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**CONTRIBUTIONS TO BOOKS**

- Sharma T., Kwatra, G. (2008) Effectiveness of Social Advertising: A Study of Selected Campaigns, Corporate Social Responsibility, Edited by David Crowther & Nicholas Capaldi, Ashgate Research Companion to Corporate Social Responsibility, Chapter 15, pp 287-303.

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# AGGREGATE IMPORT DEMAND AND EXPENDITURE COMPONENTS IN INDIA

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## ABSTRACT

*The behaviour of India's imports during the period 1970-2007 has been studied using disaggregated expenditure components of final demand. The four components of final demand under the study are private consumption, government expenditure, investment expenditure and export. The newly developed bound testing approach to co-integration has been applied to examine the long-run relationship between aggregate import demand and the expenditure components. The results reveals that there exists a long-run relation between India's import demand, and it expenditure components. Among four components of final demand, investment and export earnings have significant influence on aggregate import demand both in short-run as well as in long-run. Further, the import demand has been found to be sensitive to import-price changes. The present study also suggests that the impact of liberalization of the early 1990s had left it's positive but statistically insignificant impact on India's imports.*

## KEYWORDS
bound test, cointegration, import demand, relative prices, elasticities.

## JEL CLASSIFICATION CODE
F14, F40.

## INTRODUCTION

The external trade is a key determinant of economic growth and development for a country. For policy purposes, it is pertinent to know the determinants of aggregate import demand in India. The present study, to the best of our knowledge, is the first to use the recent disaggregated import demand formulation approach to study the behaviour of aggregate import demand in India. We use the disaggregated components of domestic income (i.e. final demand expenditure components) together with the standard relative price variable to specify the aggregate import demand model for India.

The use of the disaggregated components of final demand in estimating the aggregate import demand is a relatively recent research approach: different from the traditional approach which uses aggregated final demand, and the relative prices. Two advantages accrue from using the disaggregated import demand model over the traditional import demand model. The later implicitly assumes that the import contents of all expenditure components are identical. If this assumption does not hold, the use of a single demand variable would lead to aggregation bias. By disaggregating the final demand, the disaggregate model not only avoids the problem of aggregation bias, but also separate the effects of each component on import demand. Moreover, by avoiding aggregation problems, the disaggregate model has better forecasting powers than that of the traditional import demand model (Giovannetti, 1989).

## REVIEW OF LITERATURE

In this field, the pioneering study was made by Giovannetti (1989) for Italy. He estimated the effects of different components of total expenditure on aggregate import demand. Further, he concluded that the disaggregated model had a better fit, and had predictability power than that of the traditional model. Later, Abbott and Seddighi (1996) used this approach to estimate an import demand model for the UK. In his study, consumption expenditure had the largest impact on import demand followed by investment expenditure, and export expenditure respectively.

Mohammed and Tang (2000) had estimated the determinants of aggregate import demand for Malaysia over the period 1970-1998. The results indicated that all expenditure components had an inelastic effect on import demand in the long run. Expenditure on exports was found to have the smallest impact on the imports. They found a negative and inelastic relationship between relative prices and import demand. Mohammad *et al*. (2001) examine the long-run relationship between imports and expenditure components for five ASEAN countries (Malaysia, Indonesia, the Philippines, Singapore and Thailand) using the Johansen multivariate cointegration analysis (1990). In their study, the final demand expenditure has been split into three major components, viz. consumption, investment and export. The results reveal that import demand is cointegrated with its determinants for all five countries under consideration.

Min *et al*. (2002) estimated South Korea's import demand using the Johansen and Juselius approach for the period: 1963-1998. They found the evidence of long run elastic impact of final consumption expenditure on import demand, and the inelastic impact of export expenditure on import demand. However, the impact of investment expenditure was found it to be statistically insignificant with negative sign. Tang (2003) estimated China's import demand using the bounds testing approach to cointegration. In the long run, he found that the expenditure on exports had the biggest correlation with imports, followed by investment expenditure and final consumption expenditure respectively. The relative price variable bears the negative sign. In a study by Ho (2004), the import demand function for Macao was estimated using the quarterly data series over the period: 1970-1986. He applied the JJ-maximum likelihood method for co-integration. Among the different components of GDP, investment and export were found to be main determinants of aggregate import for this country. Narayan and Narayan (2005) have made an attempt on this area for Fiji. In their study, the three expenditure components of GDP are consumption, investment and export. They applied the bound test approach to co-integration using the sample period 1970-2000. All the regressors had been found to be significant both in short-run as well long-run. However, Fiji's import demand was inelastic with respect to all expenditure components.

Very recently, Agbola (2009) has made a study on this area for Philippines. The final demand was disaggregated into four components, viz, private consumption, government expenditure, investment and export. The sample period ranged from 1960 to 2006. He applied the Johansen's multivariate test for cointegration. The import demand was found to be inelastic both in short-run as well as long-run with respect to all expenditure components. In the long-run, government expenditure, investment and export are major determinants; while in the short-run, investment and export are major determinants of Philippines' import demand.

## IMPORTANCE OF THE STUDY

In the traditional import demand model, income and relative price are the main explanatory variables both for developed and developing countries (Ariz, 1990; Bahmani-Oskooee, 1998; Houthakker and Magee, 1969; Khan, 1974; Khan and Ross, 1977; Senhadji, 1998). The basic import demand model within the imperfect substitute framework is expressed in terms of real domestic income and relative import price (Goldstein and Khan, 1985). The disaggregation of income variable into different components of GDP has been made only in some recent research works.

## STATEMENT OF THE PROBLEM

There exist studies which examine the behavior of India's aggregate import demand using the traditional model (Dutta and Ahmed, 2006; Sinha 1996 etc.). However, from the surveyed of empirical literature for India, no study has been found that specifically estimates the disaggregate determinants of aggregate import demand. It is therefore logical for me to survey the existing literature that is directly relevant to the theme chosen for this study.

## OBJECTIVES

The main objective of the present paper is to study the existence of cointegration relationship between India's import demand and the components of aggregate final demand. Secondly, the present paper has made an attempt to estimate the long-run and short-run elasticities of India's import demands using the auto-regressive distributed lag (ARDL) framework. Thirdly, it quantifies the effect of trade liberation of the early 1990's on India's import demand. Finally, the paper tests the structural stability of the import demand function for India.

## ANALYTICAL FRAMEWORK

### THE MODEL

For the present study, the aggregate demand expenditure (GDP) is disaggregated into its components of private consumption expenditure (C), government expenditure (G), investment expenditure (I) and exports (X)). We specify the computable disaggregate import demand model as follows:

$M_t = a+ b.C_t + c. G_t + d.I_t + e. X_t +f. RPM_t + g.Dummy\text{-}92 + u_t.$ (1)

where, $M_t$ is the natural log of real imports of goods and services; $C_t$ is the natural log of real of the final consumption of private sector; $G_t$ is the natural log of real of the government expenditure; $I_t$ is the natural log of real expenditures on investment goods (i.e. sum of gross capital formation and change in inventory); $X_t$ is the natural log of real exports; $RPM_t$ is the natural log of relative import prices (ratio of import price index to domestic price index); and Dummy-92 is the dummy variable to capture the effect of trade liberalization policy taken in early 1990s. The dummy variable takes the values 0 for 1970-1991 and 1 for 1992-2007. $u_t$ is the i.i.d error term at period t. We expect the coefficients associated with the expenditure components (C, G, I and X) to be positive (i.e. b>0, c>0, d>0 and e>0). From the law of demand, an increase in import prices reduces demand for imports as imported goods become relatively more expensive Therefore, it is expected that the coefficient of import price relative to domestic price (f) will be negative.

## DATA AND METHODOLOGY

All equations are estimated using annual time series data for the period 1970 to 2007. The data series have been collected from IMF's International Financial Statistics-Yearbook, various issues. All variables have been transformed into their natural logs to manage the high magnitudes of the figures. In this studies, the bounds testing procedure has been applied to examine the co-integration relationship between import demand and its determinants. Unlike most of the conventional multivariate co-integration procedures, which are valid for large sample size, the bound test is suitable even for a small sample size (Mah, 2000).

Further, this approach does not push the short-run dynamics into the residual term as in the case of Engle- Granger (1987) technique (Pattichis, 1999).

### BOUND TEST APPROACH

Within the last two decades, several econometric techniques have been developed for testing the cointegration among variables. Among them, the most well-known techniques are Engle-Granger residual based test (1987), Phillip-Hansen Fully Modified test (1990), Johansen-Juselius maultivariate test (1990) and so on. However, one problem associated with the above mentioned tests is that variables within the model must be stationary at equal order of integration. Very recently, Pesaran et al. (2001) have developed one advanced test for cointegration using auto regressive distributed lag (ARDL) model. This method can be applied even when the variables follows the different orders of integration. We can derive a dynamic error-correction model (ECM) from the ARDL model through a simple linear transformation (Banerjee et. al., 1998). The error-correction term lagged by one period links the short-run phenomenon with the long-run one without loosing the long-run information. This approach considers the sufficient number of lag structure within a general-to-specific approach (Laurenceson and Chai, 2003).

Following this approach (Pesaran *etal,* 2001), the general specification of the model described in the following manner:

$DM_t = \alpha_0 + \beta_1 M_{t-i}+ \beta_2 C_{t-1} + \beta_3 G_{t-1} + \beta_4 I_{t-1} + \beta_5 X_{t-1} + \beta_6 RPM_{t-1} + \sum\gamma_1 DM_{t-i} + \sum\gamma_2 DC_{t-i}+ \sum\gamma_3 DG_{t-i} + \sum\gamma_4 DI_{t-i} + \sum\gamma_5 DX_{t-i} + \sum\gamma_6 DRPM_{t-I} + \delta\ Dummy\text{-}92 + u_t.$ (2)

Where, D represents the variables in difference form. In the above equation, the coefficients 'γ' represent the short-term dynamism while the coefficients 'β' represent the long-term mechanism.

In the second step, the long-run equation is derived from the restricted version of ARDL model (equation 2). Following Pesaran *etal* (2001), a conditional ARDL long-run model for import demand can be specified in the following manner:

$M_t = \alpha_1 + \sum \beta_1 M_{t-i}+ \sum \beta_2 C_{t-1} + \sum \beta_3 G_{t-1} + \sum\beta_4 I_{t-1} + \sum\beta_5 X_{t-1} + \sum \beta_6 RPM_{t-1} + \delta.\ Dummy\text{-}92 + u_t.$ --- (3)

Where, all variables are as previously defined. The lag length in the ARDL model is selected based on Akaike Information Criterion (AIC) and Schwarz Bayesian Ctriterion (SBC). Pesaran and Shin (1999) have recommended a maximum of 2 lags.

Finally, the error correction representation is estimated using the regression of variables in the difference form with the lagged error term (equation 4). The coefficient of one period lagged term reveals the speed of adjustment towards the long-run equilibrium when a shock affects the existing equilibrium situation.

$DM_t = \alpha_2 + \sum\gamma_1 DM_{t-i} + \sum\gamma_2 DC_{t-i}+ \sum\gamma_3 DG_{t-i} + \sum\gamma_4 DI_{t-i} + \sum\gamma_5 DX_{t-i} + \sum\gamma_6 DRPM_{t-I} + \delta\ Dummy\text{-}92 + \mu\ ecm(-1)+ u_t.$ --- (4)

## RESULTS & FINDINGS

### UNIT ROOT TEST

I employ the augmented dickey-fuller (ADF) test for unit root. I perform the ADF test both with intercept and no trend, and with an intercept and trend. The test assumes the null hypothesis of non-stationarity or unit root of the time series against the alternative hypothesis of stationarity.

**TABLE 1: ADF-STATISTICS UNIT ROOT TEST**

| Variables | Level/First Difference | Without Trend | I (r) | With Trend | I (r) |
|---|---|---|---|---|---|
| LM | Level | 1.137 | I (1) | -1.346 | I (1) |
| | First Difference | -5.034 | I (0) | -5.686 | I (0) |
| LC | Level | 1.487 | I (1) | -1.297 | I (1) |
| | First Difference | -6.380 | I (0) | -7.309 | I (0) |
| LG | Level | 0.024 | I (1) | -3.686 | I (0) |
| | First Difference | -4.835 | I (0) | -4.778 | I (0) |
| LI | Level | 1.603 | I (1) | -0.227 | I (1) |
| | First Difference | -4.867 | I (0) | -5.316 | I (0) |
| LX | Level | 1.498 | I (1) | -0.653 | I (1) |
| | First Difference | -4.386 | I (0) | -4.897 | I (0) |
| LRPM | Level | -3.072 | I (0) | -2.924 | I (1) |
| | First Difference | -4.784 | I (0) | -4.813 | I (0) |

Notes:

(1) 95% Critical value for ADF statistics without trend = − 2.940.

(2) 95% Critical value for ADF statistics with trend = − 3.531.

(3) I(r): r is the order of integration.

Table 1 shows that the estimated value of ADF-statistics without trend in absolute terms does not exceed the critical one for all variables in level form implying non-stationarity in data series, except import price variable. The estimated value of ADF-statistics with trend in absolute terms does not exceed the critical one for all variables in level form implying non-stationarity in data series except government expenditure. On the other hand, all the variables under consideration are found to be stationary in first difference form as revealed by the ADF-statistics both with or without trend.

**BOUND TEST RESULTS**

In the bound testing approach to cointegration, at first, the null hypothesis of zero restriction on all lagged variables in the model is tested using F-statistics. Under the null hypothesis, there does not exist any long-run equilibrium relationship in the model as mentioned in equation 1. The F-statistics has the asymptotic distribution which is non-standard. Pesaran et.al (2001) have derived the critical values of F-statistics as lower as well as upper bound. If the calculated value of F is greater than the upper value of F-statistics, then the null hypothesis of no-cointegration is rejected. On the other hand, if the calculated value of F is lower than the lower value of F-statistics, then the null hypothesis of no-cointegration is accepted. Finally, if the calculated value of F lies between lower and upper bound of critical values, then the decision is in-conclusive. The results of the bound test show that the India's import demand and the expenditure components are well co-integrated (Table.2). As the tabulated value of F-statistics is greater than the critical value at 1 per cent significant level, the hypothesis of cointegration is accepted for the present model. In other words, there exists a long-run relationship between India's import demand and GDP components.

**TABLE 2: BOUND CO-INTEGRATION TEST***

| Critical values (intercept+ no trend) | Lower Bound: I(0) | Upper Bound: I(1) |
|---|---|---|
| 90 per cent level | 2.08 | 3.00 |
| 95 per cent level | 2.39 | 3.38 |
| 99 per cent level | 3.06 | 4.15 |
| Calculated F-Statistics (Dependent variable: aggregate import demand): F (M / C, G, I, X, RPM) = 4.528* | | |

*Note: Critical values of F-statistics are extracted from Pesaran, Shin and Smith (2001), table C1,Case II, page-T-1.

**ELASTICITIES OF AGGREGATED IMPORT DEMAND**

As the import demand function is cointegrated with it's determinants, we proceed to estimate equation (3) for long-run elasticities. The results have been derived from the ARDL approach to cointegration using the Micro-fit software (Pesaran and Pesaran, 2002). The results of the ARDL model depends on the order of the distributed lag function. Akaike Information criterion has been selected for this purpose. The optimal number of lags for each of the variables is shown as ARDL (1,1,0,0,0,1,0).

**TABLE 3: LONG-RUN ELASTICITIES OF AGGREGATE IMPORT @**

| Dependent variable: M; Period: 1970-2007 | | |
|---|---|---|
| Regressors | Elasticity | 't'-Statistics' |
| C | -1.066 | -1.048 |
| G | 0.236 | 0.603 |
| I | 0.812 | 3.795* |
| X | 0.828 | 2.975* |
| RPM | - 0.936 | - 5.777* |
| Dummy-92 | 0.128 | 1.196 |
| Intercept | 1.814 | 0.674 |

@ Note: (1) ARDL Model (1,1,0,0,0,1,0) is based on Akaike Information Criterion, (2) all the variables are expressed in logarithm terms; and measured in real quantity except the relative price and (2) *: significant at 5 % significant level.

Table 3 shows the long-run elasticities of import demand with respect to different components of GDP, and other regressors. Among the different components of GDP, investment and export are the major determinants of India's aggregate import demand in the long-run. Both the variables are statistically significant at 5 percent significance level. The results reveals that 10 percent increase in investment and export would increase India's aggregate import by 8.1 percent and 8.2 percent respectively. Although the elasticity with respect to government expenditure is positive, it fails to be statistically significant. On the other hand, the coefficient of private consumption expenditure is negative, and statistically insignificant. This result is not consistent with the economic theory. However, the similar kind of unexpected result with respect to private consumption was found by Tang (2005) for South Korea. One possible reason behind it may me attributed towards the significant growth in domestic production of import-substitutes as consumer goods (Bahmani-Oskooee & Niroomand 1998, p.102).

The elasticity of import demand with respect to relative import price is highly significant; although inelastic in nature. According to the Marshall-Lerner condition, to make the policy of devaluation to be successful, the sum of price elasticities of export and import demand in absolute term must be greater than unity (Salvatore 1993, p. 465). Although, the study has not estimated the export price elasticity, the sizable value of import price elasticity (-0.936) suggests that the Marshall-Lerner condition likely to be satisfied. Finally, the coefficient of dummy variable is positive, but fails to be statistically insignificant. This implies that the trade liberalization programme taken in 1990's has little effect on India's import. The similar kind of result has also been found by Dutt and Ahmed (2005).

The short-run elasticities have been estimated from error correction model (Table 4). As in the long-run, the major determinants of India's import demand are investment and export in the short-run also. However, the elasticities of import demand with respect to those expenditure components are smaller in short-run than that in the long-run. Ten percent increase in investment and export would lead 4 percent increase in import demand in the short-run. The elasticity with respect to import price bears expected negative sign, and statistically significant. Ten percent increase in relative import price would bring down India's import demand by 8 percent. The dummy variable, although positive, is statistically insignificant. The performances of private consumption and government expenditure are the same as found in the long-run.

**TABLE 4: SHORT-RUN ELASTICITIES BASED ON ERROR-CORRECTION MODEL**

| Dependent variable: DM; Period: 1970-2007 | | |
|---|---|---|
| Regressors | Elasticity | 't'-Statistics' |
| DC | -0.052 | -0.114 |
| DG | 0.145 | 0.617 |
| DI | 0.497 | 3.753* |
| DX | 0.488 | 3.113* |
| DRPM | -0.837 | -8.312* |
| Dummy-92 | 0.078 | 1.311 |
| Intercept | 1.111 | 0.716 |
| ecm (-1) | -0.612 | -4.432* |
| $R^2$ = 0.825; Adjusted $R^2$ = 0.769; DW=1.774; F-Statistics (7,30) =18.932. | | |

@ Note: (1) all the variables are expressed in logarithm terms; and measured in real quantity except the relative price. (2) *: significant at 1 % significant level.

The co-efficient of error correction term lagged by one year measures the speed of adjustment at which import demand adjusts to changes in the explanatory variables. The estimated coefficient of this term is negative, and statistically significance at one percent level confirming the model to be stable at equilibrium. The medium value (-0.612) of this term reveals that the model would converge towards equilibrium by 0.61 percent within a year.

We have also carried out some diagnostic tests to judge the model perfection (Table.5). The calculated statistics have been verified in terms of LM-version. It shows that residual terms are serially independent as revealed by Lagrange multiplier test. Ramsey's RESET test suggests the model to be functionally well behaved. The chi-square test shows that the error terms are normally distributed. The error terms are homoscedastic as revealed by Jarque-Bera test.

**TABLE 5: DIAGNOSTIC TESTS FOR AGGREGATED IMPORT**

| Test Statistics | LM Version |
|---|---|
| A.Serial Correlation | CHSQ(1)= 0.490 |
| B.Functional Form | CHSQ(1)= 1.952 |
| C.Normality | CHSQ(2)= 2.101 |
| D.Heteroscedasticity | CHSQ(1)= 1.038 |

A:Lagrange multiplier test of residual serial correlation
B:Ramsey's RESET test using the square of the fitted values
C:Based on a test of skewness and kurtosis of residuals
D:Based on the regression of squared residuals on squared fitted values

The estimated value of adjusted R-square shows that 76 percent variation in the India's import is explained by the regressors of the model. In addition, the plot of actual and fitted values confirms that the model captures the historical database very well (Figures 1 & 2). Further, the diagrams for stability test both in terms of cumulative sum of recursive residuals (CUSUM) and cumulative sum of square of recursive residuals (CUSUMQ) confirm that the parameters of the model are quite stable over the sample period ((Figures 3 & 4).

**FIGURE 1: LONG-RUN TREND OF AGGREGATE IMPORTS**

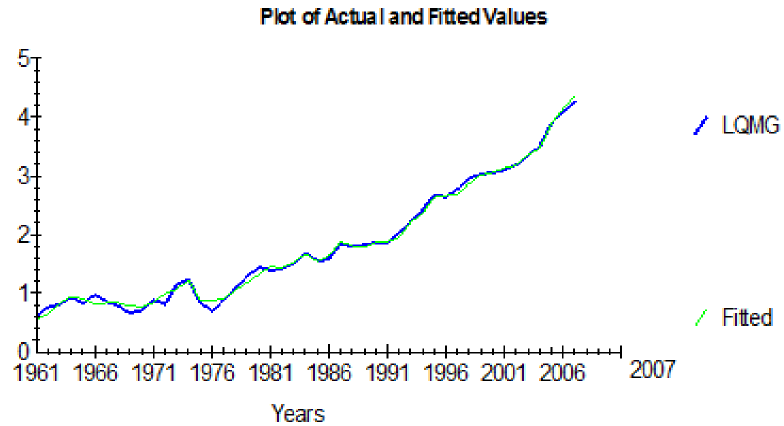



**FIGURE 2: SHORT-RUN FLUCTUATIONS OF AGGREGATE IMPORTS.**

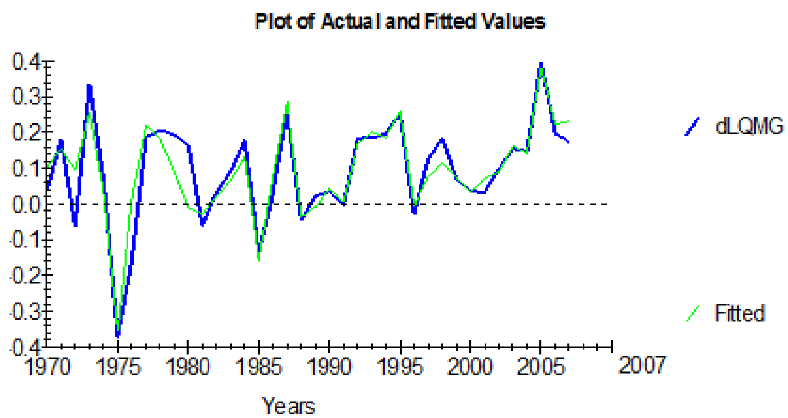



**FIGURE 3: CUSUM STATISTICS FOR DEMAND OF AGGREGATE IMPORTS.**

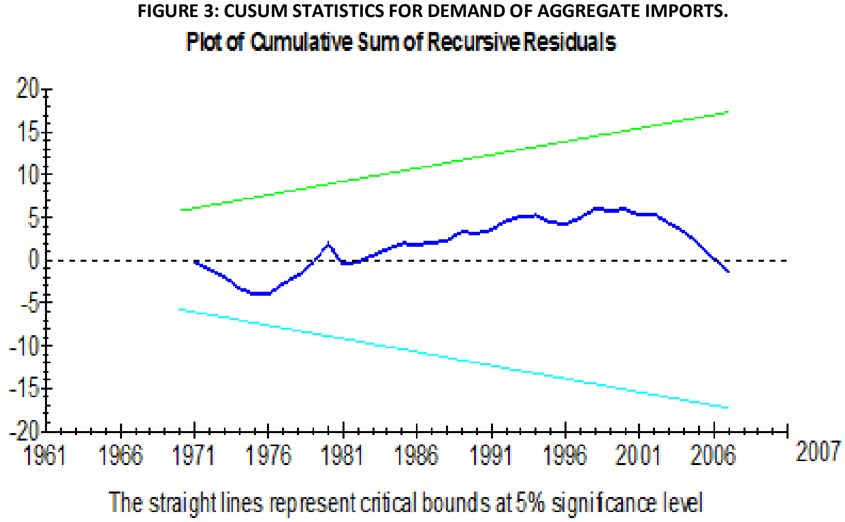
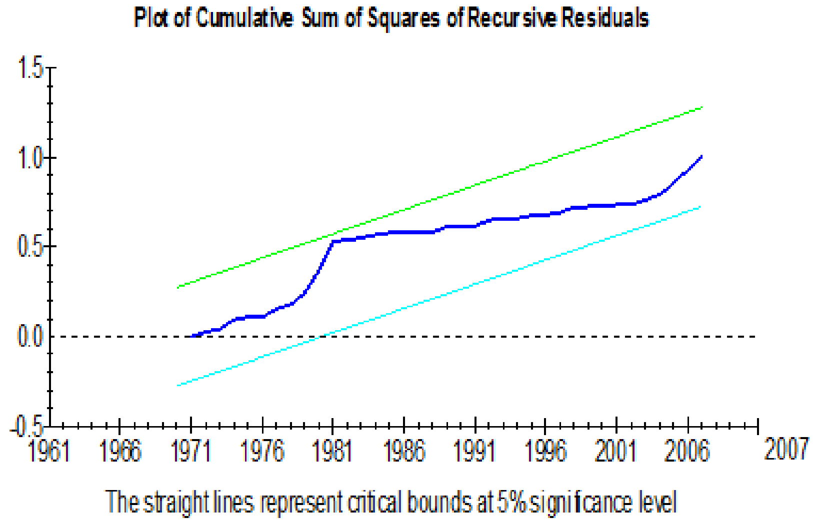


FIGURE 4: CUSUMQ STATISTICS FOR DEMAND OF AGGREGATE IMPORTS




## SUMMARY & CONCLUSIONS

The main objective of present paper is to find the long-run relationship between aggregate import and expenditure components for India. The recently developed bound test mechanism has been applied to find the long-run relationship between aggregate import demand and expenditure components of GDP, viz. private consumption, government consumption, investment and exports of goods and services. Among different components of expenditures, the elasticity of import demand with respect to exports is highest. It is well known that the share of manufactured items in India's total export basket is very high. As the manufactured items have high import contents, higher economic growth via the present export promotion strategy would imply higher growth in imports; resulting higher deficit in trade balance. Therefore, the policy makers have to use the effective exchange rate policy to tackle the disequilibrium situation in the current account of India's balance of payment. Policy makers should adopt the strategies for the development of capital-goods industries which would be competitive in terms of price and quality.

Heien (1968) has argued that for the effectiveness of devaluation "for a country, a value of the price elasticity between -0.5 and -0.10 is necessary to ensure the success of exchange rate depreciation". In other words, the relative price plays a significant role for the success of devaluation policy as a way to correct trade imbalance (Reinhart 1995; p.291). As the estimated value of import price elasticity in the present study lies between the range as suggested by Heien, it can be infer that the policy of devaluation likely to be successful for correcting the disequilibrium in the balance of payment for India.

The present rate of high inflation would keep pressure on import demand as the value of the price elasticity for import demand is fairly high (near unity). If the policy makers are seriously concern about the high deficit in the trade balance, then they should follow the fiscal and monetary policies with stronger impact on expenditures for exports and investment than private or government expenditure. In sum, the disaggregated demand model of this paper provides us a complete picture of the determinants of India's aggregate import demand. Further, this model can be used for the forecasting purposes as well.

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