

# EXCHANGE RATES AND EXPORTS NEXUS: TIME SERIES EVIDENCE FROM PAKISTAN

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## *Abstract*

This paper investigated the responsiveness of exports demand and supply to nominal, real and effective exchange rates over the period 1972-2005. We have used 3SLS that yields estimators with greater asymptotic efficiency than that achieved by the limited-information methods. It has been found that depreciation of the nominal exchange rate is expansionary suggesting the success of devaluation. Liberalization of the trade regime leads to depreciation and its impact is positive on export demand. Effective exchange rate has positive and significant coefficient implying that when an economy is liberalized, export incentives and subsidies assume relatively more importance to promote exports. Depreciation of both nominal and real exchange rates has expansionary effect on the exports supply. The price elasticity of exports supply is positive but not significant suggesting that Pakistan is a price-taker. Keeping in view, low supply price elasticity, exchange rate changes are not the sufficient condition. In addition to exchange rate, other factors also matter. Maintenance of a reasonably realistic exchange rate is expected to help export promotion and will have healthy impact on income distribution and employment.

## **I. Introduction**

Over the last five decades, Pakistan has followed different trade strategies as the domestic and international situations demanded. Towards the end of 1980s, government of Pakistan (GOP) started a comprehensive programme of macroeconomic adjustment and structural reforms in order to end the anti-export bias in trade policies and to liberalize the economy to make it more efficient and competitive. Trade liberalization is an important element of the structural adjustment programme. The successive governments have taken a number of steps to pursue an extensive liberalization of the trade regime in addition to taking a number of export measures (GOP1992-93, p.93). Exchange rate policy is also an important element of the traditional stabilization programme that requires adoption of a realistic exchange rate that is exchange rate is allowed to fluctuate as the market conditions demand.

Bird (1983) has identified three factors that have contributed to the importance of exchange rate policy in the developing countries. Since 1973-74, developing countries have faced severe balance of payments (BoPs) deficits and substantial attention has been paid to methods of payments adjustments. In addition adverse movements in developing countries' terms of trade have contributed significantly to BoPs deficits and therefore, policy orientation is required towards encouraging structural adjustment rather than simply reducing the level of domestic expenditures; depreciation may play an important role here. Bird notes that the major divergence of opinion is on viewing depreciation, on one hand, as an instrument of monetary policy and on the other hand, an instrument for encouraging structural change. Third, devaluation debate is central to relations between developing countries and IMF.

The importance and motivation of the investigation of the response of demand and supply of exports to exchange rate changes is quite obvious. The objective of this paper is to see the exchange rate responsiveness of exports demand and supply. We examine this response of exports for nominal, real and effective exchange rates. Khan (1974), Anwar (1985), Khan and Saqib (1993) and Afzal (2001) have estimated export functions for Pakistan in a simultaneous equations framework. These studies, however, have not examined the above-mentioned exchange rate response of Pakistan's exports. The studies on exchange rate behaviour (for example, Siddiqui et al 1996, Afridi 1995, Chisti and Hasan 1993) in Pakistan have also not examined the said aspect. Rest of the paper is designed as

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follows. Section 2 carries the model and data sources. Estimation results and discussion are given in Section 3 and Section 4 contains conclusions.

## 2. Methodology and Data Sources

The demand and supply of exports depend on a number of domestic and international factors. The important factors include: world or important trade partners' income; the competition of domestic export prices with the world or important trade partners' export prices, domestic production conditions, domestic inflation, terms of trade, and exchange rate policy.

Because of simultaneous nature of export demand and supply, we specify two equations simultaneously. The export and exchange rate augmented Cobb-Douglas production function for export demand and supply is:

$$X_d = A [UVX_p / UVX_w]^{\alpha_1} W^{\alpha_2} ER^{\alpha_3} e^{\epsilon} \quad (1)$$

$$X_s = B [PX/WPI]^{\beta_1} Y^{\beta_2} ER^{\beta_3} e^{\xi} \quad (2)$$

Taking the logarithm to linearise equations (1) and (2), we have

$$\ln X_d = \alpha_0 + \alpha_1 \ln [UVX_p / UVX_w] + \alpha_2 \ln W + \alpha_3 \ln ER + \epsilon_t \quad (3)$$

$$\ln X_s = \beta_0 + \beta_1 \ln [PX/WPI] + \beta_2 \ln Y + \beta_3 \ln ER + \xi_t \quad (4)$$

Where

$\ln$  = natural logarithm, A, B = efficiency parameters,  $\alpha_0 = \ln A$ ,  $\beta_0 = \ln B$ ,  $X_d$  = real value of exports demand,  $UVX_p$  = unit value of exports of Pakistan in US dollars,  $UVX_w$  = unit value of exports of the world in US dollars,  $W$  = world real income,  $X_s$  = real value of export supply,  $Y$  = real GDP of Pakistan,  $PX$  = Unit value of exports of Pakistan in domestic currency rupees (Rs),  $WPI$  = wholesale price index of Pakistan,  $ER$  = nominal, real or effective exchange rate,  $NER$  = nominal exchange rate,  $REX$  = real exchange rate,  $EER_x$  = effective exchange rate for exports and,  $\epsilon$ ,  $\xi$  = error terms

$$\begin{aligned} D_0 &= \text{dummy variable} \\ &= 0 \quad 1972 \text{ to } 1990 \quad (\text{Pre-liberalisation}) \\ &= 1 \quad 1991 \text{ to } 2005 \quad (\text{Liberalisation}) \end{aligned}$$

Real exchange rate can be defined in several different ways. However, there are generally two approaches used in literature. First, is in terms of domestic price of the foreign currency and second is the foreign price of the domestic currency. Therefore,  $REX$  is defined as according to the first approach Dornbusch et al (1989, p.12) as under:

$$REX = NER / CPI * USA WPI \quad (A-1)$$

Where  $CPI$  = Pakistan's consumer price index [1990=100],  $US WPI$  = USA wholesale price index

To take into account the combined effect of exchange and trade policies on relative prices, the real exchange rate may be substituted by the effective exchange rate for exports ( $EER_x$ ) that includes nominal exchange rate ( $NER$ ), as well as export subsidy ( $s$ ) and other incentives to exports ( $k$ ) (see Krueger(1978, Khan 1998).

That is

$$EER_x = NER (1+s+k) \quad (A-2)$$

We, therefore, now substitute the nominal, real and the effective exchanges rate for  $ER$  in the export demand and supply equations. Dummy variable has been used to capture the trade and other macroeconomic reforms in all equations.

$$\ln X_d = \alpha_0 + \alpha_1 \ln (UVX_p / UVX_w) + \alpha_2 \ln W + \alpha_3 \ln NER + \alpha_4 D_0 \quad (5)$$

$$\ln X_s = \alpha_0 + \alpha_1 \ln (UVX_p / UVX_w) + \alpha_2 \ln W + \alpha_3 \ln REX + \alpha_4 D_0 \quad (6)$$

$$\text{Ln}X_d = \alpha_0 + \alpha_1 \text{Ln}(\text{UVX}_p / \text{UVX}_w) + \alpha_2 \text{Ln}W + \alpha_3 \text{Ln}EER_x + \alpha_4 \text{Do} \quad (7)$$

Since the equations are specified in logarithm, the coefficients are elasticities in all equations.  $\alpha_1$  is relative price, and  $\alpha_2$  is world income elasticities, while  $\alpha_{31}$ ,  $\alpha_{32}$  and  $\alpha_{33}$  are the nominal, real and effective exchange rates for exports elasticities respectively. The expected signs of these coefficients are positive. Nothing can be said a priori about  $\alpha_4$  because trade liberalisation may have positive or negative effects on exports demand and supply. Given the above-mentioned discussion on exchange rate, the export supply functions are:

$$\begin{aligned} \text{Ln}X_s &= \beta_0 + \beta_1 \text{Ln}(\text{PX}/\text{WPI}) + \beta_2 \text{Ln}Y + \beta_{31} \text{Ln}NER + \beta_4 \text{D0} \quad (8) \\ \text{Ln}X_s &= \beta_0 + \beta_1 \text{Ln}(\text{PX}/\text{WPI}) + \beta_2 \text{Ln}Y + \beta_{32} \text{Ln}REX + \beta_4 \text{D0} \quad (9) \\ \text{Ln}X_s &= \beta_0 + \beta_1 \text{Ln}(\text{PX}/\text{WPI}) + \beta_2 \text{Ln}Y + \beta_{33} \text{Ln}EER_x + \beta_4 \text{Do} \quad (10) \end{aligned}$$

$\beta_1$ ,  $\beta_2$ ,  $\beta_{31}$ ,  $\beta_{32}$  and  $\beta_{33}$  are respectively relative price, real GDP, nominal, real and effective exchange rates elasticities. The expected signs of all the coefficients except  $\beta_4$  are expected to be positive.

### Data Sources:

The data on GDP, consumer price index, wholesale price index and exports have been taken from GOP, *Economic Survey* (various issues). The data regarding USA wholesale price index, and unit value of exports in domestic currency as well as US dollars were collected from International Financial Statistics (IFS) yearbooks (various years). Data on nominal exchange rate were taken from IFS for the 1970s and for 1980s onward from State Bank of Pakistan Annual Reports (various reports)... Real world income data were obtained from World Tables (various issues). To reconcile, fiscal (GOP) and calendar years data (IMF and World Bank), data were adjusted like 1971-72 = 1972 and so on. Data on effective exchange rate for exports were obtained up to 1988 from Mahmood and Qasim (1992) and from Khan (1998) up to 1997 and the data were simulated for later years (1998-2005). CPI and UVX deflated nominal GDP and exports in domestic currency respectively. Using annual data the period of the study is 1972-2005.

### 3. Estimation Results

Since we are estimating export behaviour in a simultaneous equations framework, ignorance of simultaneity would result in inconsistent and biased estimates and disregard of simultaneity leads to misleading conclusions (Tyler 1981, Ram 1985, Jung and Marshall 1985, Serletis, A.1992, and Khan and Saqib 1993). We use the method of three stage least squares (3SLS). Two stage least squares, indirect least squares, and limited information maximum likelihood are all limited-information estimators because these methods do not take into consideration information on other structural equations in the model while estimating any structural equation. If the model is not misspecified<sup>1</sup>, 3SLS will yield estimators with greater asymptotic efficiency than that achieved by the limited-information methods. The 3SLS is a full- information method. All the equations are over identified using both order and rank conditions for identification.

In equations 5 (Table 1) the coefficient of nominal exchange rates is positive and significant suggesting that depreciation of the nominal exchange rate is expansionary. Dummy is positive but insignificant. This implies that liberalisation of the trade regime has insignificant impact on export demand. The coefficient of the REX is of pivotal importance. If it is negative and significant, it will imply that *ceteris paribus* devaluation is contractionary. If the coefficient is positive and significant, the devaluation is expansionary and if it is not significant, the devaluation is neutral (Upadhyaya and Upadhyaya 1999).

<sup>1</sup> All the equations were subjected to diagnostic and specification tests [Ramsey RESET, White, JB normality, and serial correlation LM test]. All the tests supported the statistical appropriateness of the structural equations. Results not reported but available upon request.

**Table 1: Export Demand Response to exchange rates**

Equations/ Variables [log]	Equation 5	Equation 6	Equation 7
Constant	-10.8 (-1.15)	-25.09 (-4.01)*	1.41 (0.10)
UVXp / UVXw	-0.41 (-2.31)*	-0.51 (-2.56)*	-0.50 (-2.39)*
W	1.10 (1.86)**	1.98 (5.38)*	0.31 (0.35)
NEX	0.38 (1.73)**	-	-
REX	-	0.24 (1.46)	-
EERx	-	-	0.68 (1.74)**
Do	0.02 (0.17)	0.05 (0.37)	0.04 (0.28)
R <sup>2</sup>	0.96	0.95	0.95
D.W	1.83	1.76	1.70

Note: Figures within parentheses are t-statistics and \* shows 5% and \*\* indicates 10% level of significance in both Tables.

The exchange rate expresses the prices at home relative to those abroad. An increase in the exchange rate or depreciation means that foreign prices in rupees (domestic currency) have increased relative to prices of domestically produced goods. This implies that foreign goods (imports) have become more expensive compared to goods at home while the domestic goods have become cheaper for the foreign countries. Therefore, REX has the correct and expected sign. The coefficient of REX is positive but not significant. However, not-significant or less significant coefficient of the REX implies that devaluation does play a role in export performance and may improve trade balance but not decisively. Even if the economy is liberalized, devaluation role is not that important as the Pakistan's experience shows. In case of REX the dummy is positive and not significant that means that liberalisation of the trade regime leads to real depreciation and its impact is positive but not significant (equation 6). The coefficients of relative price and world income have correct and expected signs for nominal and real exchange rates equations.

In equation 7 the coefficient of the EERx is positive and significant. The coefficient of Do is positive and it is significant. This may imply that when economy is liberalized, export incentives and subsidies assume relatively more importance to promote exports. The coefficients of world income has insignificant coefficient unlike nominal and real exchange rate. A possible explanation may be that compared to world income, domestic subsidies and incentives play more decisive role in export promotion. Export supply response to the three exchange rates is similar (Table2). All the coefficients have corrected and expected signs. Except domestic supply condition represented by the real GDP (Y), other variables are not significant, though positive. Depreciation of both nominal and real exchange rates has expansionary effect on the exports supply

**Table 2: Export Supply Response to Exchange Rate**

Equations/ variables	Equation 8	Equation9	Equation 10
Constant	-0.59 (-0.25)	-2.83 (-1.67)	-0.99 (-0.35)
PX/WPI	0.13 (0.51)	0.9 (0.35)	0.22 (0.94)
Y	0.99 (2.95)*	1.23 (7.70)*	1.05 (2.48)*
NER	0.17 (0.67)	-	-
REX	-	0.18 (1.02)	-
EERx	-	-	0.11 (0.32)
Do	0.02 (0.14)	0.06 (0.51)	0.07 (0.58)
R <sup>2</sup>	0.96	0.96	0.96
D.W	1.96	1.88	1.77

Because devaluation makes imports and exports expensive in domestic currency in the home market. The reduced demand for these goods is expected to switch to import substitutes and home goods because both are relatively cheap. When the rupee price of imports increases, imports will decrease if the demand is elastic and the import- competing industries will expand production. Similarly when the export price in rupees increases, it is expected that export producing industries whose production satisfies domestic demand as well as export demand will increase production notably for exports if the export demand elasticity is relatively high.

When exporters receive a higher price in terms of domestic currency, they increase the supply of exports. But how much the volume of exports will increase, depends on the demand elasticity of exports. The price elasticity of exports supply is positive but not significant suggesting that Pakistan is a price-taker. This result is in agreement with Khan and Saqib (1993). The results suggest the exchange rate has great importance for export supply. Exporters do respond to exchange rate changes. Liberalisation does not have adverse impact on exports supply.

## Conclusion

The coefficients of relative price and world income have correct and expected signs for nominal and real exchange rates. Nominal exchange rate has positive and significant coefficient suggesting that depreciation of the nominal exchange rate is expansionary. The coefficient of real exchange rate is positive but not significant in the export demand functions. However, devaluation does play a role in export performance and may improve trade balance but not decisively. Liberalisation of the trade regime leads to depreciation and its impact is positive on export demand. The positive and significant coefficient of the EERx may imply that when economy is liberalized, export incentives and subsidies assume relatively more importance to promote exports

Except domestic supply condition represented by the real GDP in the export supply function other variables are not significant, though positive. Depreciation of both nominal and real exchange rates has expansionary effect on the exports supply. The price elasticity of exports supply is positive but not significant suggesting that Pakistan is a price-taker. Keeping in view, low supply price elasticity, exchange rate changes are not the sufficient condition. In addition to exchange rate, other factors also matter. Therefore, exclusive reliance on exchange rate changes may not prove much fruitful. Maintenance of a reasonably realistic exchange rate is expected to help export promotion and will have healthy impact on income distribution and employment.

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