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NOMINAL EXCHANGE RATE VARIABILITY: A CASE STUDY OF PAKISTAN

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This paper examines empirically the potential role of nominal and real variables in determining nominal exchange rates in Pakistan. For this purpose various equations determining the value of nominal exchange rate of Pak-rupee vis-à-vis its major trading partners are estimated using Generalized Methods of Moments (GMM) estimations. The results show that nominal exchange rates depend upon a number of endogenous and policy variables both in domestic and foreign economy. In particular, policy-induced shocks are shown to be principal cause of instability in nominal exchange rates.

1. INTRODUCTION

Residents of one country demand currency of another country for two reasons. One is to use it as a medium of exchange to benefit from any difference in prices of domestically produced goods and services and those produced abroad. It means that foreign currency facilitates trading of goods and services. The other reason for the demand for foreign currency is to use it as an asset in order to benefit from interest rate differentials across countries. It means that foreign currency facilitates capital mobility across borders.

If the dominant reason of demand for foreign currency is its use as a medium of exchange then a relative increase in domestic prices, according to the theory of purchasing power parity, should result in a decrease in net exports of the country. Under fixed exchange rate system persistence of such a situation for a while culminates into 'chronic' balance of payments deficit that may require a drastic and destabilizing

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change in nominal exchange rate. Under flexible exchange rate system, nominal exchange rate, however, adjusts more often leaving the real exchange rate and balance of payments situation mostly intact. This is why Friedman (1953) and Meade (1955) strongly favored repeal of Bretton-Woods system because it did not give a respectable and automatic way to avoid balance of payments crises.

On the other hand, if foreign currency is demanded mainly as an asset then under fixed exchange rate system, balance of payments situation of the country may change even without any change in its relative prices and under flexible exchange rate system, the nominal exchange rate may change independent of any change in relative prices. Thus there is no guarantee that real exchange rate will remain constant; it may fluctuate even more than the nominal one. It means that the country may have a balance of payments disorder for an extended period.

Empirical research has shown that since the demise of Bretton-Woods system, variations in nominal exchange rates have been far more excessive than those in relative prices.[1] Therefore, it can be argued that changes in real exchange rates originate mainly from changes in nominal rates under the flexible rate regime (Genberg and Swoboda, 1993; Mussa, 1986; Obstfeld *et al.* 1995; Rodríguez and Rodrik, 2000; Rogoff, 1996). The increasing volatility of real exchange rates and instability of external balances since the demise of Bretton-Woods system is clearly against expectations of the proponents of flexible exchange rate system. In this situation, it is advisable to exert more on nominal exchange rates than real ones to understand the matter and to formulate an effective policy.

Empirical work on exchange rate in Pakistan is mainly focused on real exchange rate or real effective exchange rate (e.g. Afridi, 1995; Afridi and Siddiqui, 1994; Burney and Akhtar, 1992; Chishti and Hasan, 1993; Khan, 1986a; Siddiqui *et al.*, 1996). Research on nominal exchange rates is mostly confined only to PPP theory or other PPP biased theories (see

[1] Prices are presumed to be rigid at least in short run because empirical evidence has revealed that Purchasing Power Parity does not hold in aggregate prices as well as in traded goods sectors across countries at least in the short run (Engle, 1993; Mussa, 1986; Obstfeld *et al.*, 1995; Rogoff, 1996).

Ahmad and Ali, 1999; Ahmad and Khan, 2002; Ahmed, 1992; Bhatti, 1996, 1997, 2001). So there is a greater need to focus on nominal exchange rate. The present study is an attempt to fill the gap by providing a detailed analysis of nominal exchange rate determination in Pakistan.

The study provides estimates of a model for the determination of nominal bilateral exchange rates of Pak-rupee vis-à-vis its twelve major trading partners i.e. Australia, France, Germany, Italy, Japan, Kuwait, Korea, Malaysia, Singapore, Switzerland, the United Kingdom and the United States. The study explores links between nominal exchange rate and the underlying fundamentals of the specified model using quarterly data over the flexible rate period 1983Q1 to 2004Q4.[2] Bilateral rates are used to avoid the issues of (a) statistical properties of multilateral aggregates, (b) the sensitivity of results to shifting weights, (c) the omission of relevant countries in the multilateral aggregation, and (d) collinearity between exchange rates, because a multilateral index is related to the indexes of other countries.[3]

The study proceeds as follows. In Section 2 a brief history of nominal and real exchange rates of Pak-rupee vis-à-vis its major trading partner is given. An econometric model is developed in Section 3. Section 4 provides empirical results along with their interpretations. Concluding remarks are summarized in the final section of the paper.

2. NOMINAL AND REAL EXCHANGE RATES OF PAKISTAN

Real exchange rate (RER) is commonly defined as the price of tradables (P_t^T) relative to the price of non-tradables (P_t^N), both measured in domestic currency units, i.e. $RER_t = \left(P_t^T / P_t^N\right)$ (Dornbusch, 1974, 1980; Krueger, 1982).[4] If we assume that the law of one price holds for tradables and that there are no taxes on trade then $P_t^T = NER_t(P_t^{T*})$

[2] The trading partners are chosen on the basis of the trade shares of various countries with Pakistan.

[3] From an econometric perspective in multilateral rates changes in some rates may cancel the changes in other rates providing ambiguous results.

[4] For more details see Edwards (1988b).

where NER_t is nominal exchange rate of domestic currency per unit of foreign currency and $P_t^{T*}(P_t^N)$ is foreign (domestic) price of tradables (nontradables). Now denoting the relative price $P_t^{T*} \big/ P_t^N$ by RP_t, the real exchange rate can be expressed as $RER_t = NER_t \left(P_t^{T*} \big/ P_t^N\right) = NER_t * RP_t$.[5] For empirical purposes RER is written as $RER_t = NER_t \left(WPI_t^* / CPI_t\right)$ where $WPI_t^*(CPI_t)$ is the wholesale (consumer) price index of foreign (domestic) country, a proxy for foreign (domestic) tradables (nontradables) prices (Harberger, 1986).

At the time of independence Pakistan adopted the on-going policy of fixed exchange rate, particularly known as the Bretton Woods system. Pakistan fixed parity of its currency against US dollar at rupees 3.32 in 1948, revised it to 4.78 in 1955, to 11.03 in 1972 and finally to 9.90 in 1973 that continued till 1982.[6] In 1982 Pakistan decided to delink rupee from US dollar. Since then the rupee almost continued to depreciation from 12.84 rupees per US dollar in 1982 to 59.12 rupees per US dollar in 2004.

Figure 1 shows the pattern of nominal and real exchange rates along with relative prices of Pakistan against its major trading partners for the floating rate period. We observe that large fluctuations took place both in nominal and real exchange rates during the entire period of analysis. However, nominal exchange rates remained more volatile as compared to the real exchange rates. During the 1980s, real exchange rates tended to depreciate more as compared to nominal exchange rates. However, in the 1990s, real exchange rates initiated overvaluation, indicating that nominal exchange rates did not depreciate enough to counterbalance the high domestic inflation rate as compared to foreign inflation rates. The values of correlation coefficients in Table 1 also confirm that relative price levels and real exchange rates remained highly inversely correlated (the only exception is Kuwait). Nevertheless, among other factors nominal exchange rates remained to be the significant driving force in

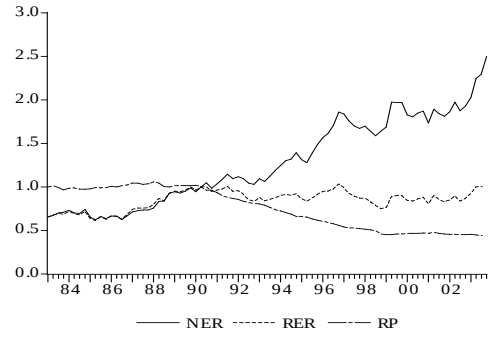
[5] This measure of RER is preferred over the traditional PPP based measures because equilibrium in its value implies simultaneous equilibrium in external and internal (i.e. nontradables) sectors of the economy (Edwards, 1988b).

[6] All these figures are taken from various issues of *International Financial Statistics*.

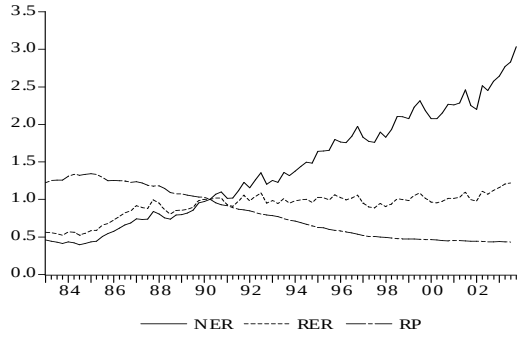
determining the real exchange rates.[7] The correlations coefficients reported in Table 1 also validate that nominal and real exchange rates are highly positively correlated (except for the exchange rate between rupee and Kuwaiti Dinar).

Figure 1: Indexes of Nominal Exchange Rate, Real Exchange Rate and Relative Price Levels in Pakistan Against its Major Trading Partners: (1983Q1 to 2004Q4)

Australia

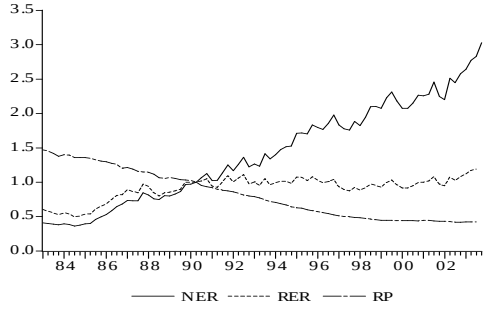


France

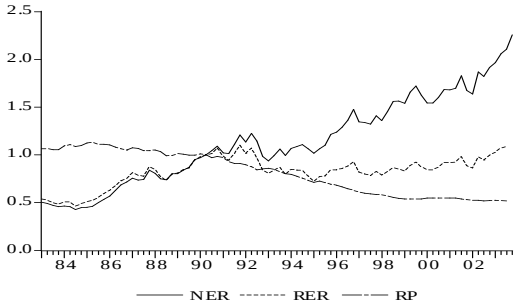


[7] The figures also validate the findings of Edwards (1987) that countries with more variable rates of nominal devaluation also have more volatile real exchange rates.

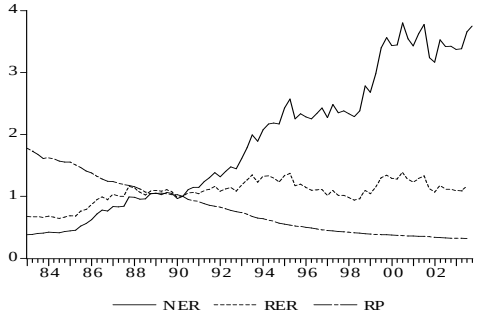
Germany



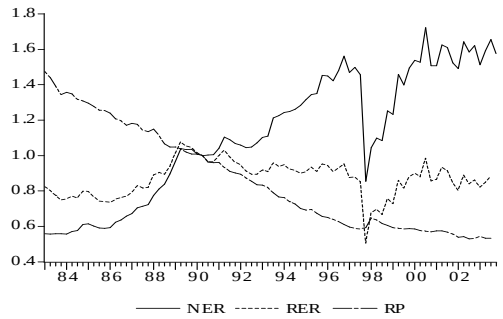
Italy



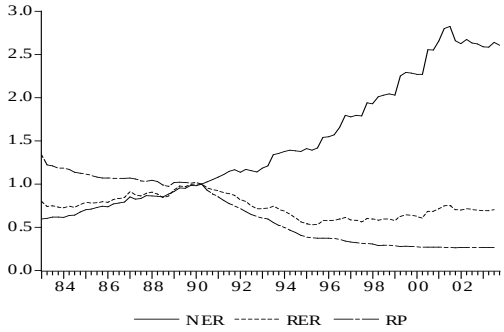
Japan



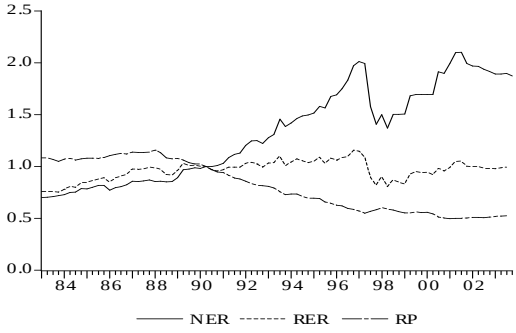
Korea



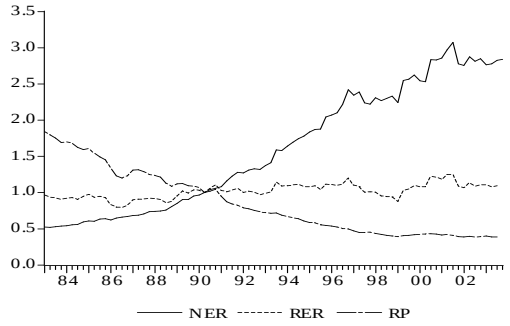
Kuwait



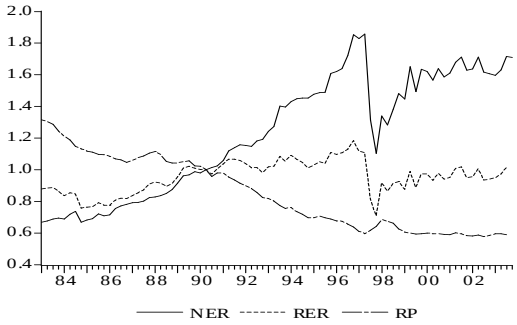
Malaysia



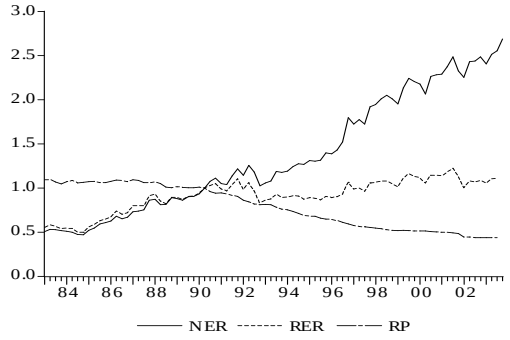
Singapore



Thailand



United Kingdom



United States

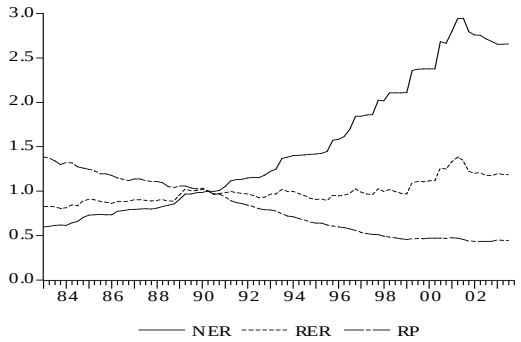


Table 1: Correlation Coefficients: (1983Q1 to 2004Q4)

Countries	Correlation Between Nominal Exchange Rate and Real Exchange Rate	Correlation Between Relative Price and Real Exchange Rate
Australia	0.5385	-0.3581
France	0.7898	-0.7774
Germany	0.7464	-0.7725
Italy	0.7323	-0.5217
Japan	0.7039	-0.7785
Korea	0.3710	-0.1559
Kuwait	-0.5268	0.7313
Malaysia	0.5496	-0.3775
Singapore	0.7464	-0.6715
Switzerland	0.6165	-0.6594
UK	0.8522	-0.7707
USA	0.8962	-0.7436

3. THEORETICAL FRAMEWORK

This section lays out a simple theoretical framework to postulate determinants of nominal exchange rate. According to Connolly and Devereux (1995), Cottani *et al.* (1990), Edwards (1988a, 1988b), Elbadawi (1994) and Lane (1999) the exchange rate of a small open economy can possibly be influenced by the following monetary and real (non-monetary) determinants.

3.1. Relative Price Levels

If foreign tradables prices increase faster relative to domestic nontradables prices then the real exchange rate will depreciate, thereby enhancing international competitiveness of the country. However, the resulting increase in net exports will ultimately lead to nominal appreciation of domestic currency. It follows that nominal exchange rate is inversely related to relative foreign price (Lane, 1999). Thus relative price level, defined below, is a key determinant of nominal exchange rate.

$$RP_t = P_t^{T*} \Big/ P_t^N \quad ,(2)$$

where RP_t and $P_t^{T*}(P_t^N)$ are relative price level and foreign (domestic) price level of tradables (nontradables) respectively.

3.2. Terms of Trade

According to Chowdhury (2000), Cottani *et al* (1990) and Edwards (1988a, 1988b) both export and import price shocks account for fluctuations in exchange rates. One way to capture these effects is through foreign terms of trade (TOT) as defined below.

$$TOT_t^* = P_t^{X*} \Big/ P_t^{M*} \quad ,(3)$$

where TOT_t^* and $P_t^{X*}(P_t^{M*})$ are external terms of trade and foreign price level of exports (imports) respectively.

The effect of terms of trade on nominal exchange rates depends on the magnitudes of income and substitution effects (Edwards and Wijnbergen, 1987; Lane, 1999); export and import elasticities and the composition of changes in terms of trade i.e. whether changes in terms of trade are due to changes in the price of foreign exportables or the price of foreign importables. The income effect occurs when an increase

(decrease) in foreign export (import) prices, ceteris paribus, raises foreign income, which is spent both on tradables and nontradables. However, since the prices of tradables being exogenous to the system remain unchanged, the price of foreign tradables relative to the price of foreign nontradables will decrease, thereby, causing a nominal depreciation of foreign currency through deterioration in the foreign current account balance. This is equivalent to appreciation of the domestic currency through improvement in domestic current account balance. The substitution effect, on the other hand, following an increase in foreign export prices, increases the production of foreign exportables, moving the factors of productions away from foreign nontradables and, hence, causing the prices of foreign nontradables to increase. This will reduce the prices of foreign tradables in relative terms and, hence, result in depreciation the foreign currency in nominal terms, which is equivalent to a nominal appreciation of the domestic currency (factors switching effect). As a result, whether domestic currency will depreciate or appreciate, depends on which of the income and substitution effects dominates. According to Edwards (1988b) empirics exert that terms of trade deteriorations usually lead to exchange rate depreciation.

3.3. Technological Progress

The relationship between technological improvements and relative price levels has long been recognized by Balassa (1964) and Samuelson (1964). We use the following proxy for technological progress.

$$TP_t = MO_t / real\ GDP_t \text{ , (4)}$$

where TP_t and MO_t denote technological progress index and manufacturing output respectively. There can be different effects of technological progress on exchange rate since improvements in productivity can be neutral or labor or capital augmenting and their effects differ across sectors. Technological improvements exert positive income effect causing an increased demand both for tradables and nontradables. With the prices of tradables being exogenous to the system an increase in prices of nontradables will result in deterioration of trade balance, thereby leading to depreciation of nominal exchange rate (Connolly and Devereux, 1995; Lane, 1999; Obstfeld *et al.*, 1995).[8]

[8] Bhagwati (1984) argues that a rise in capital-labor ratio, typically associated with technological progress, changes the product mix in the traded sector towards more capital-intensive goods, thereby, raising economy-wide wages and the relative price of

However, if technological progress is labor augmenting, improvements in the supply of nontradables, which are in general more labor intensive, will result in decrease in prices of nontradables and, hence, result in appreciation of the nominal exchange rate. The ultimate effect of technological progress on exchange rate depends on the relative strength of the demand side and supply side effects. When supply effects via labor augmenting technological progress dominate demand effects via positive income effects nominal appreciation occurs and vice versa.

3.4. Trade Restrictions

This variable (often known as commercial policy variable) is an alternative but opposite of the trade openness variable or trade intensity ratio since trade restrictions such as import tariffs, export taxes, and import quotas reduce the degree of openness (Cottani *et al.*, 1990; Edwards, 1989). The trade restrictiveness variable is constructed as follows:

$$TR_t = nominal\ GDP_t \Big/ \left(P_t^X X_t + P_t^M M_t\right), \quad (5)$$

where TR_t denotes trade restrictions and P_t^X (P_t^M) and $X_t (M_t)$ denote export (import) price and volume of exports (imports) respectively. Trade restrictions can be implemented in various forms. First, consider the case of an increased import tariff. This causes a substitution (both intra-temporal and inter-temporal) in demand away from importables, leading to a decline in tradable prices. The resulting improvement in trade balance leads to appreciation of nominal exchange rate. However, the income effect of import restrictions on nontraded goods is uncertain. Therefore, generally it is assumed that substitution effect dominates the income effect (Connolly and Devereux, 1995; Edwards and Wijnbergen, 1987).

If trade is restricted through export taxes, a nominal depreciation will occur via deterioration 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 leaving no ambiguity. It follows that on net basis the theoretical impact of trade restrictions on nominal exchange rate is vague and hence becomes an empirical matter.

(labor-intensive) nontraded goods. This will further contribute to depreciation of the nominal exchange rate.

3.5. Net Capital Inflow

Any change in capital inflows (like accumulation of foreign debt, etc.) would affect inter-temporal consumption and hence exchange rate. The capital inflow variable is constructed as follows.

$$NCIF_t = KAS_t / nominal\ GDP_t \quad , (6)$$

where $NCIF_t$ and KAS_t stands for the capital inflow variable and capital account surplus respectively.

The extent of the effects of capital inflow on exchange rate depends on the nature of spending i.e. whether it is utilized for consumption of tradables or of nontradables. If capital inflows are spent on tradables, nominal exchange rate will depreciate through trade deficit, while in case the capital inflows are spent on nontradables, nominal exchange rate will appreciate (Edwards, 1988a; 1988b; Khan, 1986b; Mehta, 2000; Razin and Collins, 1997).

3.6. Foreign Exchange Reserves

Like net capital inflow, an accumulation of foreign exchange reserves can also lead to depreciation or appreciation of nominal exchange rate depending on whether the reserves are used for the consumption of tradables or nontradables (Hariharan, 2000; Jayaraj, 2000). We have applied real value of foreign exchange reserves $(FOREX_t)$ in our analysis by taking the ratio of foreign exchange reserves (FR_t) to GDP deflator i.e.

$$FOREX_t = FR_t / GDP\ deflator_t \quad , (7)$$

3.7. Excess Supply of Domestic Credit

This variable is used as a proxy for monetary expansion (Chishti and Hasan, 1993). If velocity of money is stable then excess supply of credit is presumed to have inflationary consequences. This excess supply will be spent both on tradables and nontradables. The relative price of nontradables will be driven up if the price of tradables is assumed to be exogenous to the system, leading to real appreciation and, hence, balance of payments deficit. This will result in depreciation of the local currency in nominal terms.

Moreover, domestic credit creation reduces real wealth via higher inflation. So the demand for both tradables and nontradables decreases and as a result real exchange rate depreciation occurs. This will lead to appreciation of nominal exchange rate through balance of payments surplus. Thus the theoretical effect of excess supply of domestic credit on exchange rate remains uncertain.

Following Edwards (1988a, 1988b), we have developed the following proxy for excess supply of domestic credit:

$$ESDC_t = [\Delta \log(DC_t) - \Delta \log(NGDP_t)], \quad (8)$$

where $ESDC_t$, $\Delta \log(DC_t)$ and $\Delta \log(NGDP_t)$ denote excess supply of domestic currency, the rate of growth of domestic credit and the rate of growth of nominal GDP respectively.

3.8. The Specification of Regression Equation

We will estimate the following dynamic equation, which summaries the basic thrust of our model.

$$e_{jt} = \beta_1 + \beta_2 rp_{jt} + \beta_3 tot^*_{jt} + \beta_4 tp_t + \beta_5 tr_t + \beta_6 NCIF_t + \beta_7 forex_t + \beta_8 ESDC_t + \mu_{jt} \quad (9)$$

$$\mu_{jt} \sim (0, \sigma_j^2) \text{ and } j = 1,2.....12$$

The lowercase letters denote that the underlying variables are in natural log. Various variables are defined as follows.

e_{jt} = Bilateral nominal exchange rate of Pak-rupee against its *j*th trading partner (a country)

rp_{jt} = Relative price of foreign tradables (vs. domestic nontradables)

tot^*_{jt} = Terms of trade of country *j*

tp_t = Technological progress

tr_t = Trade restrictions

$NCIF_t$ = Net capital inflow

$forex_t$ = Foreign exchange reserves

$ESDC_t$ = Excess supply of domestic credit

μ_{jt} = White-noise error terms

The above equation indicates that exchange rate is a function of both monetary and real fundamentals. Monetary variables include price ratio of foreign traded to domestic non-traded goods and excess supply of domestic credits, while real variables include TOT, technological progress, trade restrictions, net capital inflow and foreign exchange reserves. Table 2 indicates the theoretically expected signs of the fundamentals of the basic model.

Table 2: Expected Signs of Regression Coefficients

Types of Shocks	Expected Signs
(rp_{jt})	(-)
(tot_t^*)	(+/-)
(tp_t)	(+/-)
(tr_t)	(+/-)
$(NCIF_t)$	(+)
$(forex_t)$	(+/-)
$(ESDC_t)$	(+/-)

Note: A negative (positive) sign indicates an appreciation (depreciation) of domestic currency.

4. DATA, ESTIMATION AND RESULTS

We have collected quarterly data for the twelve major trading partners of Pakistan i.e. Australia, France, Germany, Italy, Japan, Kuwait, Korea, Malaysia, Singapore, Switzerland, the United Kingdom and the United States for the floating rate period 1983 to 2004. The crude data have been collected from various issues of *International Financial Statistics* (International Financial Corporation) and *Economic Survey* (Government of Pakistan).

We have applied Generalized Methods of Moments (GMM) estimation technique of Arellano (1993) and, Arellano and Bond (1991). The GMM estimators control for the endogeniety of the lagged dependent variable

and for the potential endogeniety of other explanatory variables (Judson and Owen, 1999; Nickell, 1981). In our context the endogeniety problem is likely to arise with the variables relative price, TOT, trade restrictions, foreign exchange reserves and excess supply of domestic credit. Therefore instruments include lagged values of all these variables and current and lagged values of the presumed exogenous variables namely technologican progress and net capital inflows.[9]

Table 3 provides the results of estimation. The first column for each trading partner presents the results of originally specified regression equation, while the second column presents the results of finally selected specification in which variables that appeared insignificant in the first specification are excluded. A cursory view of the results reveals that most of the parameter estimates have theoretically expected signs and are statistically significant. High values of R^2 and adjusted R^2 indicate that the model fits the data quite well. In most of the equations autoregressive (AR) process has been applied to remove autocorrelation from the model. In all the estimated regression equations Durbin-Watson (DW) statistics are reasonably close to the desired value of two, indicating the absence of autocorrelation problem. However, for Singapore and UK we cannot ignore the possibility of the presence of mild autocorrelation.

Regression coefficients of relative foreign price level (rp_{jt}) have the expected negative sign in all regression specifications and are statistically significant, indicating that decreases in foreign tradable prices relative to Pakistan's nontradable prices have caused depreciation of the bilateral exchange rates of Pak-rupee through worsened current account positions with the respective trade partners. These results support Engel (1999) and Ahmad and Khan (2002) that Purchasing Power Parity theory holds at least partially if appropriate choice of price indexes is made.

[9] To confirm long-run validity of the relationship proposed in equation (9), we have applied ADF unit-root tests. The results show that the variables *NCIF*, *ESDC* and *tp* are stationary, while the remaining five variables are integrated of order one. This means that the estimate of equation (9) can form a long run relationship of nominal exchange rate with four of the seven explanatory variables, while the relationship with the three variables namely *NCIF*, *ESDC* and *tp* is based on short term variations in the latter.

The exchange rate of Pak-rupee has been positively and significantly affected by terms of trade indexes (tot^{*}_{jt}) of almost all trading partners in both specifications. The significant positive effect of TOT index on exchange rate indicates that substitution effect has dominated the income effect as suggested by Edwards (1988b) and Lane (1999). However, the reverse has happened in case of Singapore, whereas in case of Korea and UK the TOT has no significant effect on the nominal exchange rates.[10] Thus our findings indicate that by-and-large improvements in foreign TOT result in depreciation of nominal exchange rate.

Similarly, technological progress (tp_t) has significant positive effects on exchange rates in almost all countries indicating that the demand side effects via positive income effects have dominated the supply effects via labor augmenting technological progress in Pakistan (for Korea and Malaysia this variable is insignificant). Perhaps reverse has happened in case of Singapore where we have a negative effect of this variable, which is marginally significant only in the second specification. So our findings invalidate the findings of Lane (1999), who finds a negative effect of technological progress on nominal exchange rate. Nonetheless, our results do not support Bhagwati (1984) hypothesis that a rise in capital-labor ratio will result in nominal depreciation of exchange rate.

[10] This variable has been excluded from the regression equations of Kuwait and Malaysia due to non-availability of data.

Table 3: Empirical Findings of Model of Nominal Exchange Rate Determination with Major Trading Partners of Pakistan

Variables	Australia		France		Germany		Italy	
	Original Specification	Final Specification	Original Specification	Final Specification	Original Specification	Final Specification	Original Specification	Final Specification
Constant	4.9149	4.9258	3.6543	3.2496	5.5638	5.5638	-2.1252	-2.0555
	(16.3121)*	(17.0986)*	(9.2919)*	(8.3243)*	(14.1991)*	(14.1991)*	(-3.4321)*	(-3.2877)*
rp_t	-0.9255	-0.9324	-0.7633	-0.8240	-0.6168	-0.6168	-0.4011	-0.4079
	(-12.5528)*	(-13.7340)*	(-9.6122)*	(-13.1490)*	(-6.9318)*	(-6.9318)*	(-2.7712)*	(-2.9028)*
tot^*_{jt}	0.4973	0.5131	1.8444	2.2080	1.9872	1.9872	1.9619	1.8819
	(1.7254)**	(1.8122)**	(5.1482)*	(7.7483)*	(5.5068)*	(5.5068)*	(4.8530)*	(4.5451)*
tp_t	1.9034	1.9385	5.5461	5.1575	5.9912	5.9912	4.9722	5.0365
	(1.8510)**	(1.9159)**	(6.2623)*	(5.1529)*	(4.3946)*	(4.3946)*	(3.1946)*	(3.2110)*
tr_t	-1.3742	-1.3616	-0.3879	---	-0.9031	-0.9031	-0.2898	-0.3312
	(-4.3477)*	(-4.3622)*	(-1.2754)		(-3.2062)*	(-3.2062)*	(-1.9267)**	(-3.8097)*
$NCIF_t$	1.3693	1.3321	1.0065	---	1.6553	1.6553	0.6624	0.7125
	(3.3567)*	(4.2183)*	(2.3704)*		(4.0478)*	(4.0478)*	(1.9019)**	(2.4961)*
$forex_t$	0.0031	---	0.0471	---	0.0702	0.0702	0.0639	0.0628
	(0.1301)		(1.5789)		(2.3858)*	(2.3858)*	(2.4478)*	(2.3439)*
$ESDC_t$	-1.9631	-1.9288	-0.8476	-0.5582	-1.5310	-1.5310	0.2299	---
	(-2.7481)*	(-2.7119)*	(-1.6075)	(-2.2154)*	(-2.8587)*	(-2.8587)*	(0.6169)	
AR (1)	0.1365	0.1343	0.3828	0.4227	0.1872	0.1872	0.6832	0.6824
	(1.9784)**	(1.9797)**	(4.3640)*	(6.2923)*	(2.3334)*	(2.3334)*	(7.7929)*	(7.8545)*
R^2	0.9021	0.9040	0.9862	0.9881	0.9749	0.9749	0.9797	0.9792
$\bar{R}^2$	0.8913	0.8948	0.9847	0.9873	0.9722	0.9722	0.9775	0.9773
DW	1.9070	1.9055	1.7232	2.0058	1.8157	1.8157	1.8565	1.8229

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

Table 3 (Continued): Empirical Findings of Model of Nominal Exchange Rate Determination with Major Trading Partners of Pakistan

Variables	Japan		Korea		Kuwait		Malaysia	
	Original Specification	Final Specification	Original Specification	Final Specification	Original Specification	Final Specification	Original Specification	Final Specification
Constant	-0.4600	-0.2198	-1.1012	-1.5555	6.7554	6.7554	3.8569	3.8712
	(-0.9112)	(-0.4011)	(-1.4056)	(-2.9176)*	(12.8328)*	(12.8328)*	(6.1882)*	(9.9761)*
rp_t	-0.7906	-0.7839	-0.4310	-0.6591	-0.5710	-0.5710	-0.7545	-0.8596
	(-8.5946)*	(-10.7632)*	(-2.2667)*	(-4.1543)*	(-5.4060)*	(-5.4060)*	(-5.3837)*	(-11.2289)*
tot^*_{jt}	1.0784	0.9893	0.5347	0.4666	---	---	---	---
	(5.8572)*	(4.0148)*	(1.3540)	(1.8041)**				
tp_t	2.7851	---	1.1399	---	8.9394	8.9394	0.1733	---
	(2.6554)*		(0.4136)		(3.7072)*	(3.7072)*	(0.1017)	
tr_t	-0.3131	-1.6075	-2.0871	-1.8869	1.5022	1.5022	-1.7953	-1.6611
	(-0.8743)	(-3.2859)*	(-3.3397)*	(-4.0118)*	(2.1847)*	(2.1847)*	(-3.3349)*	(-4.7142)*
$NCIF_t$	0.4592	0.7714	1.6497	0.8710	-1.8310	-1.8310	1.7655	0.9578
	(1.2115)	(1.8187)**	(2.3260)*	(2.0193)*	(-2.9572)*	(-2.9572)*	(2.1436)*	(1.9446)**
$forex_t$	-0.0331	---	0.0624	---	-0.1046	-0.1046	0.0704	---
	(-1.0978)		(1.2751)		(-2.1596)*	(-2.1596)*	(1.2378)	
$ESDC_t$	-0.4846	-2.4664	-3.4100	-2.7487	2.1222	2.1222	-3.2175	-3.1104
	(-0.7924)	(-2.1907)*	(-2.1769)*	(-1.7313)**	(1.9042)**	(1.9042)**	(-3.4364)*	(-3.5755)*
AR (1)	0.4048	0.2275	---	---	0.2344	0.2344	0.2016	0.1986
	(3.3408)*	(2.4708)*			(2.5673)*	(2.5673)*	(2.2983)*	(2.1761)*
R^2	0.9905	0.9509	0.7094	0.7673	0.8980	0.8980	0.7728	0.8083
$\overline{R}^2$	0.9894	0.9470	0.6816	0.7518	0.8882	0.8882	0.7510	0.7955
DW	1.4399	1.8332	1.8381	1.8760	1.9005	1.9005	1.8966	1.9126

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

Table 3 (Continued): Empirical Findings of Model of Nominal Exchange Rate Determination with Major Trading Partners of Pakistan

Variables	Singapore		Switzerland		UK		US	
	Original Specification	Final Specification	Original Specification	Final Specification	Original Specification	Final Specification	Original Specification	Final Specification
Constant	2.4617	2.4428	5.4111	4.8132	6.9436	6.0220	4.1390	4.2645
	(4.8471)*	(5.6713)*	(9.5960)*	(8.1253)*	(14.2800)*	(17.5548)*	(13.8141)*	(10.5422)*
rp_t	-0.8507	-0.8084	-0.3189	-0.2871	-1.1626	-1.1764	-0.9142	-0.8855
	(-7.8102)*	(-7.0873)*	(-1.9482)**	(-2.2344)*	(-10.5073)*	(-14.8875)*	(-11.5951)*	(-9.3968)*
tot^*_{jt}	-1.9617	-2.2948	3.3266	4.2403	1.5817	---	2.8910	3.5547
	(-2.1499)*	(-3.4613)*	(3.2049)*	(4.2527)*	(1.2694)		(5.9276)*	(5.1450)*
tp_t	-2.5796	-2.5757	5.4450	5.6856	7.3137	5.6016	2.6192	---
	(-1.5023)	(-1.7248)**	(3.4808)*	(3.7194)*	(5.2041)*	(6.6210)*	(3.1245)*	
tr_t	-1.0980	-1.0364	-0.7935	---	-0.1109	---	-0.0557	-1.1855
	(-4.5183)*	(-4.1199)*	(-1.5139)		(-0.8909)		(-0.7430)	(-3.1967)*
$NCIF_t$	1.1689	1.1267	1.7764	1.0159	-0.2414	---	0.0120	---
	(2.9824)*	(3.3019)*	(3.6572)*	(4.1172)*	(-0.7129)		(0.0458)	
$forex_t$	0.0136	---	0.0518	---	-0.1625	-0.1065	-0.0269	---
	(0.3698)		(1.3445)		(-5.1860)*	(-4.3920)*	(-0.9472)	
$ESDC_t$	-1.6274	-1.4364	-1.8186	---	0.0606	---	0.2193	-1.9568
	(-3.2621)*	(-2.5744)*	(-2.4625)*		(0.1864)		(1.2712)	(-2.3965)*
AR (1)	0.2137	0.2007	0.2695	0.4040	1.6777	0.4397	1.5596	0.1996
	(2.8341)*	(2.4893)*	(3.1367)*	(3.4522)*	(2.1809)*	(3.0003)*	(2.8526)*	(2.7018)*
AR (2)	---	---	---	---	-1.9714	---	-1.5150	---
					(-1.6007)**		(-1.7740)**	
R^2	0.9699	0.9722	0.9634	0.9766	0.9233	0.9832	0.9746	0.9458
$\overline{R}^2$	0.9665	0.9695	0.9593	0.9750	0.9134	0.9821	0.9714	0.9423
DW	1.7693	1.6847	1.8224	1.9269	2.1576	1.3977	2.2729	1.8011

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

Trade restrictions (tr_t) have negative and significant effect on exchange rates in almost all regression equations. It indicates that trade restrictions have appreciated the exchange rates through current account improvements. However, for France, Switzerland and UK this variable has insignificant effect on exchange rate. Kuwait is the exceptional case in which this variable appeared with significant positive sign. Our findings on trade restrictions are in contradiction with Lane (1999), who claims that restrictions should depreciate the domestic currency as inflation has been found to be higher in restricted economies (Romer, 1993; Lane, 1997).

The results further show that with a few exceptions, net capital inflow ($NCIF_t$) has positive and significant effect on exchange rates in almost all regression equations, indicating that an increase in (net) capital inflow will result in depreciation of the nominal bilateral exchange rates via current account deterioration. This result shows that capital inflows in Pakistan are mostly spent on tradables. One of the reasons for this result is a major share of capital inflows in Pakistan has been in the form of project aid that is normally tied with the so-called conditionalities. For example balance of payments support from the IMF has been conditional upon Pakistan agreeing on trade liberalization, while bilateral aids have followed increased imports of intermediate and capital goods and services from the donors.

On the other hand, the effects of changes in foreign exchange reserves ($forex_t$) have been insignificant for eight of the twelve trading partners. The increase in foreign exchange reserves results in depreciation of exchange rate with Germany and Italy and appreciation of exchange rate with Kuwait and UK. Therefore, changes in foreign exchange reserves in Pakistan have not played any systematic role in determining its exchange rate positions with trading partners. A possible reason is that the Pakistan seldom had sufficient volume of foreign exchange reserves to intervene in the foreign exchange market in a systematic manner; its reserve position has mostly been dictated by external factors.

The regression results also show that the excess supply of domestic currency has significant negative affects on exchange rates of Pak rupee with most of the selected currencies, validating the point that excess

supply of credit has resulted in increased consumption of tradables, thereby putting adverse pressure on exchange rates. On the other hand, the excess supply of domestic credit seems to have resulted in appreciation of exchange rates with Kuwait, Italy and UK, though this effect is significant in case of Kuwait only.

5. CONCLUSION

This paper analyzes the determination of bilateral nominal exchange rates of Pak-rupee against its twelve major trading partners using standard econometric techniques based on quarterly data for the period 1983-2004. The results show that nominal exchange rates depend on a number of endogenous and policy variables related to Pakistan and its trading partners. Specifically, fluctuations in nominal exchange rates can be explained by relative inflation rate at home and abroad, both governments' monetary policies, terms of trade, trade policies and capital mobility. In brief, our findings are consonant with that of Connolly and Devereus (1995), Edwards (1988a) and Lane (1999). Therefore, this model can be used both for prediction and for analytical understanding. It can also be used for critical evaluation of various policy options.

Estimated coefficients of model vindicate the results of Ahmad and Khan (2002), Engel (1999) and Kim (1990) that PPP theory holds at least partially when appropriate and relevant price indexes are applied. The results also show that the exchange rates of Pak-rupee are mostly driven by monetary variables. Therefore, the practice of managing exchange rate as an independent instrument may not be advisable in the presence of high inflation and the adoption of a restricted monetary policy seems desirable not only for fighting inflation, but also producing exchange rate stability and sustained trade balance. Real factors such as trade restrictions, capital flows, foreign exchange reserves and trade policies also play significant roles in the determination of nominal exchange rates. Therefore, policy makers need to pay attention to foreign exchange and trade policies along with monetary policy. The results also show that trade restrictions tend to appreciate nominal exchange rates. Thus the practice of restricting trade and devaluation that Pakistan, like many other countries, had followed during the 1980s and early 1990s appear mutually contradictory. To sum up, the study

highlights incompatibility of macroeconomic policies that Pakistan had followed to meet competing objectives.

Our empirics validate Edwards's (1987) findings that unstable nominal exchange rate policies are the major source of instability in (short-term) real exchange rate. Therefore, to achieve stability of real exchange rate the degree of government intervention can be increased or any variant of crawling peg-system may be adopted. Our results are also in accord with Siddiqui *et al.* (1996) that some controlled form of monetary policy may be useful for maintaining stability in exchange rates.

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