akaike Information Criterion [AIC] and the Schwarz Information Criterion [SIC] to whiten the noise process. In both tests, if the calculated statistic is less in absolute terms than the MacKinnon (1991, 1996) values, the null hypothesis is accepted and will therefore mean that there is a unit root in the series. In other words, it means the time series is not stationary. The opposite is true when the calculated statistic is greater than the MacKinnon critical value. Consequently, unit root or stationarity tests were done on all the variables before proceeding with the tests for co integration and estimation of parameters. The decision rule was based on MacKinnon critical values as given in the table 1. The absolute values of ADF were compared to Mackinnon critical values in their 1st difference form. The ADF values must be more than Mackinnon critical values at 5% and 10% level of significance for stationarity condition to prevail.

Cointegration Test

Co integration analysis was used to avoid spurious regressions while at the same time providing a means of explicitly distinguishing between long-run and short-run estimations through the error correction formulation. Cointegration tests are conducted in case of non-stationarity of the series to ensure long run relationships. If the variables of the same order are integrated, then Johansen – Juselius Maximum Likelihood method of cointegration is applied to obtain the number of cointegrating vectors. If the variables are cointegrated of the same order, an error correction model forms a linear combination of the variables included in the model (Johansen & Juselius, 1990). The model was specified and estimated using standard methods and diagnostic tests. In order to examine whether there is long run equilibrium relationship or whether the variables move together in the long run. The stationarity of the residuals or equilibrium error term obtained from the co integration regression was tested using ADF with trend and

intercept. The absolute values of ADF were compared to Mackinnon critical values in their 1st difference form. The ADF values must be more than Mackinnon critical values at 1%, 5% and 10% level of significance for stationarity condition to prevail. Additional terms or length of the lags in the first differences were based on the Akaike Information Criterion [AIC] and the Schwarz Information Criterion [SIC] to whiten the noise process. If the co-efficient is significantly negative and higher than the MacKinnon critical value then the null hypothesis that the residuals obtained from the co integration regression have unit root was rejected. Co integration test for the residuals are based on the following parameters shown in the table 1.

Granger Causality Test

Once the long run relationship between capital flow and its fundamentals was established the next logical step for purposes of this study was to examine the Granger causal relationship among the variables. X is said to granger cause Y if and only if the forecast of Y is improved using the past values of X together with the past values of Y (Granger, 1969). Granger causality distinguishes between unidirectional and bidirectional causality. Unidirectional causality is said to exist from X to Y if X causes Y but Y does not cause X. If neither of them causes the other, then the two time series are statistically independent. If each of the variables causes the other, then a bidirectional or mutual feedback is said to exist between the variables. The parameter of interest is P- Value (p-value<0.05) indicated causality between exports and its fundamentals.

RESULTS

Empirical Analysis

Augmented Dickey Fuller Test was used to determine the presence of unit root. The MacKinnon critical values for rejection of the null hypothesis of a unit root are -2.9472 at the 5percent level significance and -2.6118 at the 10 percent level of significance. For the first difference, the critical levels are -2.9499 and -2.6133 at the 5percent and 10percent significant levels, respectively. Using MacKinnon critical values for first difference it was noted that the variables were stationary when the first difference was taken since all values were less than -2.9499 at 5 percent level of significance and they were integrated of order zero I(0) showing (0) unit roots in the first difference for all the predictors. Augmented Dickey Fuller Test confirmed the stationarity of the parameters in their first difference form hence estimation was based on the first difference to avoid spurious regression results.

Table 1. Unit root test for export model variables

Variable	Lags	Augmented Dickey – Fuller	Order of integration
Log XPS	1	-2.115633	I(1)
Log XPS	1	-5.354671	I(0)
Log YTP	1	-0.722806	I(1)
Log YTP	1	-4.634123	I(0)
Log REMIS	1	-1.465412	I(1)
Log REMIS	1	-3.286591	I(0)
Log RER	1	-1.542612	I(1)
Log RER	1	-3.758441	I(0)
Log AID	1	-1.792934	I(1)
Log AID	1	-3.604713	I(0)

Source: Authors estimation results, 2014

Table 2. Test of Co integration between exports and explanatory variables

Dickey–Fuller (DF) test on residuals	-4.614591
Augmented Dickey–Fuller (ADF) test on residuals	-5.625863
Phillips–Perron (PP) test on residuals	-4.462763

Source: Authors estimation results, 2014

Table 3. Pairwise Granger causality test for export model

Null Hypothesis	Lags	F-Statistics	P-Value
YTP does not Granger cause XPS	3	2.14132	0.21761
XPS does not Granger cause YTP		0.64057	0.55750
RER does not Granger cause XPS*	1	12.4275	0.00156
XPS does not Granger cause RER		0.52943	0.42231
REMIS does not Granger cause XPS*	1	10.4366	0.00126
XPS does not Granger cause RERMIS		0.24743	0.63208
AID does not Granger cause XPS*	1	11.3686	0.00273
XPS does not Granger cause AID		0.65332	0.47156

Source: Authors estimation results, 2014

The export performance model, causality was found to exist between exports and Real Exchange Rate (RER) with a p-value of 0.00156, Real Exchange Rate Misalignment (REMIS) with a p-value of 0.00126 and Aid (AID) with a p-value of 0.00273. The parameters granger causing exports volume exhibited unidirectional causality. Causality was not observed between Exports (XPS) and output growth of trading partners (YTP) with a P-Value of 0.21761. The results of the Granger causality test and the unit root test allow for the direct estimation of the co integration regression using Ordinary Least Squares (OLS).

Table 4. Results of the export performance model

Log XPS t-1				
Dependent variable:				
Method: Least squares				
Sample: 1960–2010				
Included observations: 50				
Variable	Co-efficient	Standard error	t-statistics	Probability
C	-0.704186	-0.323617	2.175986	0.0557
Log RER _{t-1}	0.435711	0.267368	1.629630	0.0356**
Log XPS	0.615054	0.624213	0.985327	0.0005*
Log YTP _{t-1}	2.671235	1.073213	2.4890073	0.0341**
REMIS _{t-1}	-0.061173	0.003432	-17.824300	0.0003*
Log AID _{t-1}	0.175157	0.086131	2.033611	0.0653***
R-squared	0.807214	Adjusted R-squared	0.516037	AIC -
1.644734				
SIC	- 1.056087	F-statistic	9.182636	
DW	1.756965	Prob (F-statistic)	0.000070	

* 1% ** 5% and *** 10% Level of Significance

Source: Authors estimation results, 2014

DISCUSSION

As expected, increases in output and for that matter income of trading partners positively affect the performance of exports as shown by the positive co-efficient of Output growth. Income of trading partners was found to be paramount in explaining increase in export volumes. The results confirms the dominant role played by economic prosperity of the export destination countries as demonstrated by the significant positive co-efficient of output growth of trading partners (2.671235). Output growth of trading partners is a foreign economic activity, proxied by export destination countries for Kenya's tea, coffee, and horticulture. The demand for exports is assumed to depend on the level of foreign real economic activity; with higher GDP in foreign countries resulting in higher demand in those countries. The shifting markets for the Kenyan exports, especially with the rising economic integration within East African Community, may also be used to explain this increase. Kenya's export markets have also expanded to other countries including African countries and the European Union. Changes in the real exchange rate variable also bear the expected positive sign. Real exchange rate has a profound effect on the export sector performance and the potential for export supply response is evident. The results of the study indicate positive relationship between Real Exchange Rate and export sector performance with a positive co-efficient of 0.435711 estimated in lagged form at 1% level of significance. Generally, depreciations in

the real exchange rate positively affect export performance. This means that more are exported with depreciation in real exchange rates leading to the promotion of tradeable goods sectors in the economy. Export earnings have been on an upward trend during the period which the shilling depreciated in real terms. This is particularly true for manufactured goods, horticultural products and to some extent, tea which mainly constitute the export basket in the country. The positive relationship between the depreciation of the real exchange rate and export perhaps could explain why there has been concern over the more recent appreciation of the shilling with exporters warning of job losses in Kenya's main export sectors: Tea, Horticulture, Coffee, and manufactured goods. The negative coefficient on the real exchange rate misalignment term proxied by the black market premium highlights the adverse effect this has on export performance. While maintaining a stable exchange rate is important, strategies that lead to a relatively misaligned exchange rate could be a disincentive to export, implying that positive flexibility in the exchange rate movements, in line with the macroeconomic fundamentals of the economy is beneficial to the export sector. For the policy environment proxy i.e. foreign aid, a positive relationship is seen to exist as indicated by positive co-efficient of Aid. This suggests that improvements in the policy environment elicit a favorable response from exports.

CONCLUSION AND RECOMMENDATIONS

With the rising level of globalization, openness through an export-led growth strategy is inevitable, particularly in consideration of other development constraints currently facing the country such as limited external financing. Trade liberalization or openness might also be associated with increased volatility, especially for commodity exports, therefore justifying the need for strategic supportive domestic policies to help those sectors that might not be able to cope with the wave of globalization. With advances in economic integration, particularly the EAC and COMESA, together with African Growth Opportunity Act, there are potential export opportunities that can be explored to Kenya's advantage, including promotion of the non-traditional exports.

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