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Time Series Analysis of the Somalian Export Demand Equations: A Co-integration Approach

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Abstract. In this paper, we estimated the short-run and long-run elasticities of the Somalian exports using the techniques of co-integration and error correction. The model was estimated for banana and livestock exports using annual data for the period 1967-1987. The results obtained provide evidence of a long-run equilibrium relationship between the Somalian exports and its major determinants. The error correction predicts the adjustment of the variables to their long-run equilibrium value reasonably well, but there is a substantial variation in the adjustment speed across commodities. Our results suggest that the Somalian exports are largely explained by the foreign income and are less sensitive to relative prices.

JEL Classification Codes: F14.

Key Words: Somalia, co-integration, time series, export demand equations, error correction regression

1. Introduction

One of the most important macroeconomic objectives of the Sub-Saharan African (SSA) countries and particularly Somalia is that of achieving and sustaining long run economic growth. Fundamental to this objective is the

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role and contributions of the foreign trade sector with special emphasis on the performance of the major export commodities of Somalia. The relationship between exports and economic growth has been an important subject of analysis and debate over the years. In recent years this debate has shifted in support of export-led growth strategy since the emergency of the East Asian countries[3]. Central to this argument is that there is a strong and positive relationship between exports and economic growth and many economists have accentuated that increased levels of trade on the part of the developing countries is not only desirable but indispensable for sustained economic growth and development. Recognition of the link between exports and economic growth is by and large based on the dynamic gains of international trade theory[4].

Exports play a vital role in achieving the macroeconomic objectives of SSA countries as a whole and particularly Somalia. More essentially, exports are the principal source of the foreign exchange earnings that will ease the foreign exchange constraint on economic growth by enhancing the capacity to import raw materials, intermediate goods and capital equipment. This will promote increases in capital formation that is indispensable for increasing domestic investment in the economy resulting in higher outputs and economic growth. Furthermore, increased export earnings not only will alleviate these countries external debt and balance of payments problems but will also generate positive externalities. This effect will spread into the sectors not directly exposed to foreign competition and as a result help raise the overall productivity in the economy.

It is the purpose of this paper to present a comprehensive analysis of the demand of Somalian exports. A specific objective is to determine the factors that influence the demand of the Somalian exports in the world

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[3] Several empirical studies show a strong and positive relationship between exports and economic growth. See, Ram (1987), Krueger (1990), Bahmani-Oskooee and Alse (1993), Khan and Saqib (1993), Al-Yuousif (1997) and Ekanayake (1999).

[4] According to economic theory, the gains from international trade can be divided into static gains and dynamic gains. Static gains imply gains from international trade that are due to improvements in efficiency that result from more efficient allocation of resources due to specialization (i.e. comparative advantage). Dynamic gains from international trade imply trade-induced growth in total factor productivity, higher technical efficiency, and a better utilization of productive capacity and scale economies.

market[5]. In the process, we construct an empirically tractable export demand equation that can be estimated for the different commodities of the Somalian exports utilizing the recently developed time-series techniques that deal with the issue of non-stationarity present in the data. We use the cointegration and the error correction methodology to study the behavior and performances of the Somalian exports and surprisingly, a modern approach to the behavior of the Somalian exports is lacking and this paper is an attempt to fill this void in the literature.

Studies of the developing economies in general and particularly to those of the SSA countries and Somalia are of potential importance, since much of their external sector economic problems stem from macroeconomic policies. Therefore, policy-makers who are trying to devise policies to promote and diversify the Somalian exports are interested in the magnitude of these elasticities. More importantly, these estimates will create a greater understanding of the performances and the dynamics of the Somalian exports. This study is organized as follows: section 2 presents an overview of the general trends and patterns of the Somalian exports, section 3 discusses the analytical framework utilized in this study and in section 4 we will discuss the empirical results of the study. Finally, we present a summary of the findings and discuss policy recommendations in section 5.

2. Somalian Exports: Trends and patterns

Similar to many other SSA countries, Somalia's exports are highly concentrated and intrinsically unstable. Two primary products, livestock and bananas dominate the export commodities of Somalia. These two commodities account for more than two-thirds of the country's total foreign exchange earnings with livestock alone accounting for more than fifty per cent of the country's total export proceeds since the 1960s. Notwithstanding that the banana exports have declined appreciably since 1972, it remains as the

[5] It is relatively palpable from the literature that when the new econometric models such as cointegration technique are introduced, some of the old theories and empirical results received renewed attention and the Somalian export demand equations are no exception. This relatively new technique underscores the presence of nonstationarity in the data and adverse consequences of neglecting it.

second principal export revenue generator, and accounts for between 15% and 25% of the country's total foreign exchange earnings.

Since primary commodities dominated the Somalian exports, they have performed unsatisfactorily in the world market and demonstrated considerable instability with growth rates fluctuating from 4.4% during the periods 1965-80 to negative 4.6% in 1980-89[6]. Livestock exports were extraordinarily sensitive to external shocks and considerably influence the behavior and the performances of the Somalian exports. In sum, one of the salient features of the primary products is that they are income inelastic and also tend to have low price elasticity of demand. Together they contribute substantially to instability in export earnings, which would be transmitted to the domestic economy and make domestic demand unstable thereby affecting inauspiciously the nation's macroeconomic growth.

Somalia has traditionally exported its livestock to the Gulf States of the Middle East, primarily Saudi Arabia. Since its independence (July 1st, 1960), Somalia's livestock exports increased steadily until 1983 when Saudi Arabia banned the Somalian livestock exports due to reports of rinderpest in East Africa[7]. During this juncture, cattle exports alone plummeted from 157,000 head in 1982 to no more than 38,000 head in 1983[8] (a decline of more than 75% in just one year) and even lower in the following years. All forms of the livestock (i.e. camel, cattle, goats and sheep) exports have declined appreciably due to this ban, resulting in a profound adverse impact on Somalia's export earnings. In the wake of this ban, exports fell by 22% in 1983 and by 43% in 1984 according to the Central Bank of Somalia.

In 1982 livestock exports accounted for more than 80% of the country's total export earnings. Thus the ban had a significant impact upon Somalia's export earnings and the ban remained in effect until 1986[9]. The

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[6] See World Development Report 1996.

[7] For details on this ban, see the Economist Intelligence Unit (EIU) (1986, p.39).

[8] In addition, camel exports fell from 12,000 to 6,000 head while the sheep and goats increased slightly. The source of the data is the EIU (1986-91).

[9] Somalia's economy in general suffered enormously during this ban, since its export revenue depends heavily on its livestock. Although, the proportion of exports on the net national product of Somalia is very small its overall impact cannot be underestimated. When the export revenue plummeted, imports were curtailed and many development projects were brought to a complete halt. See EIU (1986-87, p.39).

crippling impact of this ban demonstrates the vulnerability of the Somalian exports since it is immeasurably dependent on only one primary product (livestock) and one customer (Saudi Arabia). This vulnerability of the Somalian exports is *tatonnement* to the lack of diversification of its exports since independence. More precisely, as in most developing economies and essentially SSA which are heavily dependent on a limited range of primary commodities, Somalia's exports composition can be regarded as a principal factor contributing to the instability of its exports.

Bananas are ranked as the second most valuable primary export commodity of Somalia. The cultivation of bananas for export on a commercial scale in Somalia began in the late 1940s and is sold in the European Union (EU) with Italy providing the principal market. Banana exports not only provide a major source of income and employment in the rural areas of the country, but also are an important source of foreign exchange revenue. Banana exports had been increasing steadily since 1972. Similar to the livestock exports, the Somalian banana exports had been subject to wide swings in production, stocks and prices over the years. For instance, banana production decreased from its peak of 134,000 metric tons in 1972 to only 64,000 metric tons in 1987 (United Nations Conference on Trade and Development, UNCTAD).

The decline of the banana production since 1972 can be attributed to significant long-term forces that are both internal and external factors[10]. The internal factors include inadequate investment in this sub-sector of the Somalian exports, (apparently due to uncertainties over nationalization since the banana exports were a joint business enterprise between Italy and Somalia), short supplies of fertilizers and pesticides, and management skill inadequacies.

The external factors include Somalia's weather conditions, problems of the world banana economy, and tough competition in the Italian market, which Somalia had once monopolized[11]. In the vein of the other primary

[10] In addition, the area of the banana plantation also declined from 8,300 hectors in 1975 to 6,000 hectors in 1979. For further details, see H. Nelson (1982, p.151).

[11] Between 1925 and 1965, Somalia had a virtual monopoly in the entire Italian market. But, in 1966 the Italian government removed some of the preferential measurements as a result of the abolition of the state banana monopoly and introduced a tax on banana consumption to compensate for the loss of the state revenue from the banana monopoly. Somalia still benefited from some preferential

commodities exported by the developing countries, the world banana economy has been facing major economic problems since the 1970s. Once flourishing and a growing market, the world banana economy is facing an unprecedented slowdown and an uncertain future. According to Food and Agriculture Organization of the United Nations (FAO) (1986), it is estimated that the average annual growth rates of the volume of banana imports in the industrialized countries has declined from 4.4% in 1961-71 to only 1.1% in 1971-81. This new trend in the western European countries is due to declining per capita consumption of bananas over the past decades. This has resulted in a significant loss in the foreign exchange earning potential of the exporting nations, causing relentless competition among the exporting nations for larger shares of a shrinking market.

Somalia's share in the Italian market declined from 24% in 1971 to 10% in 1978 and to only 6% in 1984, while the shares of the other LDCs have increased from 63% in 1971 to 74% in 1978 and to 90% in 1984[12]. This decline occurred notwithstanding the rising costs of inputs to the industry (such as fuels, fertilizers, packaging materials, transportation, etc) and for this reason Somalia's banana exports to the EU market as a whole and particularly the Italian market became less profitable. Consequently, Somalia began exporting some of its bananas to the Gulf States of the Middle East, which offered higher prices and growing demand[13]. Once these markets were discovered, the banana production and plantation began to increase.

3. Theoretical Model and Estimation Methodology

Conventionally, the empirical analysis of the foreign trade equations and its specification has been carried out through a partial equilibrium model based on the hypothesis of the standard "imperfect substitute model" (Goldstein and Khan, 1985). This model is fundamentally based on the key assumption that the analysis is set in a simple two-country model of international trade in which each country produces a single tradable good that is an imperfect

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treatments in the Italian, French and the United Kingdom markets due to quota and licensing arrangements. For the ACP countries in which Somalia is a member, access to these markets is protected by a special protocol (i.e. protocol no. 4) of successive Lome' Convention (See FAO 1986).

[12] See FAO (1986, p.48).

[13] See the EIU (1988-89, p.40).

substitute for the domestically produced goods in the other country. According to this model, the procedure for estimating a country's export demand function is based on the Marshallian demand function and the empirical specification of the demand function for the Somalian exports is based on this model.

Under this approach, the world demand for the Somalian exports depends upon the relative price of the export commodity and the real income of the importing countries. This relationship is derived according to economic theory, from a general utility function that relates the quantities of exports to the relative price of exports to domestic prices and domestic real income. In functional form, the export demand equation for commodity "i" at time "t", where i = 1,2,3,……..,n can be specified as follows;

$$X^{d}_{it} = f(PX_{it} / PW_{it} , YW_{t})$$

Where:

X^{d}_{it} = the quantity of exports of commodity "i" demanded at time "t".

PX_{it} = unit price of commodity "i" at time "t".

PW_{it} = world price index of importing countries at time "t".

YW_{t} = the income of the importing country at time "t".

In economic theory there is little that can be gleaned as to the appropriate functional relationships that this equation can take[14]. But, in the literature, both the linear and the log-linear functional relationships have been used. In this study, we will utilize the log-linear functional form, because the specification of the export equation in log-linear form allows the endogenous variable to react proportionally to a rise or fall in the explanatory variables.

[14] Unfortunately, there is no single reliable decisive factor or criterion in the literature that one can use to choose between these functional forms (i.e. linear or log-linear functions). According to Leamer and Stern (1970), a researcher is left to select a functional form according to his own theoretical leanings with the hope that his choice does not adversely affect his result.

Furthermore, given that the assumption of constant elasticities, the problem of a secular fall in the price elasticity if the dependent variable happens to rise over time is avoided and this is usually expected in the time series data analysis on imports and exports[15].

So, the export demand equation for the "i^{th}" commodity at time "t" in log-linear form will be:

$$\ln X^{d}_{it} = \alpha_0 + \alpha_1 \ln(PX_i/PW)_t + \alpha_2 \ln YW_t$$

Since the export demand equation is specified in logarithms, both of its parameters (α_1 and α_2) now represent the relative price and income elasticities respectively. According to economic theory, an increase in foreign income will lead to an increase in exports and therefore the coefficient α_2 is expected to have a positive sign (i.e. $\alpha_2 > 0$). On the other hand, an increase in relative prices will lead to a fall in export demand, so α_1 is expected to have a negative sign (i.e. $\alpha_1 < 0$).

Before proceeding with the empirical analysis of the Somalian export demand, it is imperative that we test whether the data are stationary or non-stationary. The use of non-stationary economic variables in a given model leads to "spurious regression phenomenon" discussed by Granger and Newbold (1974) and Phillips (1986). In order to circumvent these problems, we tested all the variables individually for a unit root, i.e. whether the variable is integrated of order one, denoted ~I (1). In order to corroborate the robustness of the test results, we employed the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) tests.

To test for unit roots, we utilized different testing strategies for each of the two different tests. For the DF test, we employed the standard DF test on each variable, and this is implemented by estimating the following regression equation:

$$\Delta y_t = \alpha + \beta t + \rho y_{t-1} + \varepsilon_t$$ [16]

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[15] See Khan and Ross (1977).

[16] Although this is one of the most popular tests for the DF tests, there are other models used in the literature. The other forms of the DF tests are: the random walk test, (i.e. the following equation is estimated: $\Delta y_t = \rho y_{t-1} + \varepsilon_t$) and the random walk

Where: y_t is the relevant time series variable, Δ is a first difference operator, α is a drift, t represents a time trend, β, ρ are parameters, ε_t is a white noise process, i.e. $\varepsilon_t \sim IID\ (0,\sigma^2)$. The ADF test is an extension of the DF test and this test is based on the estimation of the following regression:

$$\Delta y_t = \alpha + \beta t + \rho y_{t-1} + \sum^{m}_{i=1} \gamma_i \Delta y_{t-i} + \varepsilon_t$$

The null hypotheses for these tests are H_o: $\rho = 0$ against the alternative H_1: $\rho > 0$. For these tests, if the computed test statistic is larger than the critical value, the hypothesis of non-stationary and the existence of a unit root could be rejected. Subsequently, the conclusion is the test for the variables in our data series may be stationary. But, if the variables are found to be non-stationary as we expect, then a transformation of the variables, usually in the form of differencing is needed to produce a stationary series. A non-stationary time series Z can achieve stationarity if differenced appropriately and the number of differencing is called the order of integration. Accordingly, a time series, Z, is integrated of order d (i.e. contains d unit roots) if it becomes stationary after being differenced d times, denoted by $Z \sim I(d)$.

3.1 Data

The data that we use in our study is annual data gathered from different sources. The period analyzed is from 1967 to 1987 and all the monetary variables are converted to real ones. In general, our data restricts the choice of the initial date because the required data for some of the relevant variables are not available before 1967. Similarly, the closing date of our data is 1987 because it is the last year the Somalian government reported any data to the international organizations. Most of the data on the Somalian export commodities are obtained from the Somalian Statistical Abstract. It is an annual statistical publication of Somalia's foreign trade. Other relevant data were taken from the International Financial Statistics produced by the International Monetary Fund (IMF), World Development Report (various issues), and UNCTAD.

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with drift test (i.e. the following model is tested: $\Delta y_t = \alpha + \rho y_{t-1} + \varepsilon_t$). Similarly, these types of tests are also done for the ADF tests.

4. Empirical Results

Our results are presented following the *modus operandi* delineated in the previous section. The first part of this section presents the time series properties of the data followed by the results of the cointegration tests. The last part of this section presents the error correction model as the main empirical result of the present study.

4.1 Unit Root Test

In line with the standard practice of modern time series econometrics, we started our empirical analysis by first testing the order of integration of each variable used in our estimation process. In order to ascertain the stationarity of the variables, the standard Dickey – Fuller and the Augmented Dickey – Fuller tests were performed. Test statistics for each variable in both levels and first differences are presented in tables A1 and A2 in the appendix. The test results suggest that the null hypothesis of non-stationarity cannot be rejected at the 5 percent level of significance for the levels (in logs) of both the banana and the livestock results. Hence, the levels of all the variables used in this study are non-stationary and are integrated of order [I (0)]. Interestingly, after differencing once, only the banana results show that all the variables are stationary in both the Dickey-Fuller and the Augmented Dickey-Fuller tests. In contrast, only the Dickey-Fuller tests show that the livestock variables are integrated of order one after being differenced once with the exception of the world income. This clearly demonstrates that almost all of the variables are integrated of order one, [I (1)] and hence the presence of a unit root is easily rejected. Since all the variables are stationary and are integrated of order one, it is *de rigueur* that the series be tested for the existence of a long-run relationship between the variables. In other words, the implication is that now we can test if there exists a possible cointegration relationship between the Somalian exports and their explanatory variables.

4.2 Cointegration Test

The concept of cointegration was developed by Granger (1981) and it deals with the issue of the determination of long-run or equilibrium in economic

relationships. It allows us to describe the existence of an equilibrium relationship among two or more variables, each of which is individually non-stationary. Hence, prior to applying the standard procedure of the cointegration tests to any series, one technical condition must be fully satisfied. That is for the series in consideration, the variables must be integrated of the same order or non-stationary individually. This implies that these variables are cointegrated and the existence of a long-run relationship among the variables can now be tested.

Having established that all the variables used in this study are integrated of the same order [i.e.I(1)], then the application of cointegration techniques is appropriate in order to proceed with the long-run analysis. There are a number of approaches in the literature for testing cointegration and the most popular one is the Engle and Granger (1987) approach. It is based on a two-step procedure for testing the existence of a cointegrating relationship among two or more variables. The first step of the Engle-Granger approach is based on estimating the following cointegration regression, which is also the long run demand of the Somalian exports in the world market:

$$X = \alpha + \beta PX + \lambda YW + \varepsilon_t$$

Where the variables are as defined previously.

To determine whether the variables are cointegrated is to test the null hypothesis of whether the estimated residuals, ε_t of the cointegration regression are integrated of order one [I (1)], against the alternative that ε_t is [I (0)] by using the ADF test. The results of the cointegration regression and the stationarity tests for the residuals (i.e. the results of the second step of the Engle-Granger approach) are presented in table A3. The results show that at the 5% level of significance both the Engle – Granger (i.e. EGD) and the Engle and Yoo (1987) cointegration tests reject the null hypothesis of no cointegration. In addition, the cointegration regression Durbin Watson (CRDW) statistic further indicated the existence of cointegration among the variables[17]. Hence, there exists a long run equilibrium relationship between

[17] The null hypothesis being tested when using the CRDW statistic is that of a single root. In other words, εt is a random walk. But, in our case we use a multivariate model and the CRDW statistic is not suitable. But, Engle and Granger (1987) point out that for quick approximate results one could use the CRDW statistic. Therefore, we only use it here as a rough estimation in our context.

the Somalian export demand and the relative price and world income. Since all the variables in the export demand equations are in logarithms, their coefficients yield direct estimates of the relevant elasticities. The estimated coefficients of all the variables had the expected signs except the relative price variable of the livestock result. Furthermore, all the variables were not statistically significant except the world income in the livestock results. The overall specification of the model does not materialize quite well in terms of the R^2 and the D.W. statistic especially for the banana results.

4.3 Error Correction Model

The final step of the Engle–Granger cointegration approach is the error correction model (ECM). According to Engle and Granger (1987), if the variables of a series are cointegrated then there must exist an ECM. This is known as the Granger Representation Theorem in the literature. Since the variables in the Somalian export demand equations are found to be cointegrated then the final stage of the empirical methodology of our study is to construct a dynamic ECM that takes into account the underlying cointegration properties of the variables. The overriding purpose of building an ECM is to capture the dynamics of the Somalian export demand in the short-run and especially to identify the speed of adjustment as a response to departures from the long-run equilibrium. In order to do so, we incorporate not only the variables that contain the short-run information, but also the cointegrating relationship (long-run information) calculated previously. The general specification of the ECM to be estimated for the Somalian exports is:

$$\Delta \ln X = \beta_0 + \beta_1 \Delta \ln PX + \beta_2 \Delta \ln YW + \beta_3 \Delta \ln X_{t-1} + \varphi EC_{t-1} + \omega_i$$

Where the variables are as defined previously and the coefficient (φ) of the error term (i.e. EC) estimates the deviations from the long-run equilibrium in period (t-1). Theoretically, the coefficient of the error correction variable is expected to be negative and its magnitude will be between zero and one. The closer this coefficient is to one, the greater the adjustment speed in the existing disequilibria between the Somalian exports and the rest of the variables.

In order to obtain a parsimonious dynamic ECM for the Somalian exports, we followed Hendry's (1995) general to specific modeling approach in which an overparameterised model is initially estimated and then gradually

reduced by eliminating insignificant lagged variables until we arrive at a more interpretable and parsimonious model. The results of this exercise are presented in tables A4 and A5 of the appendix.

An important finding is that the parameter estimates of the error correction terms in both the banana and livestock models had the expected negative signs and were statistically significant. This finding not only supports the validity of a long-run equilibrium relationship among the variables in the Somalian export demand equations, but also indicates that the Somalian exports are sensitive to the departure from their equilibrium value in the previous period. Furthermore, overlooking and disregarding the cointegrating relationships among these variables would have introduced misspecification in the underlying dynamic structure, and the statistical significance of the error correction term supports the existence of cointegration[18]. The estimated parameters of the error correction term not only represent the speed of adjustment but also are consistent with the hypothesis of convergence towards long-run equilibrium. For instance, a coefficient of –0.53 for the banana and –0.78 for the livestock results suggests that about 53 and 78 percent of the discrepancy between actual and equilibrium value of the Somalian exports is corrected each period[19].

As can be gleaned from the tables A4 and A5, the short-run values of the estimated parameters are very similar in both models. Also we can gather from these tables that the short-run price elasticities of –0.31 for the banana and –0.45 for the livestock are not only comparable in relative magnitude since both are price inelastic and had the expected (negative) signs but also were statistically insignificant at any conventional levels. On the other hand, in both cases the income elasticity had the correct sign and was statistically significant. This implies that the most prominent factor determining the Somalian exports in the short-run is foreign income and the magnitudes of these elasticities are in line with those in the literature since both are income inelastic.

Based on the results of the ECM analysis, we can now make the following observations. First, for the banana results, long-run elasticities are

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[18] See Banerjee et al (1993).

[19] It should also be noted that the coefficient of the error correction in the livestock model is not only bigger but also had the larger computed t-value and hence larger significance.

significantly smaller than the short-run elasticities, although none of them is statistically significant. More importantly, none of the variables in the long-run model are statistically significant at any conventional levels and this might be due to problems of autocorrelation as indicated by the magnitude of the D.W. statistic. On the other hand, world income is the most important factor in the short-run model and this has an important policy implications. In sum, it appears that the short-run model has out-performed the corresponding long-run model in the banana results as demonstrated by the R^2, the adjusted R^2 and the D.W. statistic. Secondly, for the livestock exports, the short-run and long-run elasticities are very comparable across models. It is worthy to note that not only that all the variables had the appropriate signs, but also the most significant factor that determines the Somalian livestock exports in both models is the world income. Hence, it is not surprising that the foreign income has a significant effect on the level of the Somalian livestock exports both in the short-run and long-run. As indicated in the outset, the destination of the Somalian livestock exports has been the Gulf States of the Middle East and as the income of these countries went up so did the level of the Somalian livestock exports to the region, but less proportionately.

We performed some diagnostic tests to check for the adequacy of the ECM. The statistical fit of each model to the data was quite satisfactory as demonstrated by the values of the R^2, the adjusted R^2 and the Durbin-Watson statistic.

5. Conclusions

The fundamental objective of the present study is to provide a comprehensive analysis of the major export commodities of Somalia for the period of 1967-87. To realize this objective, we present the short-run and long-run elasticities of the Somalian exports, drawing upon the recent developments in the statistical analysis of time series data including cointegration and error correction modeling. Our analysis confirmed that the Somalian exports and its major explanatory variables are cointegrated indicating the existence of a long-run equilibrium relationship. We proceeded to estimate an ECM for the Somalian exports. The error correction term had the appropriate sign and was statistically significant in both commodities. This implies that market forces are in operation to restore long-run equilibrium following a short-run random disturbance. However, with in the ECM, the livestock analysis appears to

have better performance than the banana results. This in part, can be attributed to the fact that these two commodities operate under a different institutional set-up. The livestock exports are completely handled by the private sector while the banana exports are entirely under the domain of the public sector. We conclude that foreign income is the single most important factor that determines the demand for the Somalian exports both in the short-run and in the long-run especially for the livestock exports. The coefficient of the foreign income is about 0.70 for the livestock and 0.62 for the banana in the short-run indicating that one percentage point increase in the foreign income would cause the Somalian exports, other things being equal, to increase by around 0.70 to 0.62 percent, confirming the pace of the foreign demand as a very important factor. More fundamentally, developments in Somalia's trading partners are quickly transmitted to the Somalian economy since Somalia has a strong trade and investment links with these economies.

An important policy implication of our findings is that of stabilizing Somalia's export earnings potential by counteracting the external factors that influence adversely the Somalian exports. More importantly, diversification of the Somalian exports would by and large improve economic fundamentals and may help bring about sustained growth in export earnings. However, given the brevity of the annual sample period and the shortcomings associated with using the single equation ECM, the results of this paper are only suggestive and should be interpreted with caution.

Finally, our analysis has focused exclusively on the demand side of the Somalian exports, revealing many possible extensions for future research. In particular, incorporating its analysis with the supply side of the Somalian exports, may prove to be instrumental for policy makers to identify those commodities that are most sensitive to the trade policies.

Appendix

Table. A1. Unit Root Test (Banana Results)

	Dicky-Fuller	Augmented Dicky-Fuller
Variables	Level	Level
X	-2.13	0.97
PX	-3.15	0.44
YW	-2.43	0.20
Variables	First Difference	First Difference
X	-4.77**	4.54**
PX	-6.09**	2.84
YW	-3.92**	3.00

Notes: These tests were performed by including both a drift and a deterministic trend in the regressions. The critical values for the DF and the ADF at the 5 percent and 10 percent level of confidences are –3.60 and –3.20 respectively.

(**) denotes that the non-stationarity hypothesis is rejected at the 5 percent level of significance.

Table. A2. Unit Root Tests (Livestock Results)

	Dicky-Fuller	Augmented Dicky-Fuller
Variables	Level	Level
X	-1.42	-0.65
PX		
YW	-2.45	0.78
	0.77	2.01
Variables	First Difference	First Difference
X	-3.83**	1.97
PX	-4.57**	2.60
YW	-2.11	1.53

Notes: These tests were performed by including both a drift and a deterministic trend in the regressions. The critical values for the DF and the ADF at the 5 percent and 10 percent level of confidences are –3.60 and –3.20 respectively.

(**) denotes that the non-stationarity hypothesis is rejected at the 5 percent level of significance.

Table. A3. Cointegration Test Results

Variables	Banana Results	Livestock Results
Constant	1.13 (0.58)	4.68 (2.75)
PX	-0.12 (-0.74)	0.67 (1.42)
YW	0.11 (0.31)	0.57 (6.35)
R^2	0.035	0.84
CRDW	1.05	1.13
Residual	4.09*	5.46*

Note: Figures in parentheses are the t-statistics.

(*) means significant at the 5 percent level.

The 5 and 10 percent critical values of the Engle – Granger cointegration tests are –3.29 and –2.90 respectively. While the 5 and 10 percent critical values of the Engle and Yoo cointegration tests are 3.67 and 3.28 respectively. The computed critical value for the Mackinnon response surface at the 5 percent level of confidence is –3.64.

Table. A4. Error Correction Regression for the Banana Results

Regressors	Parameter Estimate	T – Ratio
Intercept	0.02	(0.24)
ΔX(-1)	0.12	(0.51)
ΔPX	0.31	(1.22)
ΔPX(-1)	0.26	(1.06)
ΔYW	0.62	(2.04)**
ΔYW(-1)	0.75	(2.12)**
EC(-1)	-0.53	(1.52)*
R^2	0.66	
Adjusted R^2	0.48	
D.W.	1.99	

Note: (*) means significant at the 10 percent level of significance.

(**) means significant at the 5 percent level of significance.

Table. A5. Error Correction Regression for the Livestock results

Regressors	Parameter Estimate	T - Ratio
Intercept	0.06	(0.63)
ΔX(-2)	0.27	(1.63)*
ΔPX(-1)	0.45	(0.62)
ΔPX(-2)	0.32	(0.66)
ΔYW(-1)	0.68	(1.81)**
EC(-1)	-0.78	(2.66)**
R^2	0.55	
Adjusted R^2	0.36	
D.W.	2.12	

Note: (*) means significant at the 10 percent level of significance.

(**) means significant at the 5 percent level of significance.

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