Trade Openness and Real Exchange Rate: Some Evidence from Pakistan

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The paper studies the impact of trade openness on real exchange rate in Pakistan using quarterly data for the period 1972 to 2010. The study reveals a significant positive effect of trade openness on real exchange rate. Floating exchange rate system also depreciates the real exchange rate significantly. The results are robust to alternative trade openness measure and different model specifications. The results also highlight the role of other variables in determining the real exchange rate. Government consumptions and foreign direct investment significantly positively affect real exchange rate; while terms of trade, capital inflows, and capital accumulations have significant negative impacts on real exchange rate.

Key words: *Real Exchange rate, Trade Openness, Floating Exchange Rate*

JEL Classification: *C22, F41*

1. Introduction

Most of the studies that analyze balance of payments position of a country focus on real exchange rate, instead of nominal exchange rate, mainly because it is real exchange rate of a country that indicates its productive efficiency and is thus helpful to infer the direction of trade-flow between the two countries. Besides playing the role of

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international competitiveness, a country's real exchange rate is an important determinant of the growth of its cross-border trading; and it serves as an important relative price, signalling inter-sectoral growth in the long run (Bah and Amusa, 2003; Walters and De Beer, 1999). Edwards (1988a) suggest that real exchange rate has important effects not only on general economic performance and international competitiveness, but also on the different sectors of the economy, foreign trade flows and balance of payments, employment, structure of production and consumption, external debt crisis and allocation of resources in a country (Edwards and Savastano, 1999; Joyce and Kamas, 2003). Highly fluctuated, distorted and virtually meaningless real exchange rate results in an immense misallocation of resources and a miscalculation of the countries' comparative advantages during central planning, which distort their economic development (Dornbusch, 1988).

After the collapse of Bretton Woods system in 1973, real exchange rates have fluctuated widely in many countries as they switched from fixed to floating exchange rate system (Stockman, 1983; Mussa, 1986). Initially, the unanticipated monetary shocks were blamed for the greater instability of real exchange rates during the 1970s (Dornbusch, 1976). However, the view that monetary shocks were the sole culprit of exchange rate instability lost ground as most industrial countries have stabilized their inflation rates (Rogoff, 1999). A recent strand of the literature, the so-called 'new open economy macroeconomics', argues that non-monetary (real) factors have gained importance in explaining the real exchange rate variability. That is, in addition to monetary variables, real variables like productivity shocks, terms of trade shocks, government spending, capital flows, etc. should be taken into account while explaining real exchange rate variability. Thus, keeping in view the importance of real exchange rate for macroeconomic performance and for sectoral performance, it is important to understand the factors responsible for variations in real exchange rates. It is also useful to ascertain whether changes in real

exchange rates are transitory or permanent and whether they are caused by nominal or real variables. Nominal variables have only temporary effects on real exchange rate, while real variables have permanent (long-run) effects on real exchange rate.

Theoretical literature suggests that (equilibrium) real exchange rate that is consistent with both internal and external balances, changes in response to permanent real shocks. One such shock is trade openness. When a small closed country liberalizes its trade, demand for importables increases and demand for nontradables decreases in response to the relative price change, assuming that Marshall-Lerner condition holds, a real depreciation is necessary to maintain internal and external balances (Edwards, 1989). Calvo and Drazen (1998), however, showed that trade liberalization of uncertain duration could lead to an upward jump in consumption (including nontradables through within-period optimization) and hence a real appreciation will occur in the short run. They argue that real exchange rate will depreciate only if trade liberalization is of permanent nature, while a transitory reform could lead to a real appreciation in the short run. This is because transitory trade liberalization causes individuals to increase consumption while reform lasts, including higher demand for nontradables, in anticipation of higher prices when the trade liberalization policy is reversed. Consequently, the price of nontradables rises. This implies a decline in the relative prices of exportables and importables holding the world prices of tradables constant. In general, available theoretical literature suggests that successful trade liberalization has been associated with depreciation of real exchange rate either at the same time or beforehand (Krueger, 1978).

Empirical literature in explaining the effect of trade openness on real exchange rate remained mixed. Some studies show that openness has a positive influence on real exchange rate and that it depreciates after trade liberalization (Edwards, 1993; Elbadawi, 1994; Connolly and Devereux, 1995; 2000; Hau, 2002). In turn, some studies find

statistically insignificant effect of openness on real exchange rate (Edwards, 1987). Recently, Li (2004) has shown that credible trade liberalization lead to real exchange rate depreciation but non-credible ones could lead to short-run real exchange rate appreciation. Empirical studies differ in their results and the reason is that different studies have covered different time periods for different countries and that they have used different econometric techniques for the estimation of the real exchange rate models. They also differ in their use of data as some studies have used time-series data, others have used cross-section data, while some others have utilized pooled and panel data. The main problem with these studies is that most of them have not tackled the endemic problem of endogeneity by using any appropriate instrumental variable estimation technique.

In Pakistan some research has been conducted on the topic which has shown positive effect of trade openness on Pak-rupee real exchange rate (Chishti and Hasan 1993; Afridi, 1995; Siddiqui *et al.,* 1996). However, the latest research on the topic using recent sophisticated econometric techniques is scare in Pakistan. The present study tries to fill this gap. The study empirically explores the effect of trade openness on real exchange rate in Pakistan using quarterly data for the period 1972 to 2010.

The rest of the paper is organized as follows. The following section provides a brief history of trade openness and exchange rate system in Pakistan. Section 3 constructs theoretical framework. Data description, estimation and interpretation of the results are provided in Section 4. Section 5 presents the sensitivity analysis. Final section concludes the paper.

2. Trade Openness and Real Exchange Rate: A Brief History

2.1. Trade Openness

At the time of independence in 1947, Pakistan implemented import substituting industrialization policy to protect its nascent industrial units from international competition, The government facing the foreign exchange shortages after the war with India in 1965 further implemented different kinds of controls on imports. In December 1971, after the secession of East Pakistan (now Bangladesh) from West Pakistan (now Pakistan), government initiated the trade liberalization polices. The most important policies were the massive devaluation of domestic currency, the elimination of the export bonus scheme, and the end of restrictive licensing. However, in the late 1970s, when Pakistan faced an acute shortage of foreign exchange after the oil shock, imports were again restricted with new and more restrictive nontariff barriers. Under the auspices of the World Bank and the IMF, in late 1980s government started a comprehensive program of trade liberalization reforms. The most important initiatives were the reduction of tariffs on a number of raw materials, intermediate and capital goods, reduction in the number of banned items on restricted list, replacement of non-tariff barriers with tariffs, and the establishment of Tariff Commission to make recommendations on fiscal anomalies and effective protection. The thrust of Pakistan's trade policies in the 21st century has been on greater openness through trade liberalization with minimal tariff and non-tariff barriers and the market based exchange rate system. Pakistan, like many other countries of the world, is in the process of implementing the provisions of the WTO guidelines and agreements.

2.2. Exchange Rate System

During the past six decades, Pakistan's foreign exchange rate regime has been moving towards a deregulated and market-oriented direction. Before the 1970s, Pakistan linked its currency, Pak-rupee, to the British Pound Sterling. With increasing economic influence of the

United States, in 1971 Pakistan linked rupee to the US Dollar. After the collapse of Bretton Woods system in 1973, many industrialized countries of world switched from fixed to flexible exchange rate system. Pakistan was no more exception. Therefore, Pakistan adopted the controlled flexible exchange rate system in January 1982 with its currency linked to a trade-weighted currency basket. In 1998, to alleviate the financial crisis in Pakistan, the authorities adopted a multiple exchange rate system, which comprised of an official rate (pegged to US dollar), a floating inter-bank rate, and a composite rate (combination of official and floating inter-bank rates). With the economy recovering from the crisis in 1999, the three exchange rates were unified and pegged to the US dollar within a certain band. This band was removed in 2000. Now, Pakistan is managing a floating rate. Under the argument that Pakistan's exports are inelastic and requires depreciation of domestic currency, Pak-rupee was steady depreciated since the adoption of controlled floating exchange rate system in 1982. Pak-rupee depreciated from Rs 12.84 per US dollar in 1982 to Rs 86.35 in December 2010.

3. Framework of Analysis

3.1. Theoretical Underpinnings[1]

In theoretical literature, there are mainly two different approaches to model the real exchange rate, namely the monetary approach and the macroeconomic (or the real) approach. The monetary approach assumes highly integrated goods and capital markets. In this approach real exchange rate follows the purchasing power parity value as a long-run equilibrium value. Therefore, real exchange rate becomes constant overtime. If real exchange rate follows purchasing power parity, then purchasing power parity can be used to predict over or under valuation of the exchange rate. In turn, macroeconomic (or real) approach highlights the role of (real) economic variables in the

[1] This sub-section leans upon Villavicencio and Bara (2008).

determination of the real exchange rate. According to this approach (equilibrium) real exchange rate maintains both internal and external balance.

In macroeconomic approach, there are further two theories of exchange rate determination, namely the balance of payments approach, and the Balassa-Samuelson approach. Balance of payments approach of Nurkse (1945) underlines the role of net foreign asset position of the country in determining the exchange rate. This approach is based on the adequacy of the current account to keep equilibrium capital flows and keep in check saving-investment balances. The Balassa-Samuelson approach of Balassa (1964) and Samuelson (1964) highlights the role of sectoral (tradable and nontradable) balance in determining the exchange rate. In fact, this theory relates the long run behavior of the real exchange rate with the productivity performance of traded goods relative to non-traded goods. The idea is that if the productivity of the traded goods rises relative to that of non-traded goods, the real exchange rate will appreciate and vice versa. For empirical purpose, theoretical models have been developed that encompasses the propositions of both the balance of payments and the Balassa-Samuelson approach to real exchange rate determination (see Edwards, 1988a, 1988b).

3.2. Modeling Real Exchange Rate

This sub-section derives the real exchange rate model, which will be empirically estimated in subsequent section. In line with precious research on the topic, the following variables, which include both policy and endogenous ones, are identified as possible determinants of real exchange rate.[1] Each of these variables and the relevant theory that justifies its inclusion in the model are explained turn by turn.

[1] For such type of model see, among others, Edwards (1988a, 1988b), Connolly and Devereux (1995), Elbadawi (1994), Hau (2002), Li (2004), Bleaney (2008) and Villavicencio and Bara (2008).

$$rer_t = \alpha_0 + \alpha_1\, openness_t + \alpha_2\, tot_t + \alpha_3\, g_t + \alpha_4\, CIF_t + \alpha_5\, fi_t + \alpha_6\, ca_t + \alpha_7\, fdt_t + \upsilon_t \quad (1)$$

where the lowercase letters denote that the underlying variables are in natural log form, and where $\upsilon_t \sim N(0, \sigma^2)$. Various variables are defined as follows.

rer_t = Real exchange rate of Pak-rupee

$openness_t$ = Trade openness

tot_t = Terms of trade

g_t = Government consumption

CIF_t = Capital inflows

fi_t = Foreign investment

ca_t = Capital accumulation

fdt_t = Foreign debt

υ_t = White-noise error term

Trade openness in the form of decrease in tariffs or increase in quotas, decrease the domestic price of tradables and thus result in both income and substitution effects. The substitution effect (both inter-temporal and intra-temporal) causes in demand towards importables, leading to an increase in tradable prices. The resulting deterioration in trade balance leads to depreciation of real exchange rate. However, the income effect of openness on nontraded goods is uncertain. Connolly and Devereux (1995) and Edwards (1988b) has pointed out that the substitution effect of trade openness dominates the income effect. Thus increased openness (i.e. a decrease in tariffs or an increase in

quota) lead to a higher relative price of tradables, thereby resulting in depreciation of domestic currency via deteriorated trade balance.

If trade is increased through reduced export taxes, a real appreciation will occur via improvement in trade balance. Connolly and Devereux (1995) argue that in this case income and substitution effects tend to work in the same direction for export changes, thereby leaving no ambiguity. It follows that on net basis the theoretical impact of trade openness on real exchange rate is vague and hence the sign of α_1 is unpredictable.

Terms of trade reflects foreign price shocks that developing countries face. According to Edwards (1988b) and Edwards and Wijnbergen (1987), changes in terms of trade produce inter-temporal and intra-temporal income and substitution effects. An income effect exists when an increase (decrease) in export (import) prices, ceteris paribus, raises domestic income, which is spent both on tradables and nontradables. With the prices of tradables being exogenous to the system, the price of nontradables will increase in relative terms, thereby causing the real exchange rate to appreciate via improvements in current account balance (spending effect). On the other hand, the substitution effect, in case of increase in export prices, shifts the foreign demand away from domestic exports, thereby causing the production of exports to fall. This moves the factors of productions away from tradables to nontradables. This will reduce the prices of nontradables in relative terms and hence result in depreciation of domestic currency in real terms through trade deteriorations (factors switching effect). Therefore, the net effect of terms of trade changes on real exchange rate is ambiguous. Thus the coefficient α_2 cannot be signed at the moment.

The effect of government expenditure on real exchange rate depends upon whether it is utilized for the consumption of tradables or nontradables. If government utilizes most of the funds to purchase nontradables, relative price of nontradables to tradables increases and

real exchange rate will appreciate via current account improvements (Connolly and Devereux, 1995; Edwards, 1988a). Otherwise, if government purchases mostly imported goods then relative prices of tradables to nontradables increases and real exchange rate will depreciate through incipient trade deficit. The empirical literature, however, seems to suggest that the share of government expenditure towards nontradables outweighs that of tradables, thereby predicting a negative sign of the coefficient α_3 (Elbadawi, 1994).

Any change in capital inflows would affect inter-temporal consumption and hence real exchange rate. The extent of the effects of capital inflow on real exchange rate depends upon the nature of spending i.e. whether it is utilized for consumption of tradables or of nontradables. If capital inflows are spent on tradables then real exchange rate will depreciate through trade deficit, while in case the capital inflows are spent on nontradables then real exchange rate will appreciate (Edwards, 1988a; 1988b; Razin and Collins, 1997). Hence the sign of the coefficient α_4 can not be signed priori.

The effect of foreign direct investment on real exchange rate depends whether proceeds from foreign investment are used for the purchase of tradable goods or non-tradable goods. If the proceeds are used for the purchase of tradables (e.g. for the import of machinery and raw materials) then domestic currency will depreciate in real terms through deteriorated current account. Conversely, if spending is made on the purchase of nontradable goods then real exchange rate will appreciate. Response of real exchange rate to foreign investment also depends on whether capital accumulation takes place in export oriented industries or in import substitution industries. Thus, the sign of the coefficient on foreign investment α_5 cannot be determined.

Capital accumulation represents production capacity and potential for economic growth and technological progress of a country. The way real exchange rate responds to capital accumulation depends upon whether capital accumulation takes place mostly in export oriented

industries or in industries of import substitutes and nontradables (Afridi, 1995; Edwards, 1988a). The response also depends upon income elasticities of these industries. Overall, the response of real exchange rate to capital accumulation remains ambiguous before hand. Therefore, the coefficient α_6 cannot be signed priori. Like capital inflows, an accumulation of foreign debt can also lead to appreciation or depreciation of real exchange rate depending upon whether the foreign debt is used for the consumption of nontradables or tradables. Hence the sign of the coefficient α_7 is also unpredictable.

4. Data, Estimation and Interpretation of Results

4.1. Data Overview

Real exchange rate is defined as nominal exchange rate adjusted for foreign (tradable) price level and domestic (non-tradable) price level. We have used WPI as foreign (tradable) price level and CPI as domestic (non-tradable) price level (Edwards, 1988a; 1988b). The United States is taken as the foreign country. Nominal exchange rate is taken as domestic currency per unit of foreign currency. Thus, an increase (decrease) in the value of real exchange rate indicates depreciation (appreciation) of local currency. Trade openness is defined as the ratio of sum of exports and imports to nominal GDP. Terms of trade is defined as the relative price of exportable to importable. Government consumption is taken as ratio of real GDP. Capital inflow is constructed as the ratio of capital account deficit to nominal GDP. Foreign investment is obtained by dividing foreign direct investment with nominal GDP. To capture the effects of local investment on exchange rate we have used the ratio of domestic investment to GDP. Foreign debt variable is constructed by dividing total foreign debt with nominal GDP. Time series data is collected for the period 1972Q1 to 2010Q2 form International Financial Statistics

(IFS), World Development Indicators (WDI) and Pakistan Economic Surveys.

Table 1 contains summary statistics for the variables used in this study, which may help in the interpretation of the coefficient estimates by providing the scale of the relevant variables. Table 2 presents the correlation matrix for the variables. Column (1) of Table 2 correlates real exchange rate with all independent variables. The value of correlation coefficient of openness variable is 0.35, which indicates that real exchange rate is positively correlated with trade openness. Figure 1 plots the simple regression between real exchange rate and trade openness. The figure displays an apparent positive relationship between real exchange rate and trade openness for Pakistan. The simple regression analysis, being essentially bivariate and simplistic, calls for exploration in a more rigorous framework. This is what the next section of the paper attempts to do.

Table 1

Descriptive Statistics of the Variables [1972Q1 – 2010Q2]

	Mean	Median	Std. Dev.	Maximum	Minimum	Count
Real Exchange Rate	47.43	48.11	9.85	69.54	21.15	154
Openness	34.03	34.07	5.03	52.80	16.61	154
Terms of Trade	1.50	1.53	0.37	2.58	0.72	154
Govt. Consumption (ln)	-6.87	-6.89	0.16	-6.48	-7.37	154
Capital Inflows	7.29	7.10	4.09	17.96	-0.82	154
Foreign Investment	0.92	0.60	1.11	6.27	0.01	154
Capital Accumulation	18.01	18.29	2.56	22.82	6.06	154
Foreign Debt	24.63	26.65	13.45	53.10	3.60	154

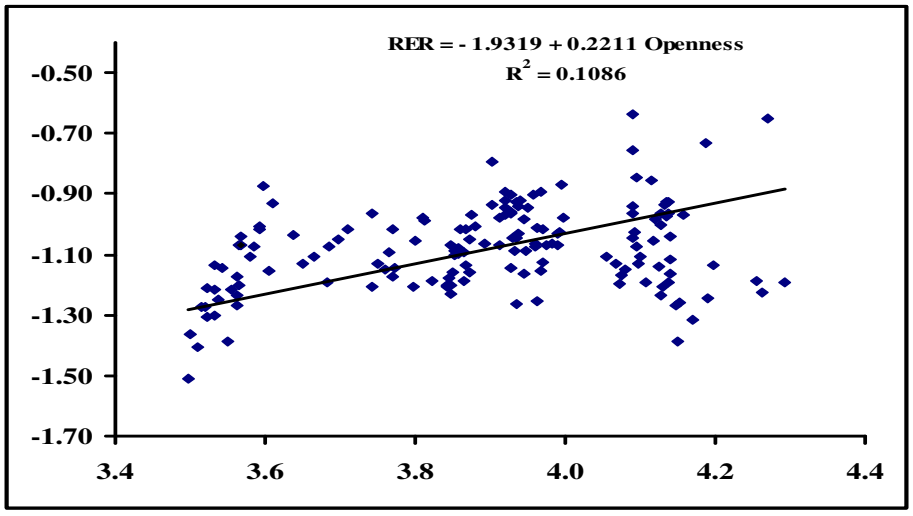
Table 2

Correlation Matrix for the Variables Included in the Regressions [1972Q1 – 2010Q2]

	Real Exchange Rate	Openness	Terms of Trade	Government Consumption	Capital Inflows	Foreign Investment	Capital Accumulation	Foreign Debt
Real Exchange Rate	1							
Openness	0.35	1						
Terms of Trade	-0.66	-0.34	1					
Government Consumption	0.24	0.34	-0.35	1				
Capital Inflows	-0.43	0.24	0.03	0.12	1			
Foreign Investment	0.56	0.39	-0.63	0.37	-0.01	1		
Capital Accumulation	-0.18	0.28	-0.48	0.44	0.43	0.49	1	
Foreign Debt	-0.84	0.41	-0.80	0.40	-0.20	0.70	0.47	1

Figure 1

Simple Regression between Real Exchange Rate and Openness [1972Q1 – 2010Q2]



4.2. Estimation and Interpretation of the Results

To estimate our model we cannot apply least square method as the potential endogeneity of the variables can render the least square estimators biased and inconsistent. Therefore, we have applied Generalized Method of Moments (GMM) estimation technique of Arellano and Bond (1991), Arellano (1993) and Arellano and Bover (1995) to estimate the real exchange rate equation. The GMM estimators control for the potential endogeneity of the lagged dependent variable and for the potential endogeneity of other explanatory variables in the model (Judson and Owen, 1999). Lagged values of the variables are used as instruments.[1]

[1] To verify long-run relationship between dependent and independent variables, we have applied ADF unit-root tests. The results show that only one variable namely capital inflow is

Results of real exchange rate equation (1) are reported in Table 3. The t-statistics on openness coefficient (3.878) indicates that there is a statistically significant positive relationship between trade openness and real exchange rate in Pakistan.[1] The coefficient for the openness stood at 0.553, which means that a one-standard-deviation increase in openness (5.03) leads to about 2.78 percent depreciation in real exchange rate. In other words, one percent increase in openness will depreciate Pak-rupee real exchange rate by 0.553 percent. The fraction of the variation in real exchange rate due to openness, as explained by column (2), is nontrivial. The remaining columns of the table investigate the robustness of these results to some simple changes in specification. These changes alter the results only trivially. Thus, the estimated impact of trade openness on real exchange rate is robust to alternative equation specifications with reasonable values of overall R-squares and adjusted R-squares. This finding is consistent with the notion that trade openness weakens the real value of the local currency in developing countries. The results show that openness is a constraint on policymakers' incentives to stabilize the domestic currency in real terms. In estimations autoregressive (AR) process has been applied to remove autocorrelation problem from the models. The values of Durbin-Watson (DW) statistics are reasonably close to the desired value of two, indicating the absence of autocorrelation problem.

Pak-rupee real exchange rate is significantly negatively affected by terms of trade shocks, suggesting that income effect of this variable dominates substitution effect. An increase in the terms of trade improves the current account and raises domestic income and expenditures. To restore internal and external balance, domestic prices

stationary at levels, while the remaining six variables are integrated of order one. It indicates that the estimate of real exchange rate equation can form a long-run relationship of nominal exchange rate with six of the seven explanatory variables, while the relationship with the one stationary variable is based on short-term variations in the latter.

[1] To check the non-linear effect of openness on real exchange rate, a squared term of openness was included in the real exchange rate equation. However, its effect on real exchange rate turned out to be statistically insignificant and hence excluded from the estimation.

rise and/or the nominal exchange rate appreciates. In either case, the result is an appreciation

Table 3

The GMM Estimates of the Relationship between Real Exchange Rate and Trade Openness [1972Q1 – 2010Q2]

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intercept	6.376	3.969	4.238	5.023	4.559	4.893	2.587	3.863	4.664	4.557	2.355
	(7.990)*	(3.008)*	(3.736)*	(4.557)*	(2.102)*	(6.591)*	(3.654)*	(5.853)*	(8.358)*	(2.741)*	(2.951)*
Openness	0.553	0.107	0.253	0.073	0.123	0.440	0.305	0.079	0.163	0.608	0.287
	(3.878)*	(2.743)*	(2.735)*	(2.206)*	(2.483)*	(3.993)*	(2.724)*	(2.203)*	(3.793)*	(4.346)*	(2.521)*
Terms of Trade	-0.183		-0.384						-0.145		
	(-2.466)*		(-2.205)*						(-2.168)*		
Govt. Consumption	0.446			0.127					0.085		
	(3.434)*			(1.523)					(1.052)		
Capital Inflows	-0.082				-0.001					-0.190	
	(-2.632)*				(-0.463)					(-7.141)*	
Foreign Investment	0.137					0.115				0.108	
	(5.450)*					(10.431)*				(7.711)*	

Capital Accumulation	-0.290 (-2.180)*						-0.967 (-2.179)*				-1.067 (-2.231)*
Foreign Debt	-0.037 (-0.355)							0.009 (0.127)			0.008 (0.035)
AR(1)	0.298 (6.666)*	0.986 (6.522)*	0.961 (2.120)*	0.998 (3.748)*	0.997 (6.711)*	0.481 (8.016)*	0.945 (5.511)*	0.993 (3.796)*	0.971 (5.819)*	0.704 (4.107)*	0.950 (5.197)*
R^2	0.959	0.960	0.946	0.961	0.962	0.767	0.943	0.959	0.962	0.723	0.941
Adjusted R^2	0.938	0.959	0.944	0.960	0.961	0.762	0.942	0.959	0.961	0.715	0.939
S.E. of regression	0.014	0.042	0.049	0.041	0.041	0.101	0.050	0.042	0.041	0.110	0.051
DW Statistics	1.934	2.281	2.445	2.351	2.352	1.716	2.154	2.238	2.429	2.663	2.107

Note: Values in parentheses denote underlying student-*t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and ** respectively.

of the real exchange rate. The estimated elasticities are plausible in the light of existing literature. One percent improvement in terms of trade appreciates Pak-rupee in real terms approximately by 0.2 percent.

Coefficient of government consumption bears a significant positive sign in all specifications. It indicates that in Pakistan government has spent most of the funds to purchase tradables, which in turn has depreciated Pak-rupee in real terms via current account deficits. This result does not support previous literature that suggests that the government expenditure usually falls more on nontradables as compared to tradables (Elbadawi, 1994). One percent increase in government expenditure on traded goods will depreciate Pak-rupee in real terms by 0.45 percent.

The regression results further show that inflow of capital has significant negative effect on Pak-rupee real exchange rate. This result indicates that proceeds of capital inflows in Pakistan are mostly spent on non-tradables, which has appreciated Pak-rupee in real terms via current account improvements. Alternatively, an increase in capital flows will finance greater absorption and a larger current account deficit. This is obtained through a real exchange rate appreciation, either through rising prices or an appreciation of the nominal exchange rate.

Foreign direct investment has depreciated real exchange rate in Pakistan. it indicates that proceeds from foreign investment have been used for the import of raw materials, machinery and other capital goods. It resulted in the deterioration of current account, which has depreciated the domestic currency. In turn, domestic capital accumulation (domestic investment) has affected Pak-rupee real exchange rate significantly negatively. The negative sign of this variable indicates that enhanced production capacity of the country due to capital accumulation probably pushes up the relative price of notradables because of dominance of income effect over substitution effect, which appreciates real exchange rate. If capital accumulation

increases by 1 percent real exchange rate will appreciate by 0.29 percent.

Finally, foreign debt negatively affect Pak-rupee real exchange rate. It indicates that in Pakistan foreign debt is used for the consumption of nontradables as compared to tradables, which has appreciated the real exchange rate via improved current account position. However, this result is not statistically significantly.

5. Sensitivity Analysis

5.1. Shift in Exchange Rate Regime

Supporters of fixed exchange rate system fear that flexible exchange rate system will lead to high fluctuations in exchange rates (Krugman, 2004). In other words, they believe hat shift from fixed to flexible exchange rate system will depreciate the local currency. To check this hypothesis we have introduced a binary variable in the model that takes the value of 1 from 1982 onwards, when Pakistan adopted flexible exchange rate system in 1982, and zero for the previous period, when the exchange rate system was fixed.

Column (1) of Table 4 provides the estimated results. The results supports the previous hypothesis as shifting from fixed exchange rate to flexible exchange rate system has depreciated Pak-rupee real exchange rate as the coefficient of 'exchange rate regime dummy' is positive and is highly statistically significant. The value of the coefficient indicates that shift from fixed to flexible exchange rate will depreciate Pak-rupee by 0.20 percent. This result is robust with alternative equation specifications. This result is to the disappointment of supporters of floating exchange rate system, particularly Friedman (1953) and Meade (1955), who strongly believed that under floating exchange rate system, speculation in foreign exchange markets would not be destabilizing in the long run.

5.2. Alternative Trade Openness Measure

An important issue while examining the effect of trade openness on real exchange rate is the absence of any suitable measure of trade openness. As a result, different researchers have used different openness measures to examine the effect of openness on real exchange rate. Although trade intensity ratio (i.e. trade to GDP ratio) is widely used as a proxy measure for trade openness, binary variables are also used to measure trade openness. One important binary measure of trade openness which is commonly used in recent literature is Sachs and Warner (1995) dichotomous variable.[31] This variable takes the value of 1 if an economy is open and zero otherwise. In Pakistan it takes the value of 1 from 2001 onwards and zero for the previous period.

To verify our results, we have used this binary variable in our estimation instead of trade intensity ratio. The results are reported in column (5) of Table 4. Significant positive coefficient on 'openness dummy' corroborates our previous findings that trade openness has depreciated the domestic currency in Pakistan. This result is also robust with alternative model specifications. Not only the remaining variables have maintained their sings and statistical significance but the foreign debt variable also becomes statistically significant.

[31] Wacziarg and Welch (2003) have updated this index.

Table 4

The GMM Estimates of the Relationship between Real Exchange Rate and Trade Openness [1972Q1 – 2010Q2]

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Exchange Rate Regime Dummy				*Openness Dummy*			
Intercept	4.502	4.765	3.785	3.519	6.522	3.838	4.110	3.587
	(7.724)*	(5.298)*	(3.101)*	(2.284)*	(7.589)*	(6.406)*	(4.402)*	(5.907)*
Openness	0.394	0.096	0.341	0.344				
	(3.277)*	(2.674)*	(4.070)*	(4.208)*				
Openness Dummy					0.279	0.073	0.115	0.030
					(3.657)*	(2.167)*	(3.085)*	(0.416)
Terms of Trade	-0.289	0.029			-0.332	0.006		
	(-4.297)*	(0.413)			(-2.999)*	(0.288)		
Govt. Consumption	0.180	0.153			0.457	0.000		
	(2.061)*	(1.675)**			(2.946)*	(-0.007)		
Capital Inflows	-0.068		-0.094		-0.085		-0.102	
	(-2.880)*		(-5.873)*		(-3.397)*		(-4.981)*	
Foreign Investment	0.075		0.014		0.057		0.110	
	(3.758)*		(1.875)**		(2.601)*		(6.770)*	
Capital Accumulations	-0.175			-0.401	-0.341			-0.165
	(-			(-2.156)*	(-2.209)*			(-0.822)

	1.742)**							
Foreign Debt	-0.028			-0.317	-0.310			-0.309
	(-0.383)			(-2.928)*	(-2.495)*			(-2.639)*
Exchange Rate Regime Dummy	0.205	0.231	0.247	0.351				
	(5.282)*	(2.448)*	(2.137)*	(5.959)*				
AR(1)	0.224	0.996	0.688	0.894	0.574	0.996	0.704	0.990
	(3.363)*	(10.877)*	(5.339)*	(2.044)*	(8.829)*	(5.397)*	(5.777)*	(7.756)*
R^2	0.852	0.960	0.920	0.937	0.863	0.957	0.804	0.954
Adjusted R^2	0.842	0.958	0.917	0.934	0.855	0.956	0.798	0.952
S.E. of regression	0.082	0.042	0.060	0.053	0.079	0.043	0.093	0.045
DW Statistics	1.861	2.483	1.989	2.364	1.857	2.363	2.596	2.393

Note: Values in parentheses denote underlying student-*t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and ** respectively.

6. Conclusion

The study empirically examines the effect of trade openness on real exchange rate in Pakistan using quarterly data for the period 1972Q1 to 2010Q2. For this purpose a dynamic model of real exchange rate determination is estimated using GMM estimation technique, a relatively modern approach. The results show that trade openness has a statistically significant positive effect on real exchange in Pakistan, which indicates that trade openness has depreciated Pak-rupee in real terms. This result is robust with alternative trade openness measure and different model specifications. The results also show that shifting from fixed to floating exchange rate system has also depreciated the real exchange rate in Pakistan. The results further show that real exchange rate depends upon a number of other endogenous and policy variables. Specifically, fluctuations in real exchange rates can be explained by terms of trade, government expenditure policies, capital mobility, foreign investment policies, capital accumulations, and foreign debt policies of the government. These results are also robust with alternative model specifications. Inconsistent macroeconomic polices are shown to be the principal source of disequilibrium in real exchange rate (Edwards, 1988b). This model can be used both for prediction and for analytical understanding. It can also be used for critical evaluation of various policy options.

The real exchange rate is found to be affected by macroeconomic variables in the same direction as suggested by theory. Thus, taken together, these results have a number of policy implications for policy makers in Pakistan. The results show that trade openness is one of the tools in the policy maker's arsenal to avoid real exchange rate variability specifically the under and/or overvaluation of the real exchange rate. Further, real exchange rate is also affected by the factors which are outside the control of policymakers, such as the terms of trade and capital flows. Excessive variability in these external variables, which can be considerable for developing economies, will result in sharp fluctuations in the real exchange rate and related domestic economic variables, such as tradable goods production,

prices, and the current account. In order to reduce the impact of terms of trade shocks, governments may utilize policies to promote the diversification of traded goods, while large fluctuations in capital flows provide a justification for some government management of capital account transactions.

Since there is much room for policy intervention, attention may also be given to government fiscal, foreign debt and investment policies when considering exchange rate objectives. Our analysis suggests that even after adopting the flexible exchange rate regime, long-term success depends on a commitment to sound economic fundamentals. This is not only the case for Pakistan but also for other developing countries.

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