Real Exchange Rate Changes and Trade Balance in Pakistan: A Revisit

Shahbaz, Muhammad and Jalil, Abdul and Islam, Faridul

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Muhammad Shahbaz
COMSATS Institute of Information Technology
Lahore, Pakistan. Email: shahbazmohd@live.com

Abdul Jalil
Quaid-i-Azam University, Islamabad, Pakistan

Faridul Islam
Department of Finance and Economics
Woodbury School of Business
Utah Valley University
Orem, UT 84058-5999

Abstract

This study uses quarterly data from 1980.1 to 2006.4 to explore the relationship between changes in real exchange rate and the trade balance indicators of Pakistan. Applying Auto Regressive Distributed Lag (ARDL) approach to cointegration we examine the existence of a possible long run relationship. We find the following: (a) a long run relationship between the series exists; and b) the coefficient of elasticity is negative and statistically significant which does not support for the J-relation. Given this, the policymakers should take conservative approach in using currency devaluation to cure the fundamental disequilibrium in the balance of payments. It is likely that such policy may not produce the desired outcome—i.e., the trade balance may not improve.

Introduction

A significant part of the global economy in the twentieth century was under the fixed exchange currency regime[1]. The decade of 1970s witnessed an increase in research emphasis in the assessment of the impact of currency depreciation on the balance of trade of a nation. A large body of literature aimed at examining the success of competitive devaluation policy as a cure to chronic trade imbalances [Harberger (1950), Meade (1951), Alexander (1952, 1959) and Mundell (1968)]. The more recent ones include Bahmani-Oskooee, (1985); Upadhyaya and Dhakal, 1997; Kale, 2001; Bahmani-Oskooee *et al.* 2005; among others]. Devaluation refers to the readjustment of the value of domestic currency of a nation that maintains fixed foreign exchange rate.

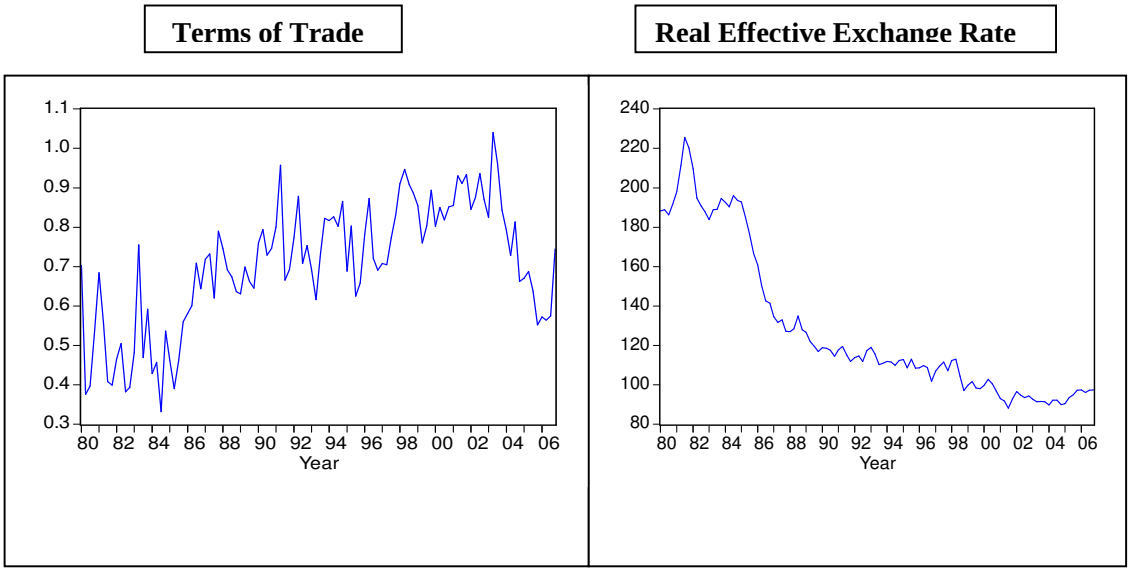
Pakistan, an emerging nation of 165 million in the Indian Subcontinent has been suffering from persistent problems of trade balance since its inception in 1947, barring a few short breaks in the 1990s. As can be seen in Figure-1, the exchange rate for the rupee (the Pakistan currency) has been depreciating even after adopting the managed floating exchange regime against the dollar since 1992. Falling value of local currency boosts export due to lowered price from importers' perspective and at the same time reduces import as it becomes more expensive to buy foreign goods. The conventional theory predicts that the overall the impact of currency depreciation, should exert favorable impact on the nation's trade balance.

In reality this may not happen because quantities tend to adjust slowly due to rigidities from contractual obligations or other related issues; while the price changes take immediate effect on the earnings. As a result, situation may actually worsen initially, but as the laws of demand and supply take effect after adjustment, the trade balance actually should improve. This is the underlying logic behind the so-called J-curve theory.

[1] The Bretton Woods system made it obligatory for each country to adopt a monetary policy that would maintain the exchange rate of its currency within a fixed value with a ±1% variation in terms of gold and allowed the IMF to bridge temporary trade imbalances. This set the stage for the fixed exchange rate regime. On August 15, 1971, President Nixon unilaterally terminated the convertibility of the dollar to gold. At that point the US$ became the basis for global reserve currency for the member states and also provided the sole backing to currency.

The J-curve is an interesting empirical phenomenon which has been tested for many nations. The topic is of particular significance because the existence of J-type relationship suggests that currency depreciation can be an effective tool in improving the trade imbalance that is rooted in chronic disequilibrium. Against the backdrops it may be helpful to examine if a J-relation exists in Pakistan. In the particular historical context of the nation's external balance, the available evidence over the J phenomenon is mixed which may send conflicting signal to policy makers. The lack of conclusive evidence in this respect for Pakistan has been the primary motivation for the present research. The issue merits further academic scrutiny in an effort to resolve the debate, something we have done in this paper.

Figure-1



Source: Economic Survey of Pakistan (2008-09)

The objective of the paper is three fold. First, examine the existence of a long run relationship between trade balance and exchange rate for Pakistan using a simple bivariate model, common in the literature (Bahmani-Oskooee, 1992; Bahmani-Oskooee and Alse[2], 1994, 1995). Second, provide estimates for the long and the short run elasticities of trade balance with respect to exchange rate. Finally, use impulse response functions to examine the J-curve relation. The paper thus provides further empirical basis

[2] Covered 22 less developed countries

for the J-curve hypothesis for Pakistan which should help policymakers to make informed decision regarding exchange rate determination. The paper implements the ARDL approach to cointegration developed by Pesaran et al (2001). As a relatively new tool to explore long term relation, the bound testing approach has gained much popularity. The extensive application of the tool has been dictated by its underlying simplicity and versatility in addressing long run equilibrium relation between and among economic time series. The paper investigates the link using two sub periods. The aim is to capture effects of pre- and post financial liberalization periods which also represent the fixed and floating regimes, respectively. The rationale behind using different sample periods is to test the robustness of our results. The authors are not aware of any work that examines the impact of exchange regime shift on trade balance for Pakistan. From that perspective, the paper is a contribution to the literature.

The rest of the article is organized as follows. Section-II presents the literature review. Section III outlines the model and estimation strategy. Impulse response function is discussed in section IV. Section V summarizes the findings and provides conclusions.

II. Literature Review

The general consensus among the professionals in the international finance is that movements in the exchange rate have direct impacts on trade balance in the long run[3]. Specifically, evidence suggests that competitive currency devaluation leads to improvement of trade balance in the long-run[4]**.** In some country-specific studies, research also shows unfavorable impact of devaluation on the trade balance [Bahmani-Oskooee, (1985); Upadhyaya and Dhakal, (1997); and Kale, (2001)]. Halicioglu, (2008) argues that a depreciating Lira has had positive impact on Turkey's trade balance; but Celik and Kaya (2010) did not find country specific J-curve effect in their panel cointegration approach covering seven countries including Turkey. Shahbaz et al., (2010) investigated impact of currency devaluation on the trade balance for Pakistan using ARDL bound testing approach to cointegration over the period of 1980 to 2006. They found long run

[3] Haimarios, (1989); Rawlins and Praveen, (2000); Bahmani-Oskooee, (1992, 2001); Aftab and Aurangzeb, (2002); Musila and Newark, (2003); Bahmani-Oskooee and Ratha, (2004) and Shahbaz et al. (2010)

[4] Rincon, (2000); Baharumshah, (2001); Bahmani-Oskooee, (2001); Brahmasrene, (2002); Lal and Lowinger, (2003); Onafowora (2003); Stucka, (2004) and Tochitskaya, (2005) etc.

relationship among the variables but the impact of currency devaluation on trade balance was negative--devaluation worsened trade balance**.** They also did not find J curve relation for Pakistan. Apart from the mixed evidences on J-curve, Marwah and Klein (1996) found S-curve for Canada and United States[5]. Akbostanci (2002) found S-shaped relation in the short run but J-curve effect in the long run for Turkey while Agbola, (2004), found M-curve relationship between devaluation and trade balance for Ghana. Agbola, (2004); Bhattarai and Armah, (2005); and Damoense and Agbola, (2004) found no J-curve or long run impact of exchange rate depreciation on trade balance in Ghana and South Africa. Jung and Doroodian (1998), and Narayan and Narayan (2004) found J-curve effect for Japan and Fiji, respectively.

Arndt and Dorrance's (1987) conjectured that trade balance in Australia has the J-Curve pattern in the short run but the long-run improvement depends on the size of long-run trade elasticities, domestic spending, international competitiveness. Felmingham (1988) defined trade balance as the ratio of imports to exports and related it to current and past values of the terms of trade for the Australian data. He found no evidence of the J-Curve. Karunaratne (1988) investigated the impact of real effective exchange rate on trade balance for Australia but failed to find any significant relation. Bahmani-Oskooee and Pourheydarian (1991) noted that such insignificance may have been due to multi-colinearity because of the inclusion of terms of trade as an explanatory variable in the model**.** To overcome this, Bahmani-Oskooee et al. (2005) investigated the short-and the long-run effects of depreciation of the Australian dollar on the trade balance between for each of her 23 trading partners. They applied ARDL bound testing approach to cointegration to the quarterly data from 1973 to 2001 and confirmed the existence of J relation in Australia for only 3 out of 23 trading partners.

Many of the above noted studies did not consider non-stationarity in the series and thus may suffer from potential spurious regression problem. Bahmani-Oskooee *et al*. (2005) employed the approach developed by Rose and Yellen (1989), to the Australian data to

[5]The theory of S-curve states that trade balance initially declines after depreciation followed by a trade balance improvement, i.e., the typical J-curve effect. However, after several quarters when trade balance improvement reaches its limits it then starts to deteriorate again.

each of her 23 major trading partners. They found support for the J-Curve in only 3 of the 23 countries[6]. Aziz (2008) investigated the effect of exchange rate on trade balance for Bangladesh using cointegration and error correction method and found the existence of J-Curve phenomenon. In assessing the impact of macroeconomic determinants on Korea's bilateral trade deficit with her trading partners e.g., Japan and US, Kim (2009) found cointegrating relationship. Korean currency depreciation improved trade balance, while J-curve effect was found in the context of trade with Japan. Herve et al., (2010) found positive effect of exchange rate on trade balance following Marshal-Learner's condition for Cote d'Ivoire both in the short and the long run; and impulse response function indicated the J-curve phenomenon.

A few studies tested the Marshall Lerner (ML) condition[7] for Pakistan. Hassan and Khan (1994) found the sum of exports-imports elasticities exceeds unity (1.64) which supports the ML condition. Akhtar and Malik (2000) examined the ML condition in Pakistan in the context of its four major trading partners. The results suggest that real devaluation might worsen the trade balance with USA and Germany, but may favor such balance with UK and Japan. Bahmani-Oskooee (1992) investigated the J-curve phenomenon by including lags of the real effective exchange rate for Pakistan. The findings are inconclusive. Aftab and Aurangzeb (2002) found the ML condition met in the long run and J-curve relation for the short run in Pakistan[8]. Recently, Aftab and Khan (2008), Bahmani-Ooskooee and Cheema (2009)[9] and Shahbaz et al. (2010) found no evidence for the standard J-curve phenomenon for Pakistan.

III. Data and Estimation Strategy

Data used in the paper cover 1980.1 to 2006.4. The monthly data published in the statistical bulletins of the State Bank of Pakistan[10] on exports and imports has been used to compute the quarterly series. The real effective exchange rate has been compiled from

[6] They excluded the U.S., a major trading partner of Australia. For the U.S., real depreciation of the Australian dollar neither had short- nor any long-run effects on the trade balance between the two partners.
[7] The condition for currency devaluation to succeed, the sum of price elasticity of exports and imports $|e| > 1$
[8] Bahmani-Oskooee (1998) could not found evidence on existence of Marshal-Learner condition in Pakistan
[9] Bahmani-Ooskooee and Cheema (2009) found China and UAE are affected by the depreciation in the Pak-rupee.
[10] This is the Central Bank of Pakistan and we got the data from various issues.

various issues of the Economic Survey of Pakistan published by the Ministry of Finance, Government of Pakistan.

Following Bahmani-Oskooee (1991), Bahmani-Oskooee and Alse[11] (1994, 1995) and Narayan (2006) for China respectively, we use the following model for Pakistan[12]:

$$Tradebalance = f(Exchangerate) \quad (1)$$

We use ratio of real exports to real imports as a measure of trade balance (TOT) instead of traditional measure for trade balance (net exports) as dependent variable. This measure enables us to transform the variables in logarithmic form which gives direct elasticities for interpretations. The econometrically estimable regression is specified as:

$$LTOT = \alpha_1 + \alpha_2 LREER + \mu_t \quad (2)$$

Where, *LTOT* is the logarithm of the ratio of real exports to real imports (see Dusasa, 2007 and Shahbaz et al. 2010 for explanation), *LREER* is the logarithm of the real exchange rate[13], α_1 is a constant term; and μ refers to an error term. The J-curve relation stipulates that exchange rate depreciation initially causes deterioration in the trade balance and improves later. Therefore, we expect $\alpha_2 > 0$.

This paper implements the ARDL approach to cointegration to examine the long run relation between the variables. The methodology developed by Pesaran et al. (2001) has several advantages over Johansen-Juselius or Engle Granger procedures. In particular, the desirable sample property makes it the weapon of choice in many circumstances. Equation-2 specifies the estimable log linear form.

[11] Covered 22 less developed countries

[12] In a recent paper Shahbaz et al. (2010) found positive but insignificant impact of income on trade balance of Pakistan. This is the reason we excluded income variables from the model. .

[13] Parity is defined as PKR/ USD.

$$\Delta LTOT = \varphi_{\circ} + \phi_{TOT} LTOT_{t-1} + \phi_{REER} LREER_{t-1} + \sum_{i=1}^{q} \gamma_{TOT} \Delta LTOT_{t-j} + \sum_{j=0}^{p} \gamma_{REER} \Delta LREER_{t-j} + \mu_t \quad (3)$$

Where φ_0 is a drift parameter, and μ_t a white noise process. The terms in the summation signs represent the error correction dynamics. While the second part of equation-3 with ϕ_{TOT} and ϕ_{REER} corresponds to long run relationship.

The ARDL bounds approach tests for equilibrium long-run relationships between the series and can be conducted using either the F- or the t-test. The F-test examines the pooled (joint) significance of the estimates on the one period lagged level of the variables in equation-3. The null hypothesis for the F-statistics is: $H_{\circ} : \phi_{TOT} = \phi_{REER} = 0$. Critical values for the F-test are from Pesaran et al (2001). The asymptotic distribution of critical values are available when regressors are either *I(1)* or *I(0)* or mutually integrated.

III.1 Unit Root Test

The descriptive statistics and the correlation matrix are shown in Table-1. The priori expectation is that real effective exchange rate is negatively correlated with trade balance.

Table-1: Correlation Matrix and Statistics Descriptive						**Correlation Matrix**	
Variables	Mean	Median	Maximum	Minimum	Std. dev.	LTOT	LREER
LTOT	-0.373	-0.3218	0.0391	-1.1033	0.2541	1.0000	-0.7807
LREER	4.8292	4.7196	5.4319	4.4951	0.2764	-0.7807	1.0000

The standard unit root tests have been used in literature such as ADF (Dickey and Fuller, 1979), P-P (Philip and Perron, 1988), and ADF-GLS (Elliot et al. 1996). Dejong et al., (1992) and Harris and Sollis (2003) point out that these tests are not appropriate in small sample because of over-rejection of the null hypothesis when it is true and vice versa. Ng-Perron (2001) test is better suited in small samples. The test shows that both variables are integrated of order *I(1)* (Table 2).

Table-2: Unit Root Test

Variables	MZa	MZt	MSB	MPT
LREER	-5.1169	-1.5062	0.2943	17.4176
LTOT	-11.9956	-2.4152	0.2013	7.7819
DLREER	-49.5118***	-4.9434	0.0998	2.0016
DLTOT	-41.0434***	-4.5216	0.1101	2.2655

Note: *** indicates significance at the 1 percent level

III.2 Cointegration Test

Prior to testing for the existence of cointegration, we choose the optimal lag length. We divide our data set into sub samples corresponding to the pre-financial liberalization period, from 1980 to 1990 (fixed exchange rate) and the post- liberalization period, from 1991 to 2006 (the floating exchange rate regime). The rationale is to test if the financial liberalization affects the outcome and also allows us to test the robustness of our results. Based on the Akaike Information Criteria (AIC), the ARDL model chose the optimal lag length of 5, 2 and 3 for 1980-2006, 1980-90 and 1991-2006 samples period, respectively. The calculated F-statistics, when trade balance is dependent variable, exceeds the critical bounds (Table 3). The null hypothesis of no cointegration for the first two periods in the Table 3 is rejected at the 1% and the third one at the 5% level of significance which suggests the existence of long run relation between the series. The robustness of long run relationship between trade balance and exchange rate changes is investigated by applying Johansen and Juselius (1990) procedure. The results confirm that cointegration between trade balance and exchange rate changes for Panel-A and Panel-B but not for Panel-C. Overall, it is evidenced that there is long run stable relationship between both variables as indicated by Panel-A.

Table-3: F-Statistics for Cointegration

Time Period	Calculated F-Statistics[14]	Wald Test Statistics
1980Q1-2006Q4	7.6402	7.1908
1980Q1-1990Q4	5.3329	5.1204
1991Q1-2006Q4	4.1781	3.9547

[14] In case-III (unrestricted intercept and no trend), critical values for lower and upper bounds (3.725, 5.163, 4.133 and 5.260, 3.920, 2.843) are obtained from Narayan (2005, pp: 1988) at 1%, 5% & 10% level of significance with lag 5, 2 & 3.

Table-4: Johansen First Information Maximum Likelihood Test for Cointegration

Hypotheses	Trace-Test	5 %	Prob-value**	Hypotheses	Max-Eigen Statistic	5 %	Prob-value
Panel-A Sample Period 1980Q1-2006Q4							
R = 0	23.2942	20.2618	0.0185	*R = 0*	17.1252	15.8921	0.0319
R ≤ 1	6.16905	9.1645	0.1781	*R= 1*	6.1690	9.1645	0.1781
Panel-B Sample Period 1980Q1-1990Q4							
R = 0	24.0844	20.2618	0.0142	*R = 0*	22.5777	15.8921	0.0038
R ≤ 1	1.5067	9.1645	0.8722	*R= 1*	1.5067	9.1645	0.8722
Sample Period 1991Q1-2006Q4							
R = 0	12.9580	20.261	0.3672	*R = 0*	10.1282	15.8921	0.3228
R ≤ 1	2.8298	9.1645	0.6130	*R= 1*	2.8298	9.1645	0.6130

Having established a long run relationship in equation-3, we estimate the short run dynamics using the following error correction model (ECM) of ARDL (q, p) :

$$\Delta LTOT = \varphi_{\circ} \sum_{i=1}^{q} \gamma_1 \Delta LTOT_{t-1} + \sum_{j=0}^{p} \gamma_2 \Delta LREER_{t-j} + ECM_{t-1} + \mu_t \qquad (4)$$

Maximum lag for each model is used such that $(i_{\max} = 5,2,3)$ respectively. The estimates of the model based on the AIC are presented in Table 4.

Results suggest that 1 percent devaluation leads to 0.7677 percent deterioration in the trade balance indicator in the long run. The relation between exchange rate and trade balance examined under the two currency regimes is negative and significant at the 1 and 5 percent levels for both periods. However, the impact is more pronounced during the fixed rather than the flexible regime. This implies that depreciation in real exchange rate is not an effective tool to improve the trade balance in the country and that the Marshal-Learner's condition does not hold for Pakistan.

The oil refinery sector in Pakistan which operated at less than capacity forced the government to import petroleum products adding pressure to the trade balance. The corrosive chemistry created by improper economic and trade policies, poor governance and political instability hurt Pakistan’s trade balance. However, the findings of the paper are in line with Arora et al. (2003) for India. The effect of devaluation has been largely

neutralized by high inflation (Shahbaz, 2008, 2009) which contributed to a sense of 'doing even more' depreciation.

Table-5: Long Run Elasticities of Trade Balance

Regressors	OLS Regression		Johansen Normalized Regression	
	Coefficient	T-Statistics	Coefficient	T-Statistics
Panel-A	Sample Period 1980Q1-2006Q4			
LREER	-0.7677	-15.1867a	-1.0179	-6.5414a
Constant	3.3337	13.6331a	4.3903	-5.8794a
Panel-A	Sample Period 1980Q1-1990Q4			
LREER	-0.8429	-7.3968a	-0.8908	-10.8907a
Constant	3.7178	6.4037a	3.9709	9.4920
Panel-A	Sample Period 1991Q1-2006Q4			
LREER	-0.4107	-2.1222b	-0.2914	-0.6757
Constant	1.6792	1.8730c	1.0660	0.5330

Note: a, b and c show significance at the 1%, 5% & 10% levels

Table-6: Short Run Relationship

Regressors	Coefficient	T-Statistics
Panel-A	Sample Period 1980Q1-2006Q4	
ΔLRER	-0.2842	-0.7267
Constant	-0.0005	-0.0396
ECM_{t-1}	-0.7654	-8.0062[a]
Panel-B	Sample Period 1980Q1-1990Q4	
ΔLRER	-0.0026	-0.0033
Constant	0.0021	0.0823
ECM_{t-1}	-0.9773	-6.3222[a]
Panel-C	Sample Period 1991Q1-2006Q4	
ΔLRER	-0.0058	-0.0139
Constant	-0.0009	-0.0712
ECM_{t-1}	-0.5126	-4.1606[a]

Note: a indicates significance at 1%

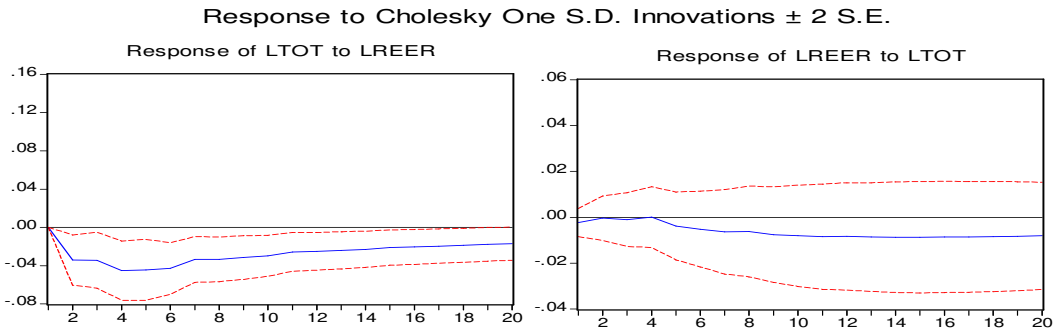
The short-run estimates suggest that real devaluation leads to deterioration in the trade balance in all three cases, although not statistically significant. The error correction terms ECM_{t-1s} measures the speed of adjustment to re-establish equilibrium in the short run dynamic model. This coefficients implies that a deviation from the long-run trade balance indicator during the different periods in the sample are corrected by about 76.54 percent, 97.73 percent and 51.26 percent each quarter for the three periods respectively. The coefficients of ECM_{t-1}'s are negative and statistically significant at the 1 percent level.

Bannerjee et al. (1998) note that a significant ECM_{t-1} with negative sign is indicates stable long run relationship.

IV. Impulse Response Function

Studies by Lal and Lowinger, (2002); Narayan, (2006) and Herve et al., (2010) suggest that the J-curve phenomenon can be examined through the application of the impulse-response function. Figure-2 depicts the response of trade balance to 1 standard deviation shock to real exchange rate which shows that the shock (devaluation of the Pakistani currency) triggers a deterioration response of trade balance from 4 time horizons and continues to 20 time horizons. This is a contra indication of the J-curve in Pakistan and may be for reasons stated earlier. (a) This may be due to lower elasticity of imports; (b) inflation eats up the potential positive impacts of devaluation; and (c) the small 'dose' of devaluation failed to reach a threshold and has been ineffective (see Arora et. al, 2003 for details). These findings are consistent with those found by Bahmani-Oskooee (1992), Akhtar and Malik (2000), Aftab and Khan (2008), Bahmani-Ooskooee and Cheema (2009) for Pakistan; Agbola, (2004) and, Bhattarai and Armah, (2005) for Ghana and Damoense and Agbola, (2004) for South Africa. However, the findings differ from those found by Aziz (2008) for Bangladesh; Kim (2009) for Korea and Herve et al. (2010) for Cote d'Ivoire.

Figure-2: Impulse Response Function



V. Conclusions and Future Research

The paper implements the ARDL approach to cointegration to examine the long run relation between currency depreciation and trade balance for Pakistan. The three major findings are summarized here. First evidence favors long run relationship between real exchange rate changes and trade balance for all periods used. Second, the statistically significant negative elasticities suggest that currency depreciation leads to deterioration in the trade balance for each of the three sample periods. Third, the impulse response function shows that one standard deviation shock to the real exchange rate causes a deteriorating response of trade balance from 4 and continues until 20 time horizons. This can be interpreted as lack of support for the J-curve phenomenon for Pakistan over the sample period.

Based on the findings, we argue that the reliance on exchange rate depreciation to improve trade balance may worsen the situation; further aggravated by high imports dependence in Pakistan. Policy of import-substitution might help lower imports dependence. Efforts should be made to insure quality control aspects of export goods aimed at restoring reputation in the international markets.

While this study uses a simple bivariate model, this is not uncommon in the trade literature. The findings are not counterintuitive based on the observed facts. However, as more data becomes available and the globalization takes its effect on the Pakistan economy, inclusion of other relevant trade variables might capture the underlying dynamics better. One obvious area of concern is the lack of stable political government which serves as a major bottleneck in the process of understanding market behavior.

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