ESTIMATED IMPORT DEMAND FUNCATION FOR PAKISTAN: A DISAGGREGATED ANALYSIS

Imran Ullah Khan Marwat[1]

ABSTRACT

The theme of the study was to estimate the elasticity of aggregated and selected disaggregated import demand function with relative prices and income for Pakistan from 1982 to 2011 on annual data. The most effective estimation tool was used (Auto-regressive Distributed Lag ARDL) by employing the Bounds Test method and Error Correction Modeling (ECM) techniques. The Un-restricted Error Correction Model (UECM) ARDL to calculate the long run elasticity of import while the short term dynamics is estimated through restricted ECM. In this research, aggregated import demand and disaggregated import demand commodities groups were made. Petroleum, Chemical, Manufacturing Goods and Machinery and Transport Groups are response variables whereas Gross Domestic Product (GDP) and Relative Prices variables are treated as explanatory variables. The disaggregated analysis of above mentioned various commodities groups are conducted in order to identify the fundamental drivers of import demand and to design fiscal and economic policy accordingly. The results indicated that at aggregated level, import demand with respective relative prices is elastic whereas it is inelastic with income in the long run. At disaggregated level, import demand with relative prices of machinery and transport group is elastic only while it is inelastic with income level in all selected disaggregated imports demand in long run. Furthermore, all import demand models are statistically significant having expected association and are stable in long run. In sort run aggregate import demand, petroleum and chemical groups are statistically significant while manufacturing goods, machinery and transport groups are insignificant. Furthermore all alternate hypotheses were accepted.

Key words: ARDL, Disaggregate Import Demand, Relative Prices, Income level

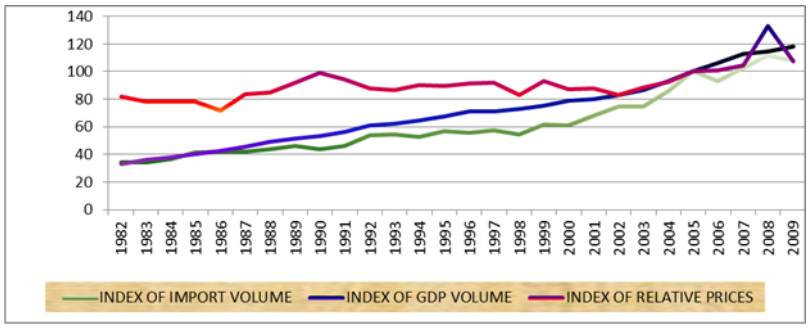
INTRODUCTION

It is evident that in most developing economies (Graphs in Appendixes) such as Pakistan, policy designers prefer to have a deficit in the external sector so as to grow at a swift pace. On the other hand, having an external deficit may drive the nation towards un-sustainability. So it is essential to have deep knowledge about the determinants, direction, sensitivity and intensity of balance of trade. Since independence, Pakistan has enormous trade deficit because increase of imports is much greater as compared to increase an export, (Graph: 1 shows the trend). In reference to the overview of Pakistan's economy in the last 3 decades, it is seen that average contribution of import is roughly 17% of GDP whereas exports share is 11%. Consequently the trade deficit, for the mentioned period, is around about 6%. At the same time, import share in GDP soars to 17 percent while the export growth in GDP is not up to the mark. Due to these facts, estimation of import demand elasticity got a lot of concentration from policy designer in order to deal with exchange rate management and external sector sustainability.

[1]Imran Ullah Khan Marwat is AML analyst, AML unit, Complines and Data Division, Askari Bank

The reason behind the rapid import growth is mounting domestic demand because of economic growth, changing life standards and energy crises. Pakistan long term economic development depends upon machinery and equipment and capital goods which are useful for economic

Graph 1: Improt / GDP/ Reletive Price



progress. From the last decade, the electricity load shedding is also skyroketing. As a result of these factors industrial raw materials, capital goods, automobiles and crude oil imports share have inceased drastically. Economic growth is strongly associated with import growth especially petroleum, chemical, machinery technical know- how and manufactured goods which are used as input for production of industrial goods.

From the last few decades, import bill is soaring for engineering goods and a majority of this involves by high value automobiles imported by rich people, instead of the imported of large capital goods. Thus it is essential to analyze each sector and group of commodities of import separately and identify whether they are necessities or luxuries. Therefore, this study is conducted to know the driving factors of commodities import demand at disaggregated level and aggregate level in order to suggest the possible solution for policy purpose.

Foreign trade policy of any economy is based on price and income elasticities of both imports and exports. Imports construct vital impact on domestic consumption and production as well, therefore, it is essential to be proficient to know, which factors influence it and what type of policy for external economic regulation will assist in improving its structure and volumes. Subsequently, the customs and tariff policy and exchange rate regulation create crucial impact on competitiveness of national producers and consequently the prospect of replacement of the foreign goods and services by domestic ones.

Secondly, a long run macroeconomic strategy (fiscal or monetary) policy can be planned for various components of imports by categorizing any long run association between disaggregated import demand and its factors, particularly macro tool of end demand. Estimated price elasticity can be exploited for policy making i.e. Import tariff and exchange rate policies which can be used by fiscal and monetary authorities to manage the Balance of Trade instability.

Due to free trade and globalization, significant changes in economy structure of any country can have an impact on policy decisions and economic structure of other trading partners. Imports also have a vital impact on domestic consumption and production as well. Therefore it is essential to know the intensity, direction and influencing determinants of import demand function, especially for a country like Pakistan which has broaden the trade deficit.

The research problem is:
How relative prices affect imports; To which extent economic growth affect trade volume? What kind of economic policies should be implemented for reducing trade deficit?. The purpose of this study to examine to which extent the relative price and income variable determines the demand for imports (both at aggregated and disaggregated level) for economy of Pakistan in order to suggest the possible solution for policy purpose.

LITERATURE REVIEW

According to the literature, the estimation of currency depreciation effects on the current account can be determined with the help of factors of trade flows. The effects of real devaluation on the trade balance of any economy can be estimated by the following methods: i) Trade balance ii) Elasticities. In econometrics, the elasticities method is depended on the estimation of export and import demand determinants. In most of research, import (export) volumes were regressed on real income, effective exchange rate and relative prices. Subsequently estimation of import and export determinates is followed by the economic inferences. For example, Marshall-Lerner-(Robinson) Condition states that devaluation or depreciation of any economy currency will significantly impact on its balance of trade improvement only if the absolute sum of the long-term import and export demand elasticities exceeds the unity i.e. $| I ?+ | X | > 1$. This indicates that ultimate impact on the trade balance to be determined by price elasticities. Further, if imported commodities demand is more elastic than total import expenditure will decline.

According to Junz H. and Rhomberg R. (1973) and other empirical studies, trade in goods in the short term tends to be inelastic because some time is required to transform the trade contracts and consuming patterns. However in the long run, trade balance improves because consumers will gradually adjust with the new prices. This phenomenon is called the J-curve effect. Theoretically, income elasticities are expected to have positive direction while and price elasticities tend to be negative. This means that the import volume will swell as domestic real GDP surges and will decrease as the relative import price rises. In economics, its important assumption for perfect elasticities of export and import supplies that to limit our attention to demand side only.

Harrod and Hague (1963) states that for any economy the increase in individual or corporation demand for imports comprises of collective demand of import. In theory, this is viable to include casual demand of income elasticity for Imports, however it is rare be like that, as imports needs arises when local consumption exceeds over the national production, income elasticity of imports would be pessimistic when local supply is greater than the local consumption. The importance of devaluations of currency for improving trade deficit has been mostly highlighted by various research papers. Bahmani-Oskooee and Niroomand (1998), Tang (2002, 2004) ,Moazzami and Wong (1988) observe whether the Marshall-leaner condition for devaluation to be an successful approach of sinking trade deficits, is fulfilled through estimating export demand and import demand function analyzed for many economies.

Tang (2005), which based on Korea's estimated import equations summarize that devaluation of currency could recover Korea's trade imbalance based on the criteria recommended by Heien (1968).

Generally, Gross Domestic Product is used instead of national income because it is a significant macro-economic variable. Conversely, numerous research recommend substitute variables. Giovannetti (1989) disaggregate GDP into final expenditure, expenditure on investment, expenditure on exports and expenditure on consumption. According to him, every expenditure factor has a different impact on the demand of Import. Senhadji (1998) demonstrate that perfect macro-economic variable as (GDP -Exports) but not the GDP only. Various empirical researches reveal that fundamental import demand determinants are Gross Domestic Product (GDP) and Relative Prices (RP).Apart of this some studies utilize RP and final expenditure components, for example public and private consumption expenditure, export and investment expenditure, as explanatory variables for import demand elasticity estimation. According to Giovannetti (1989) private and government consumption expenditure have dissimilar impact on import demand function. Tang (2002) and Funke and Nickel (2006) also have similar views.

With the passage of time, the estimation techniques have drastically changed. Previously Ordinary Least Square (OLS) method was used for estimation which is based on single equation. According to Granger and Newbold (1974) if the data is not stationary then OLS technique results in spurious regression. In order to overcome the problem Johansen Juselius (1990) and Engle Granger (1987) introduce co-integration estimation techniques. Presently, the Error Correction Method (E.C.M) is mostly used to estimate the long term and short term elasticities of the co- integration exists. For the Fiji economy, Narayan and Narayan (2005) applied the co-integration technique, in order to determine long term association between volume of import and relative prices and domestic income variables from 1970 to 2000 on yearly data. They concluded that increase in relative prices decrease the import volume while domestic income have positive relationship with import demand. Import demand elasticity with domestic income variable was elastic and highly significant which indicate that boost in growth will be like adding fuel to fire for import demand.

Relative price and income elasticity of foreign trade for 21 economies is estimated by Carporale and Chui (1999) by using ARDL approach on 32 annual observations. The estimation verifies that import demand has co-integration relationship with income and relative prices. The end result was that swift growing economies have lower import elasticities but have high income elasticities of exports. In empirical studies, for short run and long run elasticity estimation ECM is mostly employed if there is co-integration among the variables. In order to estimate the economic relationship in long term, Inder (1992) preferred Unrestricted Error Correction Model (U.E.C.M) as compare to other estimation methods. The reason behind this is that U.E.C.M estimate is accurate even if the variables are endogenus. Alam and Ahmed (2010) explored that ECM combined long run stability with short run dynamics, has no effect on data carrying long run information. According to Mah (2000) some popular estimation techniques for instance Johansen and Juselius (1990), Johansen (1988) and Engle and Granger (1987) Two Step Methods are not reliable for research having small sample size. Kramers et al (1992) proved that if variables having integrated order one e.g. I (1) than co-integration association can't be established for small sample size.

Elasticities of import demand are estimated by two ways e.g. at aggregate level and at disaggregated level. For Bangladesh mutual trade Wijeweera et al. (2008) assessed income and relative price elasticites on dis-aggregated data set. Their research prove that income factor have no major impact on import demand. Which indicates that for Bangladesh economy imported services and goods are not luxuries but are necessities. For Pakistan economy Rehman (2007) reported the similar findings at aggregated import demand. Sarmad and Mahmood (1985) elaborate that disaggregate import demand is the key driver for policy related decision such as changes in the level of domestic taxes, tariff and exchange rate management. Further, it's also help in changes on employment and production level in particular industries and sectors by estimating the effect of relative prices changes. According to Mayumi (2005), each product group has a different magnitude, attributes and intensity which would respond differently to environmental changes, domestic demand and relative price.

Research Gap

There are numerous empirical papers available on aggregate import demand while research studies on disaggregate import demand are limited especially in the Pakistani economy context. It's essential to analyze each sector of economy in isolation because every sector/group has unique features, magnitude, direction and determinants. Therefore, it's crucial to estimate import demand function for each commodities groups independently and suggest the possible measures for policy purpose accordingly.

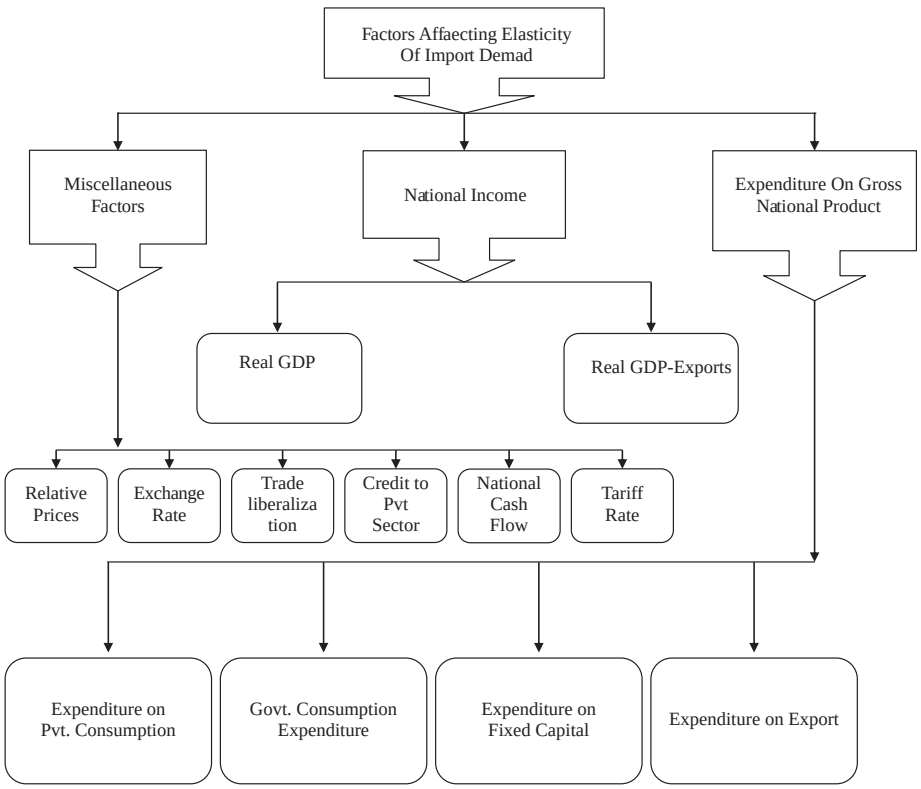
For Pakistan economy, there are many studies which attempt to determine the import demand functions. The table in Appendix indicates that all researchers except Sarmad and Mahmood (1985) and Ahmed (2011) estimated Import demand for Pakistan at aggregated level. Sarmad and Mahmood (1985) estimate the determinants of both disaggregate and aggregate import demand for Pakistan economy and finish off with result that utilize log linear model is the best functional form for import elasticity estimation. They explore that import demand at disaggregated level is essential for measuring the impact of different factors of import and helps in policy making decisions such as devaluation of currency, tariff and demand control etc. As per our knowledge, Sarmad and Mahmood's (1985) research is the first attempt to estimate the disaggregated import demand function (by using different commodities groups) for the Pakistani economy. It was great effort but some researchers have reservations over their study. In reference to their study, Syed (1985) commented, that there is problem in data transformation and model specification. This study is based on only 15 year data which leads towards small sample size bias. Furthermore, they utilize inefficient estimation techniques which require replication with latest econometric estimation methods.

As per our information Ahmed (2011) research is the second endeavor for Pakistan disaggregated import demand function estimation (by using different commodities groups). He exploited the Johansen Juselius co-integration techniques for long run relationship investigation. We know form empirical researches that most economics variables are I (1) for which co-integration relationship can't be established with study small size .He only elaborate the long term elasticities while short term elasticities estimation remain a question mark. Apart from this Ahmed's (2011) researched on a based on small sample so there is question mark on reliability of results.

This research work endeavors to improve upon the earlier research of aggregate import demand functions of Pakistan by estimating disaggregated import demand elasticities. This research is different from other research of import demand estimation conducted in Pakistan. A disaggregated import commodities groups i.e. Petroleum, Chemical, Transport and Machinery and Manufactured goods are analyzed. ARDL approach is used because according to Pesaran and Shin (1999) it is efficient for small sample size.

THEORITICAL FRAMEWORK

From the earlier mentioned empirical studies, the below mentioned theoretical framework diagram is designed.



The above diagram shows that there are numerous determinants which have impact over elasticity of import demand; however national income and expenditure component are mutually exclusive.

From the Theoretical frame work, we have developed the conceptual framework after reducing numerous variables due to complexity of model, non-availability of proper data and insignificant coefficients.

CONCEPTUAL FRAMEWORK

The conceptual framework consists of the following dependent and independent variables.

Dependent Variable

Aggregated Import Demand Function

This factor comprise of total imports demand of principle goods of Pakistani economy which consist of all imported commodities groups as well as services groups.

Disaggregated Import Demand Function

The determinant embrace the selected import demand commodities groups (Petroleum, Chemical, Manufacturing and Machinery and Transport groups) in individual capacity.

Independent Variables

Gross Domestic Product

The relationship between GDP and import demand function is positive which mean that swell in domestic income will boost the import demand both at aggregate and disaggregate level.

Relative Prices

The relative prices and import demand function are inversely proportional to each other which mean that decrease in relative prices will raise import demand both at aggregate and disaggregate level.

Research Hypothesis

Following are the alternative research hypothesis:

H_1 Relative prices are inversely proportional to aggregated import demand function.

H_2 Relative prices have negative relationship to selected disaggregated import demand commodities group.

H_3 Income level boosts the aggregated import demand in positive direction.

H_4 Income level is directly proportional to selected disaggregated import demand commodities group.

H_5 Among the variables there is co-integration relationship i.e. (H_3: $\varphi_2 \neq \varphi_3 \neq 0$)

H_6 After shock, the speed of adjustment is converging towards equilibrium i.e. ECM coefficient <0

RESEARCH METHODOLOGY

Pesaran et al (2001) deployed a comparatively modern unconventional method for co-integration analysis. The technique is Auto Regressive Distributive Lag (ARDL) by utilizing Bound Test (BT) for co-integration analysis. Pattichis (1999) reveal that compare to Engle and Granger co-integration; UECM method has superior statistical properties because it does not impose any restriction on long term stability and short term estimation. Similarly Alam and Quazi prove that Bounds test method is also effective even in the presence of endogenous regressor.

This study is based on small sample size as it has 30 annual observations. In order to check variables integrated order, we have conduct Augmented Dickey-Fuller (ADF) test .In second step co-integration is verified through Bounds test which is developed by Pesaran et al (2001). In case of co-integration existence, we have deployed U.E.C.M of ARDL in order to estimate the long term coefficient.

Data Sources

For this research, we have utilize the annul time series data from 1982 to 2011 which is based on 2000-2001=100. Due to non-availability of comprehensive monthly and quarterly data on GDP volume and GDP deflator annual series data is used. All the data is taken from Pakistan Bureau of Statistics (PBS) except the GDP which is taken from World Bank (WDI). In this study import demand is the ratio of volume of import at current prices and Unit value of import, while GDP at current level is used proxy for income level and Relative Price is the ratio of Unit value index of import and GDP deflator.

Model

This research follows the model exploited by Baluch and Bukhari (2012) which as:

$$Import_{Demand} = f(Relative\ Price, Income) \qquad (1)$$

Most of the researcher, for instance Salas (1982) and Khan and Ross (1977) preferred to use Log liner model compare to Linear Model. Gujrati (1985) also endorse the usage of log liner model. According to him log transformation reduces the problem of Hetroskedasticity. Similarly, Raijal et al (2000),Doroodian et al (1994) and Sinha (1997) states that log linear transformation is efficient comparatively.

By taking natural log the equation (1) can be expressed as:

$$lnM_t = \varphi_0 + \varphi_1 lnRP_t + \varphi_2 lnY_t + \varepsilon_t$$

Where t =1, 2, 3……30 (2)

All the variable are in the natural log form. M is the sign of import demand at real prices whereas RP represent the Relative Prices of import , Y is symbol of real gross domestic product at current prices and show the error term.

We expect negative association between import demand and relative price whereas positive relationship between income level and import demand is anticipated.

Long run estimation of Pesaran et al (2001) ARDL (a, b, c) specification for aggregated import and disaggregated imports can be obtained by transforming the equation (2) as:

Aggregate Imports

$$\Delta lnM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i} \Delta lnRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i} \Delta lnY_{t-i} + \sum_{i=0}^{c} \alpha_{3i} \Delta lnM_{t-i} + \varphi_1 lnRP_{t-1} + \varphi_2 lnY_{t-1} + \varphi_3 lnM_{t-1} + \varepsilon_t \quad (3)$$

Petroleum Group Imports

$$\Delta \boldsymbol{lnPM_t} = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i} \Delta \boldsymbol{lnPRP_{t-i}} + \sum_{i=0}^{b} \alpha_{2i} \Delta \boldsymbol{lnY_{t-i}} + \sum_{i=0}^{c} \alpha_{3i} \Delta \boldsymbol{lnPM_{t-i}} + \boldsymbol{\varphi_1 lnPRP_{t-1}} + \boldsymbol{\varphi_2 lnY_{t-1}} + \boldsymbol{\varphi_3 lnPM_{t-1}} + \varepsilon_t \quad (4)$$

Chemical Group Imports

$$\Delta lnCM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i} \Delta lnCRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i} \Delta \boldsymbol{lnY_{t-i}} + \sum_{i=0}^{c} \alpha_{3i} \Delta lnCM_{t-i} + \varphi_1 lnCRP_{t-1} + \varphi_2 lnY_{t-1} + \varphi_3 lnCM_{t-1} + \varepsilon_t \quad (5)$$

Manufactured Goods Imports

$$\Delta \boldsymbol{lnMM_t} = \boldsymbol{\alpha_0} + \sum_{i=0}^{a} \boldsymbol{\alpha_{1i}} \Delta \boldsymbol{lnMRP_{t-i}} + \sum_{i=0}^{b} \boldsymbol{\alpha_{2i}} \Delta \boldsymbol{lnY_{t-i}} + \sum_{i=0}^{c} \boldsymbol{\alpha_{3i}} \Delta \boldsymbol{lnMM_{t-i}} + \boldsymbol{\varphi_1 lnMRP_{t-1}} + \boldsymbol{\varphi_2 lnY_{t-1}} + \boldsymbol{\varphi_3 lnMM_{t-1}} + \boldsymbol{\varepsilon_t} \quad (6)$$

Machinary And Transport Groups Imports

$$\Delta \boldsymbol{lnMTM_t} = \boldsymbol{\alpha_0} + \sum_{i=0}^{a} \boldsymbol{\alpha_{1i}} \Delta \boldsymbol{lnMTRP_{t-i}} + \sum_{i=0}^{b} \boldsymbol{\alpha_{2i}} \Delta \boldsymbol{lnY_{t-i}} + \sum_{i=0}^{c} \boldsymbol{\alpha_{3i}} \Delta \boldsymbol{lnMTM_{t-i}} + \boldsymbol{\varphi_1 lnMTRP_{t-1}} + \boldsymbol{\varphi_2 lnY_{t-1}} + \boldsymbol{\varphi_3 lnMTM_{t-1}} + \boldsymbol{\varepsilon_t} \quad (6)$$

In the above equations, $\triangle$ is the sign of 1st difference $(\Delta X = X_t - X_{t-1})$ of variables. We will deploy the bound test in order to know the co-integration. $\alpha_1, \alpha_2 and\ \alpha_3$ are the coefficient of short run estimation while $\varphi_1, \varphi_2 and\ \varphi_3$ coefficient represent the long run estimation. The (a, b and c) indicates the lag length of ARDL which is assessed through Akaike Information Criterion (AIC).Before estimating the elasticities lag length specification is essential. Pesaran and Shin (1999) recommend maximum 2 lags for annual data.

To find long term relationship Bound test utilize the F statistics (Wald test). No co-integration null hypothesis is verified with help of F statistics (Joint significance) by utilizing the ARDL UECM in equation (3) exclusive of difference lagged variables.

$$H_0: \varphi_1 = \varphi_2 = \varphi_3 = 0$$

(Among the variables there is no co-integration relationship)

$$H_a: \varphi_1 \neq \varphi_2 \neq \varphi_3 \neq 0$$

(Co-Integration is present among variables)

Pesaran et al (2001) provides the F statistics critical values for verifying the mentioned hypothesis and Narayan (2005) updated it especially for small sample size. Asymptotic critical value for the Bound Test is provided by "Pesarn et al." (2001), which comprise of 2 bounds: Upper Bound (UB) and Lower Bound (LB).UP supposing that variable is I (1) while LW suppose I (0). However if computed F value lay outside instated of UP and LW limit, the null hypothesis of co-integration is fail to accept deprived of any information of the order of integration. On the other hand if it falls within bounds then it is essential to have knowledge regarding the rank of integration prior to final any conclusion about the rejection or acceptance of Null hypothesis. According to Baluch and Bukhari (2012) if F statistics drop between lower bond and upper bond than in this situation no conclusive assumption to be made regarding the co-integration relationship. And in such case ECM term significance of ECM will provide guide about the co-integration relationship.

Bardsen (1989) explore that, from the mentioned (equation 3,4,5,6 and 7) ARDL Un-restricted Error Model the long term relative price and income component elasticities can be obtained by

$$-\left(\frac{\varphi_1}{\varphi_3}\right) \text{ and } -\left(\frac{\varphi_2}{\varphi_3}\right) \text{ respectively.}$$

Where $\beta_1 = -\left(\frac{\varphi_1}{\varphi_3}\right), \beta_2 = -\left(\frac{\varphi_2}{\varphi_3}\right)$ deduced from equation (3, 4, 5, 6 and 7) respectively.

The ECM is calculated as:

$$ecm_t = M_t - \beta_1 RP_t - \beta_2 Y_t \quad (8)$$

$$ecm_t = PM_t - \beta_1 PRP_t - \beta_2 Y_t \quad (9)$$

$$ecm_t = CM_t - \beta_1 CRP_t - \beta_2 Y_t \quad (10)$$

$$ecm_t = MM_t - \beta_1 MRP_t - \beta_2 Y_t \quad (11)$$

$$ecm_t = MTM_t - \beta_1 MTRP_t - \beta_2 Y_t \quad (12)$$

Restricted ECM of ARDL (a, b and c) is deployed for capturing the short run elasticity which can be defined as:

Aggregate Imports

$$\Delta lnM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i}\, \Delta lnRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i}\, \Delta lnY_{t-i} + + \sum_{i=0}^{C} \alpha_{3i}\, \Delta lnM_{t-i} + \gamma ecm_{t-1} + \omega_t$$

Petroleum Group Imports

$$\Delta lnPM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i}\, \Delta lnPRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i}\, \Delta lnY_{t-i} + + \sum_{i=0}^{C} \alpha_{3i}\, \Delta lnPM_{t-i} + \gamma ecm_{t-1} + \omega_t$$

Chemical Group Imports

$$\Delta lnCM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i}\, \Delta lnCRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i}\, \Delta lnY_{t-i} + + \sum_{i=0}^{C} \alpha_{3i}\, \Delta lnCM_{t-i} + \gamma ecm_{t-1} + \omega_t$$

Manufactured Goods Imports

$$\Delta lnMM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i}\, \Delta lnMRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i}\, \Delta lnY_{t-i} + + \sum_{i=0}^{C} \alpha_{3i}\, \Delta lnMM_{t-i} + \gamma ecm_{t-1} + \omega_t$$

Machinary And Transport Groups Imports

$$\Delta lnMTM_t = \alpha_0 + \sum_{i=0}^{a} \alpha_{1i}\, \Delta lnMTRP_{t-i} + \sum_{i=0}^{b} \alpha_{2i}\, \Delta lnY_{t-i} + + \sum_{i=0}^{C} \alpha_{3i}\, \Delta lnMTM_{t-i} + \gamma ecm_{t-1} + \omega_t$$

The short term estimation is, which provided by the coefficient of difference lagged variables, is congregating towards the equilibrium point and we are expecting that γ to be negative. Actually the coefficient of ECM value and sign measures the velocity of correction or divergence to or from stability point after a shock. The negative value indicates the convergence while the positive value of ECM coefficient shows the divergence from equilibrium point. If the "γ" is significant than its signal for short term relationship and it's also further strengthen existence of long term co-integration among the variables.

Model Diagnostics Tests

In order to verify the validity of the assumptions and analyzing the coefficients short run and long run and stability, we have applied ARCH test for hetroskedasticity, Ramsay Rest test, cumulative sum (CUSUM), Serial correlation LM test, cumulative sum of squares (CUSUMSQ) and normality test.

RESULTS

From empirical studies we reach on the consensus that every research having time series data, initiated with verifying the variables stationarity. ADF test is utilized for checking unit root problem in the data under this study. The Table 1 shows the detail of each variable whether it's integrated order of zero or one. We can see that all variables are I (1) e.g. integrated order of one. Pesaran et al (2001) insist that the response variable should be I(1), on the other hand explanatory variables may be either I(0) or I(1) for estimation of Unrestricted ARDL-ECM. Therefore bound test application pre-condition is satisfied.

We have selected lag length 2 on the foundation of minimum AIC in accordance to General to Specific approach. The estimated long run elasticities (equations 3,4,5,6 and 7) of Unrestricted ECM-ARDL (2, 2, and 2) and short term dynamics (equations 13,14,15,16 and 17) of Restricted ECM-ARDL (2, 2, 2) are given below. For long term the calculated F- Statistics of all models that is greater than the upper bound of bound test at 10 % level of significance which indicates the long run stability of coefficients. Other model fitness and diagnostics test results are also up to mark .The mentioned models details, its Goodness of fit and diagnostic test are reported in Appendixes.

Table 1: ADF Unit Root Test Result

	At Level				At First Difference			
Variable	Prob.	Intercept	Trend	Lags	Prob.	Intercept	Trend	Lags
M	0.5390	YES	NO	0	0.0035	YES	NO	0
PM	0.3315	YES	NO	0	0.0226	YES	NO	2
CM	0.5810	YES	NO	2	0.0000	YES	NO	1
MM	0.4628	YES	NO	0	0.0000	YES	NO	0
MTM	0.1700	YES	NO	0	0.0000	YES	NO	0
RP	0.9437	YES	NO	1	0.0000	YES	NO	0
FRP	0.0764	YES	NO	0	0.0000	YES	NO	0
PRP	0.9996	YES	NO	2	0.1639	YES	NO	2
CRP	0.6430	YES	NO	0	0.0002	YES	NO	1
MRP	0.4806	YES	NO	0	0.0004	YES	NO	0
MTRP	0.1026	YES	NO	0	0.0000	YES	NO	0
Y	0.7841	YES	YES	0	0.0055	YES	YES	1

Critical value is P= 0.05 at 5 % level of significance. Prob. stands for probability value

Table 2: Long Run Import Demand Elasticities for Pakistan for period 1982-2011

Import Demand Category	Relative Price	Income	F -value	P-Value (F-Stat)	R2
Aggregated imports	-3.18	0.93	6.34*	0.00	0.74
Petroleum groups imports	-0.08	0.19	7.83*	0.00	0.74
Chemical groups imports	-0.55	0.32	11.40*	0.00	0.73
Manufactured goods groups imports	-0.13	0.32	6.71*	0.00	0.53
Machinery and Transport groups imports	-2.11	0.66	20.43*	0.00	0.90
Average	-1.21	0.48			

*Critical value is P= 0.05 at 5 % level of significance. P stands for probability value.

Table: 3

Short run Import Demand Elasticities for Pakistan for period 1982-2011

Import Demand Category	ECT	P -Value (F-Statistic)	F-Value	R2
Aggregated imports	-0.27	0.01	3.96*	0.42
Petroleum groups imports	-0.64	0.00	7.01*	0.56
Chemical groups imports	-0.91	0.01	4.42*	0.45
Manufactured goods groups imports	-0.54	0.10	2.23	0.29
Machinery and Transport groups imports	-0.48	0.11	2.13	0.27

*Critical value is P= 0.05 at 5 % level of significance. P stands for probability value.

Aggregate Imports

Long run elasticity of overall imports demand with relative prices and income is shown by:

$$\boldsymbol{M_t = 1.19 - 3.18RP_t + 0.93\,Y_t}$$

The UECM ARDL estimated coefficients indicate that relative price is highly elastic, significant and contributing to overall import demand is high. One percent increase in relative prices will reduce aggregated imports up to 3.2 percent on average. On the other hand income is inelastic with respective aggregate import demand and one percent rise in GDP will enhance the overall import averagely by 0.93 percent in long run. The direction of both variables is according to economic theory. Rashid et al (2010) and Ahmed (2011) also estimate roughly similar result for Pakistan import demand at aggregated level.

The short run elasticities are captured through restricted ECM ARDL.Table #3 shows that error correction term (ECT) is significant and its coefficient is -0.27, which reveals that 27 % of de-stability rise from external shock at current time will be corrected in coming time period. The sign of ECT is accordance with expectation.

Petroleum Group Imports

The below given regression result show of Petroleum Groups import demand long run elasticity with respect to relative price and income component.

$$\boldsymbol{PM_t = 2.65 - 0.08PRP_t + 0.19\,Y_t}$$

The petroleum import demand elasticity coefficient with relative price is very low and inelastic

but have expected direction, which show that imports of fuel is essential for economic growth and it's not much sensitive with increase of price level. For fuel relative prices, Ahmed (2011) is reported the same estimation. However the petroleum import demand elasticity with income level has moderate impact on fuel import bill comparatively.

The short term petroleum import demand elasticity coefficient (ECT) is -0.64 and which is highly significant. It shows that high speed of correction in instability after external shock. Hence it further verifies the long run stability of model.

Chemical Group Imports

If we see the below long run elasticities of Chemical group imports, it reveals that coefficient of relative price is comparatively high with respect to income component.

$$\boldsymbol{CM_t = 1.92 - 0.55 CRP_t + 0.32 Y_t}$$

In long run one percent increase in relative price will decrease the chemical import demand by 0.55 percent whereas one percent rise in income level will enlarge the chemical imports by 0.32 percent only. For chemical group imports demand both coefficients of relative price and income are inelastic in long run. For short run elasticity if we overlook the ECT coefficient it's -0.91 and statistically highly significant. Thus speed of adjustment after external shock is pretty vigorous in short run.

Manufactured Goods Imports

For this commodity group's long run elasticities is given by:

$$\boldsymbol{MM_t = 0.26 - 0.13 MRP_t + 0.32 Y_t}$$

Manufactured goods import demand elasticities for both relative price and income are inelastic. Coefficient of relative prices is restively low but its relationship direction is according to economic theory. It shows that increase in relative prices will not key impact on the imported manufactured goods in long run. Conversely GDP component is significant and have moderate coefficient comparatively e.g. one percent swell in income will enhance the imported manufactured goods demand by 0.32 percent in long run. The ECT coefficient value is -0.54 but manufactured goods import demand elasticities for relative prices and income are insignificant in short run as reported in Table # 3.

Machinary And Transport Groups Imports

The below given relationship show the long term elasticities of the mentioned import group.

$$\boldsymbol{MTM_t = 1.69 - 2.11 MTRP_t + 0.66 Y_t}$$

If we overview the elasticity coefficients of all commodities groups, machinery and transport import demand elasticity coefficients have high values after the aggregate import demand elasticity coefficients. One percent increase in imported machinery and vehicles prices will shrink the imported machinery and vehicles demand by 2.11 % in long run on average. Similarly one percent rise in GDP will boost the machinery and vehicles import demand averagely by 0.66 % in long run.

According to Table #3, for this group error correction coefficient is around about -0.48 but statistical insignificant. Which indicates in short run machinery and transport import demand model is not stable and it don't impact very much.

CONCLUSION

The study highlights the impact of relative prices and income level on (both aggregate and selected disaggregates commodities groups) demand of imports for Pakistan. Relevant empirical studies were reviewed in order to get insight. ADF test is utilized to know the variables order of integration the result of which designates that all variable are stationary at order one e.g. I (1). Study is based on small data span, so we deployed the most robust co-integration technique Bounds test (ARDL), as it is efficient in such situation because for small sample size when variables I (1) co-integration relationship can't be established through other estimation methods. Imports demand (both at aggregate and disaggregate level) and for its determinants long term relationship and short term elasticities are estimated pursuing General to Specific method on the basis of AIC lag length criteria. ARCH test for hetroskedasticity, Ramsay Rest test, cumulative sum (CUSUM), Serial correlation LM test, cumulative sum of squares (CUSUMSQ) and normality test verified that models are stable in short run and long run.

Table #2 and 3 indicates that all the null research hypotheses are rejected so in turn we accepted the alternative hypotheses. Hence it's proved that relative prices have inverse association with both aggregated and selected disaggregated import demand function. Similarly, rise in domestic income has boost the import demand both at aggregate and disaggregate level is evidenced. Also, the F statistic value in Table# 2 validate that Co-Integration is present among variables. Overall, for both aggregated and disaggregated imports demand and for its determinants, existence of stable and significant long run relationship is ascertained.

In the long run, Aggregate Imports Demand and Machinery and Transport Group Imports Demand with relative prices are elastic i.e. -3.18 and -2.11 respectively. Although, for other imports commodities groups demand are inelastic with relative prices; especially Petroleum Groups import demand elasticity with relative price is very low i.e. -.08, which reveals that petroleum products imports has not another alternative and it's the necessities which is essential for the economic growth. That's why petroleum group is not much sensitive with increase of price level. On the other hand income level, measured by GDP, for all imports demand functions (both at aggregate and disaggregate level) is inelastic and statistically significant in long run. However, for Aggregate and Machinery and Transport Group imports demand elasticities coefficients with income is comparatively high i.e. 0.93 and 0.66 respectively. This is a very significant finding which discloses that for the Pakistani economy, imported services and goods are not luxuries but are necessities.

Similarly, in short run aggregated Imports, Petroleum and chemical group's imports are statistically significant whereas manufactured goods and machinery and transport groups import demand are statistically insignificant which make sense as both of these commodities groups requires some time to transform the trade contracts and consuming patterns. Junz H. and Rhomberg R. (1973) and other empirical studies reported the same findings in the short run. Further, the ECT term for all imports demand is negative (reported in Table#3) which is according to our expectations and economic theory. Hence, there is a strong evidence to reject the null hypothesis 6 and accept the alternative hypothesis (H6). Additionally, finding of this research grasps policy implication for both fiscal as well as for monetary authorities.

RECOMMENDATIONS/ POLICY IMPLICATIONS

From the results it's clear that aggregate import demand with respect to relative price is much more elastic. Therefore the policy should be designed to encourage, develop and give incentives to domestic industries e.g. Tax rebates to import substitution industries especially for Manufacturing, transport and chemical sectors in order to reduce the trade deficit. Exchange rate tool can't be used for reduction of trade deficit because Heien (1968) suggest for that, the import demand elasticity with relative price should be in the range of -0.5 and -1, as the mentioned elasticity have the mixture trend at selected disaggregated level and at aggregate level its -3.10 .

Apart from this, finding of the study would also be beneficial for the fiscal authorities with reference to revenue collection side. As aggregate imports with relative prices is elastic, therefore duties and Tax on imports can be also deployed to narrow the gap of trade deficit especially on chemical, machinery and transport groups. Thus, it would not be helpful in curtailing current account deficit only but will also support in rapid economic growth and narrowing the trade deficit.

Gap For Future Research

Further research can be conducted to analyze the impact of all Commodities imports and Services imports demands elasticities separately on final expenditure components and relative prices data of non-tradable verses tradable instead of using proxies.

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