THE LONG RUN RELATIONSHIP BETWEEN EXPORTS AND IMPORTS: THE EXPERIENCE OF INDIA AND IRAN

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ABSTRACT

Persistent rise in current account deficits in India and Iran has been a serious problem similar to the many developing countries. Trade statistics of India and Iran suggest a continuous deficit in their foreign trade during the study period (1970-2010). Sustaining current account balance is important in achieving sustainable economic growth in these countries. This is possible only when exports and imports of these individual countries are cointegrated and the causal connection runs between exports and imports. The present paper is an attempt to verify the long run relationship between exports and imports of these countries separately for the period 1970 – 2010. The empirical results based on unit root tests, co integration and error correction models suggest that the exports and imports of India; and Iran are cointegrated indicating the long run equilibrium between exports and imports of these countries. The results based on Engel-Granger error correction model suggest that disequilibrium between long run and short run periods is adjusted every year in these countries. This implies the short run adjustment behaviour of exports towards imports. In view of this empirical finding it may be concluded that the present macro and trade policies have been effective in attaining long run equilibrium between exports and imports and these countries should continue with their present trade and macroeconomic policies.

Key Words: Exports, Imports, Trade deficit, Current account deficit, Cointegration and Error Correction Model, Iran and India.

JEL Classification: F1, F18

I. INTRODUCTION

Imports and exports are the two important components of the current account of Balance of Payments (BOP) of any country. Of late, there has been an increasing interest among the economists to study the long run relation between exports and imports as it reflects the efficacy of trade and macro policies of a country. The knowledge of cointegration between these
variables is of paramount importance to policy framing as it is vital to formulate trade policies with special reference to sustaining trade balance of a country. Cointegration between exports and imports implies long run equilibrium and trade deficits are only short run phenomena. If the estimated coefficient between exports and imports is equal to one, it implies that the country in question satisfies international budget constraint.

Trade relations between India and Iran have witnessed a significant rise during the last decade, with India’s total trade (exports plus imports) with Iran rising from US$ 520 million in 2001 to US$ 10.5 billion in 2010. This buoyant trend has been supported by both rise in India’s exports to and imports from Iran, with India’s imports from Iran showing a much higher growth as compared to India’s exports to Iran (EXIM Bank of India, 2012).

Since the advent of the floating exchange rates during the early 1970s, and the trade liberalization during 1990s, there has been an extensive debate about the impact of exchange rates and other macro variables on imports and exports. Despite the availability of vast literature on exchange rates, exports and imports, there is little or no evidence available on the cointegration relationship between exports and imports. After the publication of seminal work by Husted (1992) several researchers have tried to verify this relationship. The present paper is an attempt in this direction and tries to empirically verify the long run relationship between exports and imports of Iran and India separately.

The economy of Iran has been experiencing several changes and shocks. It had to face the 1974-75 OPEC oil crises and a consequent decline in its exports, political upheaval associated with the 1979 Islamic Revolution, a prolonged war with Iraq (1980-1988), a volatile international oil market, economic sanctions and the decline in the growth rates. Iran has been experiencing deterioration in its exchange rate coupled with volatility, and declining economic growth due to structural problems and exogenous factors such as stringent economic sanctions. Starting from the late 1950s to the mid-1970s the country has seen a rise in its imports and a decline in exports. During this period and particularly after 1973, the oil prices have risen resulting in an increase in national income. During this period imports also have risen due to the removal of several restrictions. However, during war period, due to the problem relating petroleum exports foreign exchange has dwindled and also the import capacity. Shortly afterwards, imports have increased as the reconstruction of the economy has started and due to the trade liberalization policies. But during the years, 1993 and 1994, the imports have decreased due to restrictive atmosphere. During 1995-1996, government set the limits on imports with less intensity; furthermore, it increased oil price and foreign exchange incomes, consequently the amount of imports have risen again. In 1997 along with decreasing the global oil price, the value of imports decreased by 6.1%. This trend continued up to the year 1999, but since 2000 the global oil price along with redemption and decrease of the restriction of import policies, imports have continued to increase. In brief, the imports and exports of Iran have been rising but with fluctuations due to internal and external factors. Iran’s trade deficits have also started rising phenomenally during the recent period (see table 1).
India also has been experiencing persisting trade deficits and the problem has become more pronounced in recent years. Though, exports rose significantly due to export promotion and trade liberalization policies, imports have outweighed exports due to the larger import base and mainly due to the imports of crude oil and gold. The persistent decline in the exchange rates and rising oil and gold prices has led to an increase in the trade deficits in India. Prior to 1970s, India’s trade deficits rose as a consequence of its inward looking policy and export pessimism. During 1970s and 1980s, India attempted passive liberalization but imports have risen faster due to oil price hikes in 1970s and 1980s. During 1990s exports grew at a faster rate (15.66 per cent) and in the post liberalization period, export and import growth has picked up. However, during the entire study period trade deficits have risen.

The empirical work in this paper involves estimating the relationship between exports and imports using Engel-Granger method and Johansen’s cointegration and vector error correction methods. The remaining paper is structured as follows: The second section deals with review of empirical literature. The third section is on data and econometric models. The fourth section discusses the empirical findings and the final section is on conclusion and policy suggestion.

II REVIEW OF LITERATURE

Basing on budget constraint, Husted (1992) proposes a theoretical relationship between exports and imports as follows:

$$C_t = Y_t + B_t - I_t - (1 + r)B_{t-1}$$

Where $C_t$ is the aggregate consumption, $Y_t$ is the aggregate income, $I_t$ is the aggregate domestic investment, $r$ is the international rate of interest and $B_t$ is the international borrowing. Under several restrictions he derives the final equation which brings in the relationship between exports and imports:

$$X_t = a_0 + a_1 Mt + e_t$$

Alternatively Arize (2002) proposed an alternative model,

$$M_t = a_0 + a_1 X_t + e_t$$
In both the models the coefficient \(a_1\) represents budget constraint and remains stable if exports and imports are cointegrated. Cointegrating relationship between exports and imports implies that countries do not violate their international budget constraint and therefore supports the effectiveness of their macroeconomic policies in attaining the long-run equilibrium. Otherwise, it is unstable and the economy cannot meet its foreign debt liability. Several researchers have tried to analyze the long-run or cointegrating relationship between exports and imports. Using quarterly US trade data for the period 1967–1989, Husted (1992) has shown that exports and imports are cointegrated in the long run and therefore supports the effectiveness of their macroeconomic policies in attaining the long-run equilibrium. In another study, Herzer and Nowak-Lehmann (2006) and Erbaykal and Karaca (2008) have shown the existence of a cointegrated relationship between exports and imports, which suggest that trade deficits are only short-term phenomenon therefore, sustainable in the long-term. Peder (2007) examined the cointegration of imports and exports in India and found the cointegrating relation between these variables. Lehman (2005) found cointegrating relation between exports and imports in Chile in spite of its balance of payments problems. Similar to these studies, Bahmani-Oskooee and Rhee (1997) used quarterly data of Korea and found evidence of cointegration with a positive impact of exports on imports. Similarly, Apergis (2000) found cointegration between exports and imports for Greece. Using Indian data for the period 1949-50 to 2004-05, Upender (2007) has shown that India’s nominal exports and imports are cointegrated. Jain and Janesh Sami (2012) have studied the cointegration between exports and imports in Singapore and provided evidence for the long run equilibrium using ARDL bounds test. Contrarily, using ARDL bounds test, Narayan and Narayan (2005) studying the relationship for 21 least developed countries have concluded that exports and imports are cointegrated only for six out of the 22 countries, and the coefficient of exports is less than one. Arize (2002) used quarterly data for the period 1973–1998 from 50 OCED and developing countries to examine the same question. He found that for 35 of the 50 countries, there was evidence of cointegration between exports and imports; and 31 of the 35 countries had a positive export coefficient. There are other studies, which concentrated on studying the structural breaks using Gregory- Hansen methods (see Konya and Singh2008). The review of the empirical studies reveals the fact that there are not many country specific studies on the long run relationship between exports and imports and more so on Iran. The present study tries to fill this gap.

III DATA AND ECONOMETRIC MODEL

The data for the present study have been collected from World Development Indicators (WDI) and Trade Map, IMF for the period 1970-2010. The data on exports and imports are in dollar terms and have been transformed into their natural logarithms. With such data we can avoid hetrocedasticity problem and the coefficients of the regression models can be interpreted as elasticities. A bivariate cointegration methodology is used to investigate the hypothesized long-run equilibrium relationship between exports and imports of Iran and India. To make cointegration analysis sensible, it is necessary to examine the order of integration. This paper implements Augmented Dickey-Fuller (1981) and Phillips-Perron (1988) procedures for testing the presence of unit roots.

To explore long-run equilibrium relation between the series we use Engel-Granger method and apply VER procedure following Johansen (1991), and Johansen and Juselius (1990) to estimate
the cointegrating regression. If the Granger causality test confirms the existence of a
cointegrating relationship, the relevant error-correction term (ECT), obtained from the
cointegrating regression, must be included in the standard causality test. This helps avoid
problems of misspecifications due to omissions of relevant constraints. Due to its ability to
combine the long-run relationship with the short-run dynamics, Granger causality test within the
Vector Error-Correction Model (VECM) environment is preferable. The existence of
cointegration implies that unidirectional or bi-directional Granger causality exists. The usual $t$-
test is applied to the coefficient of the error-correction term, lagged by one period ($ECT_{t-1}$). A
significant $t$-statistic suggests long-run relationships, and a significant $F$-statistic for the joint test
suggests short-run causality. According to Engel and Granger representation, the two variables $Y$
and $X$, despite the fact that they are non-stationary in levels, are said to be co-integrated, if the
residuals from the cointegration regression are integrated of any order less than $d$. For instance, if
$[Y] \sim I (1)$ and $[X] \sim I (1)$, the residuals from the cointegration regressions of $Y$ on $X$ or $X$ on $Y$
have to be $I (0)$ in order to have co integration between $Y$ and $X$. Then there will be long run
equilibrium relationship between $Y$ and $X$. In the short run there may be disequilibrium between
actual value of $Y$ [or $X$] and long run equilibrium values. An Error Correction Model helps to
examine the presence of equilibrium or disequilibrium in the short run. Further, the estimate of
error correction term explains the extent of disequilibrium that can be corrected at each period.
How quickly disequilibrium can be corrected depends on the magnitude of the estimate of error
correction term. Therefore, the coefficient of the error correction term can also be interpreted as
the coefficient of speed of adjustment between short run dynamics and long run equilibrium
values.

In order to verify the causality between exports and imports, we follow a two-step procedure as
follows: The first step in causality investigation is to verify for the existence of a unit root in the
variables. Since many macroeconomic series are non-stationary, unit root tests are useful to
determine the order of the variables and, therefore, to provide the time-series properties of data.
In order to verify the presence of a unit root in variables, the popular ADF test and Philips-
Perron (PP) test have been employed.

The second step explores the causal relationship between the series. If the series are stationary,
then the standard Granger’s causality test should be employed. But, if the series are non-
stationary and the linear combination of them is stationary, the ECM approach should be
adopted. For this reason, testing for co-integration is a necessary pre-requisite to implement the
causality test. We have used Engel-Granger method for verifying the co-integration between
exports and imports. However, in the first step, ADF and PP unit root tests have been used to
verify the degree of integration between variables. Following Husted (1992) we have estimated
the following cointegration equations:

$$X_t = a_0 + a_1 M_t + e_t$$

Where, $X_t$ and $M_t$ are exports and imports respectively.

**IV. EMPIRICAL FINDINGS**

The unit-root test helps to identify whether a variable is stationary or not. The test also helps in
finding the order of integration at which the variables become stationary. These tests are
necessary to avoid spurious correlation between variables. Testing for the presence of unit root in the variables is the primary task before attempting cointegration. The augmented Dickey-Fuller and Philips-Perron unit root test values of the variables (both at levels and at their first difference) are presented in the following table:

Table 1: ADF and Philips –Perron (PP) Unit Root test

<table>
<thead>
<tr>
<th>variables</th>
<th>ADF Test statistics</th>
<th>PP Test statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>with constant</td>
<td>with constant and trend</td>
</tr>
<tr>
<td>Exports of India(XI)</td>
<td>0.2830</td>
<td>-1.0478</td>
</tr>
<tr>
<td>Imports of India(MI)</td>
<td>-1.26232</td>
<td>-3.0923**</td>
</tr>
<tr>
<td>Exports of Iran(XIR)</td>
<td>-3.0829**</td>
<td>-2.4871</td>
</tr>
<tr>
<td>Imports of Iran(MIR)</td>
<td>-2.5070</td>
<td>-2.5902</td>
</tr>
<tr>
<td>ΔXI</td>
<td>-3.6104*</td>
<td>-4.8150*</td>
</tr>
<tr>
<td>ΔMI</td>
<td>-4.1219*</td>
<td>-4.1272*</td>
</tr>
<tr>
<td>ΔXIR</td>
<td>-3.5031*</td>
<td>-3.7031*</td>
</tr>
<tr>
<td>ΔMIR</td>
<td>-4.8731*</td>
<td>-4.8489*</td>
</tr>
</tbody>
</table>

Note: *denotes rejection of the null hypothesis of non-stationarity at 1% ** at 5% significance level.

Tests for Cointegration

Initially, we have employed Engel-Granger procedure for testing for cointegration and estimating the error correction model. In the first stage, we have estimated the model is based on our equation:

\[ \ln \text{Exports}_t = b_0 + b_1 \ln \text{Imports}_t + e_t. \]

Where, \( b_1 = \frac{\partial \ln \text{Exports}_t}{\partial \ln \text{Imports}_t} \) = long run [static] percentage effect.

In the second stage, ADF test on residuals has been conducted based on the following equation:

\[ \Delta U_t = b_0 + b_{1t} \Delta U_{t-1} + b_3 \Delta U_{t-1} + e_t \]

Where, \( \Delta \) is the first difference operator. If ADF is significant, then exports and imports are cointegrated and the error correction model may be estimated as follows:

\[ \Delta \ln \text{Exports}_t = b_0 + b_1 \Delta \ln \text{Imports} + b_2 \text{EC}_{t-1} + e_t. \]

Where, \( b_2 = \text{Error Correction Term} \).

\( b_1 = \partial \Delta \ln \text{Exports}_t / \partial \Delta \ln \text{Imports} = \text{Percentage effect in short run} \)
b₂ = ∂Δ ln Exports₁ / ∂ ECₜ₋₁ = Proportion of disequilibrium in t-1 time period can be corrected t period by changes in Y.

ADF and Philips- Perron tests suggest that both exports and imports are integrated of order one, I(1) at their levels. This implies the non-stationary of the variables and we cannot use the OLS (ordinary least squares) estimation and apply the usual statistical tests to infer about the relationship between exports and imports. When the variables are non-stationary at the level, the relevant method is the cointegration as suggested by Johansen. And to infer the short run causality between variables we should use VECM methodology. The implementation of VECM involves the following steps:

1. Deciding the optimal lag length of the of the variables in VAR. Test for the number of cointegrating vectors using the trace statistics [λ_trace] and maximum Eigen value [λ_max statistics]. The λ_trace and λ_max statistics are used to determine whether the number of cointegrating vectors.

2. In λ_trace if H₀: r = 0, then H₁: r > 0. If the test result rejects the null hypothesis the indication is that there are cointegrating vectors and we proceed by setting r = 1 …2..in the null hypothesis until we fail to reject it. In λ_max if H₀: r = 0, then H₁: r =1.Rejecting the null hypothesis implies the existence of an exactly one cointegrating vector.

3. If there is cointegration, we run VECM and generate the long run cointegrating parameters which show the long run relation between the variables considered and adjustment coefficients which convey information about the speed of adjustment to long run equilibrium. This is accompanied with VEC diagnostic tests to ensure the adequacy of the model.

4. Conduct weak ergogeneity test to identify the dependent and independent variables using the results and construct the long run equation. Then generate error correction term (ECT) from the regression of the long run equation and formulate the Error Correction Model (ECM).

**Table 2: Cointegration between Exports and Imports: India and Iran (1970-2010): Engel-Granger Method**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cointegration Equation</th>
<th>ADF Statistic</th>
<th>PP Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports of India (XIₜ)</td>
<td>LnXₜ=-0.0197+ 1.0051lnMₜ (0.06027) (73.70909)</td>
<td>-2.8570*</td>
<td>-2.8537*</td>
</tr>
<tr>
<td></td>
<td>R² =0.99268</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.6675</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exports of Iran (XIRₜ)</td>
<td>LnXₜ=-4.5702+0. 0.8073 lnMₜ (1.9392) (8.0773)</td>
<td>-3.2240*</td>
<td>-3.2160*</td>
</tr>
<tr>
<td></td>
<td>R² =-0.6259</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DW =1.0755</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Figures in the parentheses are t values and * indicates Significance at five percent level
The results based on cointegration and error correction models suggest that the exports and imports of India and Iran are cointegrated. The positive and statically significant regression coefficient (table-2) indicates the long term relationship between these variables. The long run elasticity of exports with respect to imports of India has been estimated to be 1.00 and the elasticity of exports with respect to Iran’s imports is estimated to be 0.81. The results based on ECM model (table-3) suggest that the short run elasticity between exports and imports in India is 0.37 and for Iran it is 0.43.

We have also conducted the multivariate cointegration test suggested by Johansen using different lag lengths. However, the test statistics in terms of $\lambda_{\text{trace}}$ and $\lambda_{\text{Max}}$ could not provide any conclusive evidence. Hence, the present study confines to Engel-Granger method and provides some policy suggestions based on this method.

V. CONCLUSION AND POLICY SUGGESTIONS

The present paper aimed at studying the long run equilibrium relationship between exports and imports of India and Iran separately in order to verify the Husted (1992) hypothesis. For this purpose, Engel-Granger and Johansen’s methods of testing for cointegration have been used. The empirical evidence based on ADF and PP unit root tests illustrate that the aggregate exports and imports of India and Iran are stationary at the first difference level. The estimates based on Engel-Granger cointegration and error correction models suggest that the exports and imports of India and Iran are cointegrated implying the existence of long run equilibrium relationship between these variables in these countries during 1970-2010. The results based on error correction model based on $\Delta \ln$ exports and $\text{ECT}_{-1}$ suggest that there is a short run equilibrium as well, indicating that the changes in exports adjust to the changes in imports in the same year. There is disequilibrium between actual values of imports and equilibrium values of imports in the short run. However, thirty seven percent of disequilibrium between long run and short run periods is adjusted every year in India. While in Iran, forty three percent of disequilibrium is
adjusted every year. It implies that the present macro and trade policies have been effective in attaining long run equilibrium between exports and imports in these countries. In view of this finding it may be suggested that these countries should continue with their current trade and macroeconomic policies.

REFERENCES


