Exchange Rate Volatility and Pakistan's Bilateral Imports from Major Sources: An Application of ARDL Approach

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Abstract

The aim of the present study is to investigate the effect of exchange rate volatility as well as some important explanatory variables on Pakistan's bilateral import from her major trading partner countries: USA, UK, Japan**,** Saudi Arabia, UAE, Germany and Kuwait- during 1982Q1 to 2008Q2. The study has two main objectives: first is to examine whether bilateral import elasticities are significantly different among external suppliers. If this is true, the different policies for each trading partner should be prepared and implemented instead of a single trade policy to decrease imports and ultimately improve trade balance. Second objective is to fill the research gap about the said issue particularly for developing countries. The results suggst that income elasticities are all significant but different in magnitude and exchange rate volatility is negative and statistically significant for Pakistan's bilateral import from UK in the long run.

Keywords: Bilateral import, Exchange rate volatility, Income elasticity, Relative price, Real effective exchange rate, ARDL approach.

1. Introduction

Many empirical studies investigated the impact of exchange rate volatility on international trade flows. The main perception following these studies is that an increase in exchange rate volatility tends to generate uncertainty which may have a negative impact on trade flows. In contrast to previous work, which is primarily concerned with exports, the current study tends to estimate the impact of exchange rate volatility on demand for bilateral imports for Pakistan, using bilateral import data from major external sources of Pakistan. Pakistan has been facing massive trade deficit for the several decades as the imports have been growing much faster than the modest growth of exports. During the last decade domestic demand expanded because consistent economic growth increased the level of investment in due course increased the country's imports demand. Long-term economic growth of Pakistan depends on the imports of capital, machinery and petroleum products that speed up economic productivity. With the structural change in Pakistan, the share of imported capital goods, machinery and industrial raw materials are continuously increasing.

However, the effectiveness of any country's import policy mostly depends on the magnitude of import elasticities with respect to income, price, exchange rate and volatility of exchange rate, but the current policies will not be more effective unless they have ability to meet the various import elasticities of major suppliers' countries. Therefore main objective of the present study is to examine whether bilateral import elasticities are significantly different among external suppliers. If this is true, the different policies for each trading partner should be prepared and implemented instead of a single trade policy to decrease imports and ultimately improve trade balance. For policy perspective, it is important because trade policies based on aggregate import elasticities might be deceptive, if bilateral import elasticities are different from those of aggregate import demand model.

The objective of the present study is to investigate the effect of exchange rate volatility on Pakistan's bilateral import from her major trading partner countries- USA, UK, Japan**,** Saudi Arabia, UAE, Germany and Kuwait- during 1982Q1 to 2008Q2. The selection of the countries is justified by the fact that Pakistan's imports from these countries comprise a significant portion of its total imports to the developed world. In 1982, Pakistan's imports from

these seven countries accounted for 65 percent of world total imports (See table 1). In 2008, Pakistan's imports for selected countries accounted for 42 percent to the world total imports (Direction of Trade Statistics, various issues). Pakistan's imports from selected countries have been remaining greater than 40 percent of the world total during the study period. The reason for sample period started from 1982Q1 is the exchange rate regime changed from fixed to managed floating exchange rate.

The present empirical study differs from previous research for Pakistan in various dimensions. First, it is the pioneer study for Pakistan, which uses exchange rate volatility as an important determinant of import demand. All previous studies for Pakistan estimated traditional import demand functions with income and price elasticities of import demand. Second, it is the first bilateral import demand function for Pakistan. Third, the study used longer sample period covering 106 quarterly observations as compare to previous import demand functions estimated for Pakistan, such as Sinha (1997a) covered 24 observations, Sarmad (1989) 27 observations, and Afzal (2001) 30 observations. Fourth, it employed ARDL approach to detect long- as well as short-run impact of exchange rate volatility on aggregate demand for imports. The previous studies for Pakistan and for other Asian developing countries in the region did not employ this approach in the said area of research.

Fifth, it used real effective exchange rate (Note 1) to construct the measures of exchange rate volatility. According to Pelinescu (2006), "*the real effective exchange rate (REER) measures the changes in the competitiveness of a country by taking into account the changes in the relative prices between the countries involved*". A growth in the level of this indicator implies a loss of competitiveness. Finally, the study uses GARCH process for estimating volatility of real effective exchange rate. Any previous study did not employ this process to estimate volatility of exchange rate to determine the import demand for Pakistan and developing country in the region. The structure of this paper is organized as follows. The next section discusses the empirical literature on import demand function for selected Less Developed Countries (LDCs) and developing countries as well as studies about bilateral import demand function. Section 3 presents the theoretical framework for import demand. Section 4 presents econometric techniques and variable information. Section 5 discusses the empirical finding and finally, section 6 concludes this paper.

2. Review of the empirical Literature

A vast number of empirical studies have been investigated the major determinants of import demand function for LDCs as well as developing countries. In the international literature, the conventionally used import demand functions has been analyzed in many different studies for several decades, including Khan (1974) for 15 developing countries, Arize and Afifi (1987) for 30 developing countries, Bahmani-Oskooee (1998) for six less developed countries, and Sinha (2001) for five Asian countries. Besides, there have also been many country-specific studies, such as Dutta and Ahmad (1999) for Bangladesh, Tang (2002) and Sinha (1996) for India, Tang and Mohammad (2000) for Malaysia, Raijal *et al*. (2000) for Nepal, Sinha (1997b) for Thailand.

The previous studies for Pakistan such as Sarmad (1989) estimated import demand function for Pakistan during the period 1959-60 to 1985-86 using a general approach and did not deal with the issue of stationarity of the variables. Sinha (1997a) estimated import demand function for Pakistan, performed stationarity and residual based cointegration technique developed by Engle Granger (1987) on annual time series data for the period 1970-1993. Afzal (2001) estimated import demand function for Pakistan using simultaneous equation model, by employing Ordinary Least Square (OLS) and Two Stage Least Square (2SLS) techniques covers the period from 1960 to 1999. However, Afzal (2001) also does not tested for the stationarity of the data. Moreover, the earlier studies for Pakistan used small sample of annual time series data and did not used volatility of exchange rate as a determinant of import demand. There are only few studies, estimated empirically import demand function for Pakistan, using bilateral trade data, such as Akhtar and Malik (2000) estimated bilateral price and income impacts on Pakistan's trading performance with its four major trading partners [USA, UK, Germany and Japan]. Using quarterly data for the period 1982-1Q to 1996-4Q applied three stage least square technique. Their results indicate income elasticity of imports from USA and Japan is in a close range of unity. For UK and Germany it is positive and small but statistically not significant.

There are only few studies which investigate the impact of exchange rate volatility on import demand with traditional income and price elasticities in case of developing and less developed countries. For example, Bahmani-Oskooee (1996) estimated import and export demand functions for seven developing countries (Brazil, Greece, Korea, Pakistan, Philippines, Thailand and Turkey), using quarterly data for 1975-1985. He found that exchange rate volatility did have an adverse effect on the imports of Greece, Pakistan and South Africa, while domestic income and relative price variables have expected signs in case of all sample countries. Bahamani-Oskooee and Payesteh (1993) estimated import demand function for six less developed countries (Greece, Korea, Pakistan, Philippines, Singapore and South Africa). They found that income elasticities of most of the countries are significant and have expected positive sign while exchange rate volatility has negative and significant

effect on imports of Pakistan, Philippines, Singapore and South Africa. A recently published study Alam (2009) estimated the effect of exchange rate volatility on imports demand in Pakistan using real gross domestic income as domestic demand, real effective exchange rate as a measure of external competitiveness and exchange rate volatility as a measure of risk. By employing VAR & VECM approach, study found that exchange rate volatility has negative and significant effect on Pakistan's imports demand for the period of 1980Q1 to 2005Q4. A more recent study Alam and Ahmed (2010) investigated the effect of exchange rate volatility on aggregate imports demand using real gross domestic income, relative price of imports, real effective exchange rate and exchange rate volatility, by employing ARDL approach covering the period 1982Q1 to 2008Q2; found that exchange rate volatility has negative but insignificant effect on aggregate imports demand in Pakistan.

The majority of studies use time series analysis, based on aggregate trade flows. Only few studies found that investigated the impact of exchange rate volatility on bilateral imports. Cushman (1986) found mixed results concerning the impact of exchange rate volatility on US import demand using bilateral time series data for the major trading partners of the USA. Caporale and Doroodian (1994) used monthly data for the period 1974-92; they found that exchange rate volatility has a significant negative effect on US imports from Canada. McKenzie and Brooks (1997 and 1998) also included exchange rate volatility variable into import demand function for both Australian and German trade flows to United States America. For the Australia to US trade, they found a significant but weak relationship between volatility and trade. Mckenzie (1998) investigated the impact of exchange rate volatility on Australian bilateral export and import to USA, Japan, Germany, Hong Kong, New Zealand, Singapore and the UK for the period 1988Q1 to 1995Q4. It also estimated the impact of exchange rate volatility on Australian sectoral export and import. Mckenzie (1998) found that out of fourteen bilateral import equations eight provided a positive and six negative coefficients on exchange rate volatility variable, and none of them is statistically significant, while aggregate import equation provided a negative and significant coefficient on exchange rate volatility.

3. Theoretical Consideration and Model Specification

To investigate the impact of volatility in the exchange rate, a bilateral import demand function for Pakistan from the major sources of imports could be specified as:

$$ln\ M_{it} = \alpha_o + \alpha_1\ lnY_t + \alpha_2\ lnRPM_{it} + \alpha_3\ lnREER_t + \alpha_4\ lnV_t \quad + u_t \tag{1}$$

Where:

M_{it} Real bilateral import demand for Pakistan to country i at time t.

Y_t Real Income or real gross domestic product of Pakistan at time t, expected sign is positive, because increase in real income, increases domestic demand for imports.

PRM_{it} Relative price of imports at time t proxies as Pakistan's unit value index of imports (UVIM) divided by the Pakistan's CPI (expected sign negative)

$REER_t$ Real Effective Exchange rate at time t (expected sign +)

V_t Real Effective Exchange rate volatility indicator at time t. However, the effect of exchange rate volatility is ambiguous, depending on traders' attitude to risk. If traders are risk-neutral, uncertainty in exchange rates may be an additional opportunity to increase profits and thereby enhances overall trade flows. On the other hand, if traders are risk-averse, the risk due to exchange rate uncertainty is an additional cost, which will tend to depress overall trade volumes.

u_t Stochastic error term with usual properties of white noise.

4. Empirical Framework:

It is important but not necessary to determine the stationarity properties of time series before proceed with the ARDL analysis. This study employed both the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests to determine the order of integration for all the series. The Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests are now well known and widely used; therefore there is no need to explain the mechanism of these tests.

4.1 Autoregressive Distributed Lag (ARDL) Bound Testing Approach

In the present study, the long- and short-run dynamic relationships between Pakistan's bilateral imports and real effective exchange rate volatility are estimated by using the relatively new ARDL bound testing approach was popularized by Pesaran and Pesaran (1997). The ARDL has numerous advantages (Note 2) First, it is different from the most widely used method for testing cointegration, the ARDL approach could be applied regardless of the stationary properties of the variables under consideration and allows for inferences on long-run procedures. In other words, this procedure can be applied independently of whether the series are I(0), I(1), or fractionally integrated

(Pesaran and Pesaran 1997; and Bahmani-Oskooee and Ng, 2002), Thus avoiding problems resulting from non-stationary time series data (Laurenceson and Chai,2003). Second, the ARDL model takes sufficient numbers of lags to capture the data generating process in a general-to-specific modeling framework (Laurenceson and Chai, 2003). It estimates $(p+1)^k$ number of regressions in order to obtain optimal lag-length for each variable, where p is the maximum lag to be used, k is the number of variables in the equation. Finally, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation (Banerjee *et al.* 1993). The ECM integrates the short-run dynamics with the long-run equilibrium without losing long-run information. To illustrate the ARDL modeling approach, the following simple model is considered:

$$y_t = \alpha + \beta x_t + \delta z_t + e_t \tag{2}$$

Where y_t, x_t and z_t are three different time series; e_t is a vector of stochastic error terms; and α, β, and δ are the parameters. For the above equation, the error correction version of the ARDL model is given by:

$$\Delta y_t = \alpha_0 + \sum_{t=1}^{p} \beta_t \Delta y_{t-1} + \sum_{t=1}^{p} \delta_t \Delta x_{t-1} + \sum_{t=1}^{p} \varepsilon_t \Delta z_{t-1} + \lambda_1 y_{t-1} + \lambda_2 x_{t-1} + \lambda_3 z_{t-1} + u_t \tag{3}$$

The first part of equation (3) with β, δ and ε represents the short run dynamics of the model whereas the second part with λ is represents the long run relationship. The null hypothesis of no co-integration in the long run relationship is defined by Ho: $\lambda_1=\lambda_2=\lambda_3= 0$, is tested against the alternative of Ha: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq 0$, by the means of familiar F-test. However, the asymptotic distribution of this F-statistic is non-standard irrespective of whether the variables are I(0) or I(1).

4.2 ARDL Model Testing Procedure

The ARDL model testing procedure starts with conducting the bound test for the null hypothesis of no co-integration. The calculated F-statistic is compared with the critical value tabulated by Pesaran and Pesaran (1997) or Pesaran *et al*. (2001). If the test statistic exceeds the upper critical value, the null hypothesis of no long-run relationship can be rejected regardless of whether the underlying orders of integration of the variables are zero or one. Similarly, if the test statistic falls below a lower critical value, the null hypothesis is not rejected. However, if the sample test statistic falls between these two bounds, the result is inconclusive. When the order of integration of the variables is known and all the variables are I(1), the decision is made based on the upper bound. Similarly, if all the variables are I(0), then the decision is made based on the lower bound.

The ARDL method estimates $(p+1)^k$ number of regressions in order to obtain optimal lag length for each variable, where p is the maximum number of lag to be used and k is the number of variables in the equation. The model can be selected using the model selection criteria like Schwartz-Bayesian Criteria (SBC), Akaike's Information Criteria (AIC), Hannan Quinn Information Criteria (HQIC) and R-bar square Criteria. In the second step, the long run relationship is estimated using the selected ARDL model. When there is a long run relationship between variables, there exists an error correction representation. Therefore, in the third step, the error correction model is estimated. The error correction model result indicates the speed of adjustment back to the long run equilibrium after a short run shock.

4.3 Data

The empirical investigation is carried out with quarterly data on bilateral aggregate real imports, from each external source, over the period between 1982Q1 and 2008Q2 for 7 major importing countries: USA, UK, Japan, Germany, Saudi Arabia, Kuwait and UAE. The data series of bilateral import from each source country are collected from the IMF's Directions of Trade Statistics – DOTS 2009 CD- ROM (IMF, 2009) and unit value index of import, consumer price index and gross domestic product for Pakistan and real effective exchange rate are compiled from the IMF's International Financial Statistics - IFS 2009 CD- ROM (IMF, 2009). All real values are measured in base of year 2000. Furthermore, all of the series are transformed into natural log form. Log transformation can trim down the problem of heteroskedasticity because it compacts the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold difference (Gujarati, 1995). The variables are constructed as follows:

Real bilateral imports*:* The bilateral import data are expressed in constant US dollars; and deflated by the country's import price deflator (unit value index of imports) to generate real bilateral imports.

Real Domestic income*:* The nominal gross domestic product expressed in constant US$ for base year 2000, deflated by consumer price index to generate real gross domestic product of Pakistan.

Relative price index of import*:* Relative price index of import (RPIM) is the ratio of unit value index of imports (UVIM) to each trading partner's consumer price index (CPI).

Exchange Rate Volatility*:* Exchange rate volatility is a measure that intends to capture the risk faced by exporters due to unpredictable fluctuations in the exchange rates. The study used a measure derived from Bollerslev's (1986) generalized autoregressive conditional heteroscedasticity (GARCH) models.

5. Empirical Analysis

The standard Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests are employed to check the order of integration of the variables under consideration. However the ARDL framework does not require pre-testing of variables for the level of integration, the unit root tests could be justified the use of ARDL model. The results obtained are reported in Table 2. Based on these tests statistic, it is found that there is a mixture of I(1) and I(0) of underlying regressors and this provides a good rationale for using the bounds test approach, or ARDL model. Prior to estimating the short- and long-run relationship between variables under consideration for each source, the study has to decide the lag-length on the first differenced variables. Bahmani-Oskooee and Bohl (2000) have exposed that the results of this step are usually sensitive to lag-length. To verify this, study incorporate lag length equal to 1 - 10 (taken more lags because there are 106 quarterly observations) on the first-differenced variables. The computed F-statistic for each lag-length is reported in Table-3 along with the critical values at the bottom of the table.

As reported, the test outcome of the significance levels for seven exporting countries varies with the choice of lag-length. For United States, United Kingdom and United Arab Emirates, the computed F-statistics are significant for lag lengths 1 to 4 different levels of significance. For Saudi Arabia computed F-statistics only at lag 1 and 2 are found to be significant at 95% and 99% level respectively. For Germany the computed F-statistics only at lag 1, 2, and 3 are found to be significant. The F-statistics for Japan are significant at lag 2, 3, 4, 5, 6 and 7 at different levels of significant. The results seem to provide evidence of the existence of a long-run relationship among bilateral aggregate real imports, real gross domestic product, relative price ratio, real effective exchange rate and volatility of real effective exchange rate in case of six out of seven exporting countries (USA, UK, Saudi Arabia, United Arab Emirates, Germany and Japan). In other words, these variables have a tendency to move together in the long run in case of imports from above mentioned six countries. This results should be considered preliminary and indicate that in estimating Equation (2) the study must retain the lagged level of variables. Finally, for Kuwait, computed F-statistics are insignificant at all lag-lengths. The computed F-Statistics of the bound test is lower than the critical lower bound limit even at 90% confidence interval which implies that hypothesis of no cointegration can not be rejected for the long run relationship of Pakistan's bilateral imports from Kuwait. Consequently, based on this F-statistic result, the study dropped the case of Kuwait that didn't indicate the long run relationship and further analysis can not be necessary to estimated (that is ARDL approach). In the second stage, the study maintains the lagged level of variables under consideration and estimates equation (3).

5.1 The Estimates of Long run Coefficients

The long run ARDL models selected on the bases of different information criteria for different countries, reported in table 4. Based on ARDL (1,1,0,0,1) for United States, ARDL (2,4,0,2,4) for United Kingdom, ARDL (4,3,1,4,3) for Japan, ARDL (2,1,1,2,0) for Germany, ARDL (2,1,2,0,0) for Saudi Arabia, and ARDL (4,0,2,2,0) for UAE long run relationships are examined. Several significant conclusions can be drawn from the results. The income elasticities of imports are found positive and highly significant for Pakistan's bilateral imports from USA, UK, Japan and Germany and contrary to expectation it is found to be significant negative for imports from Saudi Arabia and UAE. The results suggest that due to a 100 percent increase in Pakistani real GDP, imports from USA rise by about 76 percent, from UK rise by about 68 percent, from Japan increase by 141 percent and from Germany rise by about 115 percent. Imports of machinery, transport equipment, agriculture and other chemicals from Japan and Germany are the plausible reason for high elasticity of import. A statistically negative coefficient for the income variable in the case of Saudi Arabia and United Arab Emirates requires some explanation. Although it is unlikely, negative income elasticity is theoretically possible. For example, if a country imports inferior goods, it is possible that it purchases less in the consequence of income increase. But it does not seem to be a conceivable explanation for Saudi Arabia and United Arab Emirates imports into Pakistan, because Pakistan imports necessary goods such as petroleum from these countries. This may be due to the influence of the some of the omitted variables in the import demand equation.

The import price elasticity is significantly positive for both Saudi Arabia and United Arab Emirates. This suggests that increase in relative price of imports will increase bilateral imports from Saudi Arabia and United Arab Emirates, because Pakistan heavily dependent on imported petroleum products and Saudi Arabia and United Arab Emirates are the major sources of petroleum products for Pakistan. A possible reason for this unexpected result may be that when a country imports essential goods, then it cannot response rapidly to international price changes. The results further explain that import price elasticity is negative but insignificant for USA, UK and Japan, while for Germany it is positive and insignificant. This result suggests that increase in relative price of imports may reduce bilateral import demand from USA, UK and Japan. The elasticity of real depreciation (real effective exchange rate) is also

positive and significant for Saudi Arabia and United Arab Emirates, implies that depreciation of local currency reduces imports from Saudi Arabia and United Arab Emirates.

The elasticity of real effective exchange rate is negative and significant for Germany, implies that depreciation can not reduce the imports from Germany. The long run results for bilateral import of Pakistan from major source countries, suggest that there is evidence to exist the significant adverse effect of real effective exchange rate volatility on bilateral imports of Pakistan in case of only United Kingdom. The long run elasticities of real effective exchange rate volatility with respect to Pakistan's bilateral imports are negative but insignificant in case of United States of America and Japan, implies that real effective exchange rate volatility may caused to reduce imports from USA and Japan. The long run elasticities of real effective exchange rate volatility with respect to Pakistan's bilateral imports from Germany, Saudi Arabia and United Arab Emirates are positive but insignificant and the magnitudes of elasticities are very small implies that volatility of real effective exchange rate may not decrease bilateral imports from these countries.

To summarize the long run elasticities, the present study shows that real gross domestic product of Pakistan is positively related to real bilateral import demand in case of four out of six source countries. The result shows that income elasticities are greater than and close to one, in case of Japan and Germany, but less than one in case of USA and UK, while in case of Saudi Arabia and United Arab Emirates elasticities are negative. Bilateral income elasticities of USA, UK, Japan and Germany are consistent with bilateral income elsticities estimated by Akhtar and Malik (2000). This implies that bilateral imports of Pakistan from USA, UK, Japan and Germany are growth driven.

5.2 Short run Causality Hypothesis Testing

After exploring the long run association between Pakistan's bilateral imports and its determinants under consideration, the study now proceed to short run causality hypothesis on error correction mechanism (ECM). The results of the short-run dynamic models for the selected countries are demonstrated in table 5. The highly significant error correction terms (ECT) further confirms the existence of a stable long run relationship (See Banerjee et al, 1993). The estimated coefficients of the error correction term (ECT) of all the countries are negative and highly significant at 0.01 marginal level, implying that part of the changes in imports represents an adjustment to its last-period deviations from its long-run steady-state equilibrium, so that the time paths of these variables do not diverge in the long run.

The dynamic short run causality among the relevant variables can be obtained by using Wald test to restrict the coefficient of the variables with its lags equal to zero. If the null hypothesis of no causality is rejected, then it is concluded that relevant variables Granger-caused imports demand. If the number of lags included in the model is 0 or 1, the estimated t-statistics shows the short run causality evidence. The present study found that real gross domestic product of Pakistan is significantly caused imports demand from USA, UK, Japan and UAE, while it do not cause bilateral import demand from Germany and Saudi Arabia in the short run. However the ratio of the relative price and real devaluation are Granger caused bilateral import demang from Japan, Germany, Saudi Arabia and UAE in the short run, where as real effective exchange rate volatility Granger caused bilateral import demand only from UK and Japan in the short run.

Further, the diagnostic tests reject some noticeable econometric problems. Test for normality confirms residual normality in most of the cases and ARCH test rejects heteroscadasticity in the disturbance term at 1 percent level of significance in most of the cases. The Ramsey's RESET test passes the specification of functional form for the estimated model at 5 percent level of significance for most cases. However, the LM test results indicate that there exists serial correlation in the residuals for two out of six cases of bilateral imports. "*The ARDL model has been shown to be robust against residual autocorrelation. Therefore, the presence of autocorrelation does not affect the estimates*" (Laurenceson and Chai, 2003, p. 30).

6. Concluding Remarks

The dynamic relationship between bilateral import demand for Pakistan and exchange rate volatility as well as some important explanatory variables with seven major trading partners' countries, namely United States, United Kingdom, Japan, Saudi Arabia, Germany United Arab Emirates and Kuwait, has been examined. The ARDL bound testing appraoch suggest a stable long run relationship among selected explanatory variables over the sample period for Pakistan's bilateral imports from each of its chosen source countries except from Kuwait. The income elasticities of imports are positive and highly significant in four out of six cases which suggest that Pakistan's bilateral import demand is growth driven. The income elasticities for bilateral imports are more elastic than income elasticity for aggregate imports (Alam, 2009; Alam and Ahmed, 2010), which indicates that as real income growth occurs in Pakistan, it demands more imports from USA, UK, Japan ang Germany to accelarate its growth process. The result shows that relative price elasticities for bilateral imports significantly and positively effects bilateral imports from

Saudi Arabia and United Arab Emirates, suggesting that import of essential goods do not decrease by increasing import price.

The general consensus indicates that depreciation would have contractionary effect in the long run in most of the economies. The present study also confirm this consensus in case of bilateral imports from Saudi Arabia and UAE, which shows that devaluation has significant contractionry effects on Pakistan's bilateral imports. However, elasticity of devaluation is insignificant in case of USA, UK and Japan, that implies devaluation may not reduce import demand from USA, UK and Japan to Pakistan, because USA, UK and Japan are major importers of capital goods for Pakistan. Contrary to the theoretical expectations, the results further displys the fact that in spite of depreciation Pakistan's bilateral imports from Germany could not reduce. The result further suggsts that exchange rate volatility reduces the demand for Pakistan's bilateral import from UK, and may reduce bilateral imports from USA and Japan in the long run. The long run bilateral elsticities for exchange rate volatility greater than long run aggregate elasticity for exchange rate volatility in case of USA, UK and Japan (Alam and Ahmed, 2010). This suggests that aggregation of data may dilute any possible relationship.

The short run causality analysis of ARDL demonstrates that exchange rate volatility causes demand for Pakistan's imports from UK and Japan significantly in the short run. For remaining countries real effective exchange rate volatility does not affect demand for Pakistan's bilateral imports in the short run. The short run income elasticities displys that increase in real growth in Pakistan causes bilateral imports in case of four out of six exporting countries. Finally, for policy makers, different elasticities of bilateral import demand function estimated in the present study suggests that to reduce the trade deficit, a single trade policy is not too effective. Policy makers should make separate policies for different trading partner, according to their trade relations with Pakistan and in the light of present analysis.

References

Afzal, M. (2001). Import function for Pakistan: A simultaneous equation approach. *The Lahore Journal of Economics*, 6(2), 109-116.

Akhtar, S., and Malik, F. (2000). Pakistan's Trade Performance vis a vis its Major Trading Partners. *Pakistan Development Review,* 39(1), 37-50.

Alam, S., and Ahmad, Q. M. (2010). Exchange Rate Volatility and Pakistan's Import Demand: An Application of Autoregressive Distributed Lag Model. International Research Journal of Finance and Economics, issue 48, 7-23.

Alam, S. (2009). An Import Demand function for Pakistan: The VAR & VECM framework. India Macroeconomic Annual, 81-109.

Arize, A., and Afifi, R. (1987). An Econometric Examination of Import Demand Function in Thirty Developing Countries. *Journal of Post Keynesian Economics,* 9(4), 604-616.

Bahmani-Oskooee, M. (1996). Exchange rate uncertainty and trade flows of LDCs: evidence from Johansen's cointegration models. *Journal of Economic Development*, 21(1), 23-35.

Bahmani-Oskooee, M., and Bohl, M. T. (2000). German monetary unification and the stability of the German M3 money demand function. *Economics Letters,* 66, 203-208.

Bahmani-Oskooee, M. (1998). Cointegration Approach to Estimate the Long-Run Trade Elasticities in LDCs. *International Economic Journal*, Korean International Economic Association, 12(3), 89-96.

Banerjee, A., Dolado, J.J., Galbralth, J.W., and Hendry, D.F. (1993). Co-integration, Error Correction and the Econometric Analysis of Non-Stationary Data. New York: Oxford University Press.

Behmani-Oskooee, M. and Gelan, A. (2006). On the relation between Nominal Devaluation and Real Devaluation: Evidence from African countries. *Journal of African Economics,* 16(2), 177-197.

Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroskedasticity. *Journal of Econometrics,* 31, 307-327.

Caporale, T., and Doroodian, K. (1994). Exchange Rate Variability and the Flow of International Trade. *Economic Letters*, 46, 49-54.

Charemza, W. W. and Deadman, D. F. (1992). New Directions in Econometric Practice, Edward Elgar Publishing, London.

Cushman, D. O. (1986). Has Exchange Risk Depressed International Trade? The Impact of Third-Country Exchange Risk. *Journal of International Money and Finance,* 5(3), 361-179.

Doyel, E. (2001). Exchange rate volatility and Irish- UK trade: 1979-1992. Applied Economics, 33, 249-265.

Dutta, D., and Ahmed, N. (1999). An Aggregate Import Demand Function for Bangladesh: A Cointegration Approach. *Applied Economics*, 31, 465-472.

Engle, R.F., and Granger, C.W.J. (1987). Cointegration and Error Correction: Representation, Estimation and Testing. *Econometrica,* 55, 251-76.

Gujarati, D. N. (1995). Basic Econometrics (3rd edition). McGraw-Hill, Inc., New York.

IMF. (2009). Direction of Trade Statistics. International Monetary Fund, Washington D. C.

IMF. (2009). International Financial Statistics. International Monetary Fund, Washington D. C.

Khan, H. (1974). Import and Export Demand in Developing Countries. IMF Staff Papers, 21, 678-92.

Laurenceson, J. and Chai, J.C.H. (2003).Financial Reform and Economic Development in China. Edward Elgar, Cheltenham.

McKenzie, M. and Brooks, R. D. (1998). The Impact of Exchange Rate Volatility on Australian Trade Flows. *Journal of International Financial Markets, Institutions and Money,* 8, 21-38.

McKenzie, M. (1998). The impact of exchange rate volatility on Australian trade flows. *Journal of International Financial Markets*, Institutions and Money, 8, 21-38.

McKenzie, M. D. and Brooks, R. D. (1997). The Impact of Exchange Rate Volatility on German-U.S. Trade Flows. *Journal of International Financial Markets, Institutions and Money,* 7, 73-87.

Pelinescu. (2006). Estimating the Real Effective Exchange Rate (REER) by Using the Unit Labor Cost (ULC) in Romania. *Journal for Economic Forecasting,* 3(4), 5-22.

Pesaran, H.M. and Pesaran, B. (1997). Working With Microfit 4.0: An introduction to econometrics. Oxford University Press, London.

Pesaran, M. H and Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. In S. Strom (ed), *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*, Cambridge, Cambridge University Press, Ch.11, ISBN 0 521 63323 0 (hardback); 0 521 63365 6 (paperback).

Pozo, S. (1992). Are Flexible Exchange Rates Really More Volatile? Evidence from the Early 1900s. *Applied Economics*, 24(11), 1213-18.

Rijal, A., Koshal, R. K. and Jung, C. (2000). Determinants of Nepalese Imports. *Journal of Asian Economics,* 11, 347-54.

Sarmad, K. (1989). The determinants of import demand in Pakistan. *World Development*, 17(10), 1619-25.

Sinha D. (1996). An Aggregate Import Demand Function for India. *International Review of Economics and Business,* 43, January-March, 163-173.

Sinha D. (1997a). An aggregate import demand function for Pakistan. *Atlantic Economic Journal* 25(1), 114-114.

Sinha D. (1997b). Determinants of Import Demand in Thailand. *International Economic Journal*, 12, 73-83.

Sinha D. (2001). A Note on Trade Elasticities in Asian Countries. *The International Trade Journal*, 15(2), 221-237.

Stockman ACI, (1995). Effect of Exchange rate risk on intra –EC trade. De Economist, 143(1), 4-54.

Taglioni, D. (2002). Exchange Rate Volatility as a Barrier to Trade: New Methodologies and Recent Evidence. *Economie Internationale*, CEPII research center, issue 1Q-2Q, 227-259.

Tang T.C., and Mohammad, H.A. (2000). An Aggregate Import Demand Function for Malaysia: A Cointegration and Error Correction Analysis. *Utara Management Review,* 1, 43-57.

Tang, T. C. (2002). Aggregate Import Demand in India: Stable or Unstable? *The Economic Challenger,* 14(4), 35-7.

Notes

Note 1. The existing literature provides sets of studies using nominal (Stockman, 1995; Taglioni, 2002) as well as real (Pozo, 1992; Doyel, 2001) exchange rate and both nominal and real effective exchange rate (Behmani-Oskooee and Gelan, 2006).

Note 2. The early discussion on ARDL Modelling approach can be found in Charemza and Deadman (1992).

Table 1. Pakistan's Imports from selected external sources

1982-2008 (Million US $) (Percentage from developed world and world total)

Selected external sources	1982	1990	1999	2008
USA	537.99	946.34	659.88	2192
UK	381.2	359.61	400.2	937
Japan	692.9	876.97	789.74	1599
Saudi Arab	713.69	461.21	874.42	5621
UAE	319.61	157.97	725.9	5223
Germany	312.95	544.78	429.47	1363
Kuwait	602.64	440.29	861.56	2519
above total	3560.98	3787.17	4741.17	19454
% of imports from developed world*	87.21%	79.45%	76.46%	66.05%
Imports from developed world(Mln US$)	4083.22	4766.58	6200.6	29452
% of world total	65.34%	51.30%	46.05%	41.68%
Imports from world (Mln US$)	5450.01	7383.01	10297.7	46681

Source: IMF's Direction of Trade Statistics 2009. Figures in parenthesis are percentages.

***** Developed world consider as group of countries consist of USA, UK, Japan, Saudi Arab, UAE, Germany, Kuwait, Italy, France, Malaysia, China.

Table 2. Unit Root Test

Countries	Variables	ADF-Test with intercept		Phillips-Perron Test with intercept	
		Level	First Difference	Level	First Difference
Pakistan	LREER	-2.6191	-9.4183*	-2.7224***	-9.4090*
	LVREER	-3.4577**	-11.5696*	-3.4293**	-13.7934*
	LRGDP	-0.6096	-3.5708*	-1.0880	-25.1059*
	LRPI	0.6915	-4.8663*	0.5968	-11.3834*
USA	LRM	-1.2232	-5.6071*	-2.4941	-19.3653*
UK	LRM	-1.0671	-4.0741*	-1.2962	-18.6772*
Japan	LRM	-1.2183	-4.7996*	-1.3750	-14.3872*
Germany	LRM	-0.8714	-4.5438*	-1.4961	-16.4946*
Saudi Arabia	LRM	-2.5550	-5.4930*	-3.1579**	-18.8110*
UAE	LRM	-1.2400	-5.1703*	-3.3173**	-18.7827*
Kuwait	LRM	-3.5250*	-5.4885*	-3.7624*	-9.1666*

Note: Critical values are: -3.4963, -2.8903 and -2.5821 (significant at 1%, 5% and 10% respectively when 1st difference is constant). *, ** and *** represent significant at 1%, 5% and 10% respectively.

Table 3. F-Statistics for testing the Existence of a Long-run import demand Equation

Lag length	F-statistics						
	USA	UK	Japan	Germany	Saudi Arabia	UAE	Kuwait
1	4.6434**	10.0245*	2.8531	4.6380**	6.6518*	7.0562*	1.2801
2	4.0164**	8.2507*	7.1928*	6.1503*	4.7586**	5.6250*	1.0946
3	4.3338**	5.6645*	6.4709*	4.1534**	3.4386	4.6732**	2.1931
4	3.7538***	4.0972**	6.1572*	3.3951	3.0079	3.5655***	1.9121
5	3.3806	3.1478	5.1948*	2.7730	2.4680	2.8707	1.4610
6	2.9990	2.8830	4.4462**	2.5323	2.5648	2.8614	1.4871
7	2.6539	2.4767	3.6329***	2.3128	2.1969	2.5740	1.3618
8	2.4101	2.2725	3.0286	2.4686	2.0652	2.3899	1.2617
9	2.0195	1.9983	2.7646	2.1877	2.7757	2.0359	1.1659
10	1.8508	1.6144	2.9005	1.8843	2.2642	1.9258	1.1275

Note: The relevant critical value bonds are taken from Pesraran, Shin & Smith (2001) [Case III with an unrestricted intercept and no trend and number of regressors=4 from]. They are 3.74 – 5.06 at the 99%; 2.86 – 4.01 at the 95%; and 2.45 – 3.52 at the 90% significance levels respectively.

*, ** and *** denote that F-statistics falls above the 99%, 95% and 90% upper bond respectively.

Table 4. The Long run ARDL model Estimates

Countries		LRGDP	LRPI	LREER	LREERV	C
USA	ARDL(1,1,0,0,1)	0.7594* (4.1526)	-0.0043 (-0.0073)	-0.1693 (-0.3109)	-0.3221 (-1.1131)	-3.3608 (-0.9454)
UK	ARDL(2,4,0,2,4)	0.6826* (3.5381)	-0.7011 (-1.0066)	0.1055 (0.1764)	-0.7507*** (-1.7018) [0.092]	-3.3453 (-0.8281)
Japan	ARDL (4,3,1,4,3)	1.4121 * (3.8860)	-0.1681 (-0.1510)	-1.4344 (-1.3595)	-0.8809 (-1.3026)	-1.9366 (-0.2937)
Germany	ARDL(2,1,1,2,0)	1.1148* (5.3979)	0.8928 (1.2556)	-0.9720*** (-1.6813)	0.0633 (0.2125)	-4.7576 (-1.1805)
Saudi Arabia	ARDL(2,1,2,0,0)	-0.2284*** (-1.8052)	2.3086* (5.2763)	2.9009* (7.7665)	0.0765 (0.4175]	-20.9833* (-8.4569)
UAE	ARDL(4,0,2,2,0)	-0.8245* (-2.7814)	1.6955*** (1.6355)	2.9852* (3.1201)	0.0011 (0.0025)	-16.0639* (-2.5632)
Figures in parenthesis are t-statistics. *, ** and *** denote that significant at 1%, 5% and 10% level respectively.						

Table 5. Error Correction Model

Dependent variable: ΔLRM						
	t-statistics/F- statistics					
Countries	**USA**	**UK**	**Japan**	**Germany**	**Saudi Arabia**	**UAE**
ARDL →	(1,1,0,0,1)	(2,4,0,2,4)	(4,3,1,4,3)	(2,1,1,2,0)	(2,1,2,0,0)	(4,0,2,2,0)
∑ΔLRM	-	-2.2624**	3.012**	-2.3772**	-2.3783*	4.6201*
∑ΔLRGDP	4.0783*	8.0854*	29.9344*	0.7612	0.4610	-1.6694
∑ΔLRPI	-0.0073	-1.0824	-3.5643*	-2.1489**	3.2088**	3.8084**
∑ΔLREER	-0.3101	1.9421	3.7738*	4.2149**	3.9296*	4.3096**
∑ΔLREERV	0.5354	3.2581*	6.9818*	0.2149	0.4165	0.0025
ECT(t-sta)	-5.8153*	-3.0592*	-2.39445*	-4.1935*	-4.9161*	-2.5080*
R^2	0.3784	0.5581	0.4994	0.3698	0.4003	0.4515
Adj. R^2	0.3336	0.4749	0.4334	0.3020	0.3439	0.3775
DW-St.	2.2120	2.0722	2.2701	2.0414	2.0904	1.8811
Diagnostic Tests						
A	χ^2=0.48(.03)	χ^2=2.82(.58)	χ^2=18.55(.00)	χ^2=7.28(.12)	χ^2=4.51(.34)	χ^2=4.31(.36)
B	χ^2=10.76(.00)	χ^2=1.81(.18)	χ^2=2.95 (.08)	χ^2=11.61(.00)	χ^2=1.08(.29)	χ^2=0.82(.36)
C	χ^2=0.31(.85)	χ^2=3.72(.16)	χ^2=1.02(.60)	χ^2=3.49 (.17)	χ^2=49.64 (.0)	χ^2=43.27(.0)
D	χ^2=0.05(.81)	χ^2=0.63(.43)	χ^2=0.63 (.43)	χ^2=1.92 (.17)	χ^2=0.02(.88)	χ^2=4.13(.04)
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						

*, ** and *** denote that significant at 1%, 5% and 10% level respectively.