

# An Econometric Modeling for India's Imports and exports during 1971-2013

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## Abstract

The objective of the paper is to examine the relationship between India's imports and exports during the reference period 1971-2013 by employing the advanced econometric tools. The findings show that long run relationship between imports and exports in India. Moreover it suggests that short run fluctuations in between the variables are not sustainable during the long run. This recommends that India's foreign trade policies have been effective in equalizing the both during the long period.

**AMS Subject Classification:** 91B60 & 91B62

**Key Words:** Trade balance, unit root, Granger causality, Inter-temporal budget constraint

## 1 Introduction

India, as a developing country with open trade policy is highly depending on its foreign trade. If there is any changes in the trade will affect imports

and exports, finally economic growth. Over the last two decade and so, the relationship between imports and exports was very arguable issue among the developing economies. Disequilibrium between imports and exports implies that current account deficits are only short run period and as a result the equilibrium would be maintained in the long run.

The theme of whether there is a relationship between imports and exports in the long run has been examined for emerging and developed countries. Arize analyzed Quarterly data for the period of 1973-1998 for 50 OECD and developing countries to study the above subject. It was found that cointegration between imports and exports for 35 of 50 and 31 of 35 countries had positive sign.

Bahmani - Oskooee [2] observed the relationship between Australian exports and imports by employing co-integration and found that coefficient is close to unity, indicating that Australia's macro economic policy has been efficient in the long period.

Bahmani - Oskooee and Rhee [3] analysed cointegration between Korea's imports and exports by using quarterly data. They found same between the variables and also exports has a positive sign.

Tang [11] examined the relationship between imports and exports for ASEAN Countries but he found equilibrium only for Malaysia and Singapore but not for the Thailand, Philippines and Indonesia.

The paper is prepared as follows: Section two explains a background theory and econometric models. The penultimate part describes data and result analysis. Section four recommends conclusion.

## 2 Theoretical background

The Theoretical basis is an intertemporal balance model. This framework is taken from Husted [5] . He models the behaviour of the stock of external debt to determine whether a country's intertemporal budget constraint is

verified. The representative consumer's current period budget constraint at period 't' is given by

$$C_t = Y_t + B_t - I_t(1 + r_t)B_{t-1} \quad (1)$$

where  $C_t$ ,  $Y_t$  and  $I_t$  are consumption, output and Investment respectively;  $r_t$  is a one period world interest rate;  $B_t$  describes international borrowing available to the consumer, which could be positive or negative. Initial debt size is  $(1 + r_t)B_{t-1}$ .

$$B_t - B_{t-1} = r_t B_{t-1} - NX_t \quad (2)$$

where  $NX_t$  describes trade balance. In order to get a testable relation for the hypothesis of current account sustainability, Husted [5] makes several assumptions to derive a testable model, which is given by

$$EX_t = \alpha_0 + \alpha_1 IM_t + \Sigma_t \quad (3)$$

$EX_t$  and  $IX_t$  are exports and imports of goods and services and services plus net transfer payments plus net interest payments.  $\Sigma_t$  denotes disturbance term. Cointegration technique is used to analyze the relationship between or among the macro economic variables, which are include in the econometric model. Before checking Cointegration among the variables they must be fulfill the condition of stationary property. If the null hypothesis of no Cointegration is rejected, which means alternative hypothesis of Cointegration is accepted based on the comparison of computed and table values If Cointegration does not exist between variables the current account is vulnerable otherwise not. If there is evidence of relationship and if  $\alpha = 1$  the current account is not susceptible. If 1 falls below zero and above one , imports are increase more than exports and the sustainability hypothesis is rejected.

### 3 Data and empirical results

The study used annual data over the period 1971-2013 to estimate the equation (3) and they have been downloaded from RBI website and transformed

in to logarithms. To find the behaviour of India’s exports and imports, two curves have been plotted on a logarithmic graph for the period, (1971-2013) under consideration. Even though exports and imports drift apart from each other, they have natural tendency to move together in the long run period.

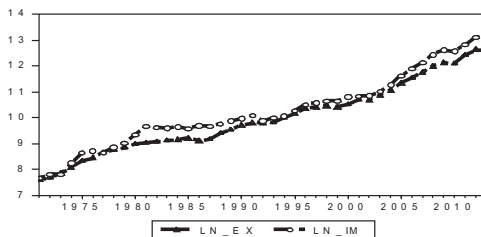


Figure 1: Trend of India’s exports and imports during 1971-2013

The stationary or non stationary can be tested applying the Augmented Dickey Fuller (ADF) test

$$(ADF)\Delta EX_t = a + bEX_t + \sum_{i=1}^{\gamma} C\Delta EX_{t-1} + \varepsilon_t \tag{4}$$

a, b and c are the coefficient to be estimated and where  $\varepsilon_t$  is selected such that  $\varepsilon_t$  is white noise. The tests are based on the null hypothesis is: Export is not  $I(0)$  and if the calculated Augmented Dickey Fuller statistics are less than the MacKinnon critical values, then the null hypothesis is rejected and the series are stationary or integrated order of one. The findings of the ADF test signify that the variables are found to be non stationary in raw form and found stationary when they are differenced first order. The calculated ADF test statistics are higher than the MacKinnon critical values. The results are recorded in the below table 1.

**Table 1: Results of unit root test for exports and imports**

Variables	Level		First Difference	
	Constant, No Trend	Constant, No Trend	Constant, No Trend	Constant, No Trend
EX	2.333	-1.590	-6.219**	-6.660**
IM	3.142	-1.805	-5.305**	-6.834**

\*\* indicates the rejection of the null hypothesis of non-stationary at 1% level of significance.

If the variables are stationary then there is a possibility of cointegration between the variables. So one can using Johanson and Juselius technique to

find out the relationship between same. If they do so it is possible to conduct the error correction model to capture the short run as well as long run relationships. Haikkio and Rush [6] found that more no frequency in the data will not provide any authentic results in the proposed model, irrespective of whether monthly or yearly data included. Hence, this study used 42 Observations (Annual data for the period of 1971-2013).

If two or more variables move together, causality exist between the variables in at least one direction, Engle and Granger [4]. Furthermore, if a trend component exists between variables, both of them will move together in the long run. Most of variables, which are non stationary, but when they joined together make a relationship and we can conclude data are said to be cointegrated. Cointegration technique which measures the evidence of long run relationship between or among the variables integrated in the same order. Since the order of integration of imports and are the same, the cointegration approach can be useful to examine whether exports and imports drift from each other arbitrarily in the long run. Non stationary variables of two said to be cointegrated if there exists a linear combination of the two series. For instance, by employing standard OLS regression technique, estimate the parameters of cointegration and calculate the residuals terms.

$$EX_t = \alpha_0 + \alpha_1 IM_t + U_t \quad (5)$$

**Table 2: Results of cointegration regression of exports and imports**

Variable	Coefficient	Std.Error	t.static	Prob.
EX	1.016666	0.011015	92.30168	0.0000
C	-0.441526	0.102929	-4.289631	0.0001

The above table shows, although the imports and exports are non stationary in raw form shows that imports and exports are cointegrated in the long run.

$$EX_t = -0.44 + 1.016IM_t + U_t$$

The variables may congregate towards an equilibrium path in the long run; they may diverge from equilibrium in the short run. Hence it is interpreted that as India not being violation of its international budget. The disequilibrium between short run and long run values in lagged year would be corrected quickly or slowly current year by changes in exports or imports. The residuals  $U_t$  from the cointegration regression are subjected to the stationary test based on the following equations.

$$(ADF)\Delta\varepsilon_t = \alpha + \beta_0\varepsilon X_{t-1} + \sum_{i=1}^k \beta_1 \Delta\varepsilon_{t-1} + V_t \quad (6)$$

where  $U_t$  is the residual from equation 5. The null hypothesis of non stationary is rejected if  $\beta$  is negative and the calculated ADF statistics is less than the MacKinnon [9] critical values, which means there is a long run stable relationship between the two variables and causality between them is tested by error correction model. On the other hand, if the null hypothesis of non stationary is rejected and the variables are not cointegrated then the standard Granger causality test is appropriate. The error correction model provides information about long and short run cointegration between the variables.

$$EX_t = -0.06 + 0.45IM_t - 0.11IM_{t-1} + U_t$$

The error correction model, estimated coefficient is negative and the calculated ADF statistics is less than the MacKinnon critical [9] values, which states that there is a long run stable relationship between the two variables. This indicates disequilibrium between the variables during short run and long run periods neither corrected nor extended to each period. Furthermore there is no disturbance is present, which implies bringing change in imports to adjust the exports in the same year. Hence there is a equilibrium between these two in the short run and long run as well. Though the error correction model provides enough information about short and long run behaviour of the variables, the study employed standard Granger causality test and the results are shown in table 3.

**Table 3: Results of granger causality test**

Direction of Causality	F Value	Decision
Exports $\rightarrow$ Imports	6.08	Reject
Imports $\rightarrow$ Exports	0.04	Do not reject

Note: The Null hypothesis in each case is that the variable under consideration does not "Granger Cause" the other variable.

If two variables are cointegrated, then causality must exist in at least one direction, Granger [4]. The result advocates that the direction of causality is running from exports to imports since the estimated F is statistically significant. On the other hand, there is no causality from imports to exports, since the F is statistically insignificant.

## 4 Conclusion

The important objective of the research is to study the long run equilibrium between India's exports and imports during the period of 1971-2013 by applying advanced econometric techniques. The result shows that the India's exports and imports will converge in the long run. Short run fluctuations in between the variables are not maintained in the long term period; imports and exports eventually move together towards an equilibrium state. This recommends that India's foreign trade policies have been effective in equalizing the both in the long term period.

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