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Volatility of Exchange Rate and Export Growth in Pakistan: The Structure and Interdependence in Regional Markets

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1. INTRODUCTION

Pakistan follows the flexible exchange rate system since July 2000. Prior to this period it followed a managed floating exchange rate since 1982 and a fixed rate prior to 1982. Due to controlled exchange rate a little fluctuation in exchange rate was observed. It is empirical concluded that the Pakistan's share of exports in world market did not indicate any significant change during fixed and managed floating exchange rate regimes [Kumar and Dhawan (1991)]. Pakistan's share in world exports was stable during the last 24 years, ranging between a minimum of 0.12 percent in 1980 and a maximum of 0.18 percent in 1992. After introduction of floating exchange rate during 2002-2003 (the share was 0.17 percent) Pakistan's exports performance was related to the volatility of exchange rate. Only one empirical study is available regarding to Pakistan's context by Kumar and Dhawan (1991) who estimated the impact of exchange rate volatility on Pakistan exports to the developed world from 1974 to 1985. They found that volatility of exchange rate adversely effect on export demand. They also investigated the third country effect and suggested that Japan and West Germany act as the alternate market for Pakistan's export to the United States and United Kingdom. The high degree of volatility and uncertainty of exchange movements observed in Pakistan is of great concern of policy-makers and researchers to investigate the nature and extent of the impact of such movements on Pakistan's volume of trade. In many countries it is experienced that higher exchange rate volatility reduced the trade by creating uncertainty about future profit from exports. These uncertainties may require hedging in short run and even influence the firm's investment decision in the long

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run. However, most empirical studies investigating the effects of exchange rate volatility on trade flows have yielded mixed results. As mentioned earlier, not much empirical research is available to determine the relationship between exchange rate volatility and exports in Pakistan particularly with reference to floating exchange rate.

The objective of this paper is to investigate the effect of exchange rate volatility on exports growth between Pakistan and other leading trade partners during 1991–2004. The countries are selected from various regions to capture the varying impact of level and degrees of bilateral relationship between Pakistan and other countries. For empirical test the regional countries selected are SAARC (India and Bangladesh), ASEAN (Singapore and Malaysia), European (UK), and Asia-Pacific (Australia and New Zealand) and North America (US).

The rest of the paper is organised such that second section describes the literature review and theoretical framework. The data description is provided in Section 3 followed by discussion of results in Section 4. The summary and concluding remarks are given in Section 5.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

In literature the contradictory results about the impact of exchange rate volatility on international trade are observed. Studies that support the hypothesis that the volatility of exchange rate reduces the volume of trade are included [Cushman (1983, 1986, 1988); Akhtar and Hilton (1984); Kenen and Rodrick (1986); Thursby and Thursby (1987); DeGrauwe (1988); Pere and Steinherr (1986); Koray and Lastrapes (1989) and Arize (1995)]. On the other hand, [Hooper and Kohlhagen (1978); Gotur (1985); Bailey, Tavlas, and Ulan (1987) and Asseery and Peel (1991)] found no evidence about the impact of exchange rate volatility on trade.

Hooper and Kohlhagen (1978) was the first study to analyse systematically the effects of exchange rate uncertainty on the trade. They investigated bilateral and multilateral trade among developed countries during 1965–75. They measured exchange rate risk by standard error of nominal exchange rate fluctuations. They could not establish any significant impact of exchange rate volatility on the volume of trade. They measured the exchange rate risk volatility as the standard error of nominal exchange rate function. Later Cushman (1983) introduced the real exchange rate rather than nominal exchange rate and found negative relation among the exchange rate volatility and volume of trade. In another study Cushman (1986) introduced the third country effect and argued that the recognition of third countries in the analytical framework implies that the effect of exchange rate variability on bilateral trade flows not only depend upon the exchange rate risk experienced by the country under consideration but also depend upon the correlation of the exchange rate fluctuations by other countries. Akhtar and Hilton (1984) examined the bilateral trade between West Germany and US. They determined that the exchange rate

volatility has a significant negative impact on the exports and imports of two countries. However, the volatility of exchange rate has been measured by the standard deviation of effective exchange rates.

Gotur (1985) rejected the result of Akhtar and Hilton (1984). He added the countries in Akhtar and Hilton (1984) models i.e. France, Japan, UK and increased the sample period and the measures of exchange rate risks. He did not observe any significant relation between exchange rate volatility and volume of trade on the bilateral trade flows. His result is identical to IMF (1984) study on this issue. Chowdhury (1993) investigated the impact of exchange rate volatility on the trade flows of the G-7 countries in context of a multivariate error-correction model. They found that the exchange rate volatility has a significant negative impact on the volume of exports in each of the G-7 countries. Baak, Mahmood, and Vixathep (2002) investigated the impact of exchange rate volatility on exports in four East Asians countries (Hong Kong, South Korea, Singapore, and Thailand). Their results indicated that exchange rate volatility has negative impacts on exports in both the short run and long run periods.

The empirical evidences regarding the impact of exchange rate volatility on export growth to developing countries are inconclusive; as they have explained variation in exchange rate policies and level of growth. Bahmani-Oskooee (1984, 1986); Coes (1981); and Rana (1983). Bahmani-Oskooee (1984, 1986) found that exchange rate has a significant impact on trade flows of selected developing countries even in periods when most of them had pegged exchange rates. Coes (1981) and Rana (1983) analysed this issue on the basis of Hooper-Kohlhagen (1978) study using annual data. Coes (1981) examines Brazilian exports (as a proportion of the total value added) in 9 primary and 13 manufacturing sectors for 1965–74. His result indicated that the significant reduction in exchange rate uncertainty in the Brazilian economy during the crawling peg period might have contributed as much as the changes in prices toward explain the greater openness of the economy after 1968. Rana (1983) study is the most thorough study in context of developing countries. He reached the same results regarding the import volumes of a number of Southeast Asian countries some of which are also included in the Bahmani-Oskooee (1984) sample. Rana (1983) estimated the import demand function for each country in the sample. He concluded that the increase in exchange rate risk has a significant negative impact on import volumes. He did not analyse export volumes in the same manner although they are likely to be of greater interest. Kabir (1988) used the standard regression model to investigate the Bangladesh export demand function. He found evidence for income inelastic demand for exports. Ahmed, Haque and Talukder (1993) estimated an export demand function using co integration and error correction model. Their results are similar to Kabir (1988) result regarding to export demand function for Bangladesh Export. However, they concluded that the cost efficiency by lowering price might not boost the export

demand significantly. Bayes, Hossein and Rahman (1995) has hypothesised that Bangladesh export supply is a function of relative prices of its exports and the capacity output of the tradable sector. They have estimated the demand and supply models of exports with annual data and found that Bangladeshis export is highly sensitive to the income growth of its trading partners and estimated that a 10 percent rise in a foreign income would raise the demand for Bangladeshi exports by 23 percent.

3. ECONOMETRIC MODELS AND SPECIFICATION

It is concluded that different studies have different results due to different methodology different sample periods, and different estimation techniques. The characteristics of the above studies are: they do not recognise the trade flows and variables explaining the relative price measure and outputs are likely to be non-stationery; the econometric methodology used in these studies pointed out the problems of short run perspective. That is why the results found in such situation regarding to the relationship is most likely medium or short run relationship. Based on the above facts following equation is estimated:

$$X_t = \xi_0 + \xi_1 i_t + \xi_2 p_t + \xi_3 \sigma_t + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where X_t denotes real exports from Pakistan to other selected countries in different regions, p_t is the real bilateral exchange rate reflecting the price competitiveness, i_t is the manufacturing production index of importing country which is the proxy for GDP, because the quarterly data on GDP[1] is not available. σ_t is the exchange rate volatility. The sign of ξ_1 is expected to be positive and the sign of ξ_2 is also to be positive because higher exchange rate implies a lower relative price that increases export.

In order to ensure consistency in data, the exports of Pakistan measured in local currency and to convert to real export, export unit index is used, which is based on Pakistan currency. Real exports of Pakistan define as

$$X_{tt} = Ln\left(\frac{EX_{it}}{EXUV_{it}} X100\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where X_t is the real export of Pakistan in domestic currency unit natural logarithm, EX_t is the monthly nominal exports of Pakistan in domestic currency and $EXUV_t$ is the index of export unit of Pakistan and t is the time period.

Industrial production index (i_t) is used as a proxy for GDP of importing country because of non-availability of quarterly data on GDP. Many study has been

[1]Though industrial production is a good proxy for GDP in industrial countries. However, the trend of industrial production is increasing in under developed countries like as India Bangladesh etc. That is why industrial production is taken as proxy for monthly GDP for all countries.

used the industrial production index as proxy variable e.g. Baum, Calagy and Ozkan (2002). The variable i_t is the natural logarithm of the industrial production index of an importing country.

Bilateral trade between two countries depends upon the exchange rate and the relative price level of two trading partner countries. Hence real exchange rate is calculated on the basis of these variables. The real exchange rate is

$$p_{it} = Ln\left(E_{it} x \frac{CPI_{jt}}{CPI_{it}} \right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Where p_{it} is the real quarterly exchange rate between in natural logarithm between Pakistan and other trading partners. E_{it} is the nominal quarterly exchange rate: CPI_{it} and CPI_{jt} is the consumer price index number of Pakistan and an importing country j respectively.

Various studies provide the formula for the measurement of exchange rate risk. However, in this study the standard deviation of exchange rate risk is used which is also used by Akhtar and Hilton (1984) and Baum, Calagyan and Ozkan (2002). The exchange rate volatility define in natural logarithm

$$\sigma_{ijt} = Ln\left[\sqrt{\frac{1}{n-1} \sum_{k=1}^{n} \left(RER_{ik} - \overline{RER_i} \right)^2} \right] \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Where σ_{it} is the volatility of real exchange rate and RER_{it} is the daily exchange rate of Pakistan and $\overline{RER_i}$ is the daily average of real exchange rate.

Real export (X_t) of Pakistan with real exchange rate volatility (σ_t) with the combination of the real bilateral exchange rate (p_t) and industrial production index (i_t) are examined.

If X_t and σ_t are considered to be stochastic trends and if they follow a common long run equilibrium relationship, then X_t and σ_t should be cointegrated. Cointegration is a test for equilibrium between non-stationary variables integrated of same order. According to Engle and Granger (1987), cointegrated variables must have an ECM representation. The main reason for the popularity of cointegration analysis is that it provides a formal background for testing and estimating short run and long run relationships among economic variables. Furthermore, the ECM strategy provides an answer to the problem of spurious correlation. If X_t and σ_t are cointegrate, an ECM representation could have the following form.

$$\Delta X_t = \alpha_0 + \alpha_1 B_{t-1} + \sum_{i=0}^{n} \alpha_{2i} \Delta X_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta \sigma_{t-1} + \sum_{i=0}^{n} \alpha_4 \Delta i_{t-1} + \sum_{i=0}^{n} \alpha_5 \Delta p_i + e_t \quad \ldots \quad (5)$$

where B_{t-1} is an error correction term. In Equation (1) Δx_t, $\Delta\sigma_t$ and e_t are stationary, at first difference implying that there right hand side must also be stationary. It is obvious that Equation 1 composes a bi-variate vector autoregression (VAR) in first difference augmented by the error correction terms B_{t-1} indicating that ECM and cointegration are equivalent representations.

4. DATA

The data used in this study is quarterly covered from 1991:3 to 2004:2. The data for nominal exports (EX_t) is taken from various issues of *Statistical Buellton* presented by Federal Bureau of Statistics government of Pakistan. The data for export unit value of Pakistan ($EXUV_t$), the industrial production index of importing country (i_t), consumer price index of Pakistan (CPI_{it}) and consumer price index of importing country (CPI_{jt}) are taken from various issues of International Financial Statistics (IFS) of International Monetary Fund (IMF). The data for nominal exchange rate is taken from various issues of *Monthly Statistical Bulletin* published by State Bank of Pakistan.

5. ESTIMATION AND INTERPRETATION OF RESULTS

Table 1 shows the exports of Pakistan to Australia, Bangladesh, India, Malaysia, New Zealand, Singapore, UK and US. The data shows that a large portion of trade goes to the US and UK (approximately 31 percent). However, consistency[2] in trade is found in case of New Zealand, Australia, Bangladesh, and India.

The volatility of exchange rate of sample courtiers during the study period is presented in Table 2. Coefficient of variation is used for this purpose. For further empirical comparison the data set is split in two sub-periods, i.e. firstly before the flexible exchange rate (July 1991 to June 2000) and later the flexible exchange rate period (July 2000 to June 2004). It is interesting to note that higher volatility is found in full sample period i.e. July 1991 to June 2004 as compared to the sub-periods. In contrast to expected higher volatility during the flexible exchange rate, we observed lower volatility compared to managed floating exchange rate regime.

The results of unit root test and cointegration are presented in Tables 3 and 4. It indicates that series of all four variables are each I(1) with constant and time trend in the data at the level. The null hypothesis is that there can be *r*-cointegrating vectors among four variables system (X_t, σ_t, p_t, i_t) for all countries, which are taken in the study periods. The test statistics imply that series of all four variables are less than the critical values. It indicates that the presence of at least one unit root of all four variables are each I(1). However, the results derived from first difference of the variables reject the null hypothesis of a unit root, at least five percent level of significance.

[2]Consistency is measured by standard deviation. It shows the less variation in export.

Table 1

Export of Pakistan

	Australia		Bangladesh		India		Malaysia	
Years	Export	Percentage	Export	Percentage	Export	Percentage	Export	Percentage
1990-91	1478	1.07	2160	1.56	933	0.67	1711	1.24
1991-92	2103	1.22	3218	1.87	2814	1.63	2017	1.17
1992-93	2664	1.50	2890	1.63	2175	1.23	1601	0.90
1993-94	3078	1.50	3092	1.50	1288	0.62	1989	0.96
1994-95	3458	1.37	5233	2.08	1284	0.51	1869	0.74
1995-96	3786	1.28	3956	1.34	1379	0.47	2223	0.75
1996-97	4755	1.46	3413	1.05	1412	0.43	3222	0.99
1997-98	5025	1.23	4569	1.12	2074	0.51	3956	0.97
1998-99	5330	1.36	5977	1.52	2444	0.62	4600	1.17
1999-00	5793	1.30	6233	1.39	2774	0.62	5001	1.11
2000-01	6609	1.22	7796	1.44	3237	0.60	4400	0.81
2001-02	6222	1.10	6210	1.09	3022	0.53	4428	0.78
2002-03	7032	1.07	6692	1.02	3118	0.47	4451	0.67
2003-04	7496	1.05	11227	1.58	5400	0.76	4801	0.67
SD		0.15		0.31		0.34		2.44

	Singapore		New Zealand		United Kingdom		United State	
Years	Export	Percentage	Export	Percentage	Export	Percentage	Export	Percentage
1990-91	3093	2.23	381	0.28	10051	7.27	14893	10.77
1991-92	3067	1.78	471	0.27	11372	6.62	22006	12.81
1992-93	3542	2.00	628	0.35	12654	7.15	24542	13.86
1993-94	2724	1.32	704	0.34	16031	7.80	29502	14.35
1994-95	3181	1.27	801	0.32	17725	7.05	40600	16.16
1995-96	3100	1.05	956	0.32	18811	6.38	45692	15.50
1996-97	2662	0.81	999	0.31	23282	7.16	576299	17.71
1997-98	2285	0.56	1068	0.26	24231	5.94	68722	16.87
1998-99	2088	0.53	1146	0.29	25828	6.57	849333	21.61
1999-00	2532	0.57	1356	0.30	30001	6.71	109915	24.59
2000-01	2817	0.52	1461	0.27	33666	6.21	131228	24.24
2001-02	2764	0.49	1585	0.28	40486	7.16	138669	24.53
2002-03	5072	0.77	1773	0.27	46098	7.03	153087	23.34
2003-04	2078	0.79	6736	0.95	54171	7.64	169510	23.91
SD		0.60		0.029		0.50		4.88

Table 2

Volatility of Exchange Rate in Different Time Periods (Coefficient of Variation)

	July 1991 to June 2000			July 2000 to June 2004			July 1991 to June 2004		
Countries	Mean	SD	C. V	Mean	SD	C.V	Mean	SD	C.V
Australia	25.61	5.41	21.13	34.69	4.21	12.14	28.41	6.57	23.14
Bangladesh	0.837	0.13	15.52	1.03	0.05	5.20	0.89	0.14	16.07
India	1.034	0.08	8.69	1.25	0.03	2.77	1.10	0.12	11.50
Malaysia	12.29	1.79	14.61	15.51	0.60	3.88	13.28	2.14	16.11
New Zealand	20.92	4.90	23.45	29.47	4.75	16.14	23.55	6.24	26.58
Singapore	23.04	5.40	23.46	33.45	0.70	2.11	26.24	6.61	25.19
UK	58.98	15.8	26.82	91.54	6.78	7.40	69.08	20.33	29.54
US	36.89	9.69	26.27	58.98	2.30	3.91	43.69	13.11	30.01

Table 3

Phillips-Perron (PP) Test

Variables	With Intercept		With Intercept and Trend		N	Critical Values		
	Level	Ist diff.	Level	Ist diff.		1%	5%	10%
Australia								
Real Export	–4.23	–4.43	–4.43	–7.71	52	–3.56	–2.91	–2.59
Real Ex. Rate	–1.74	–5.98	–2.82	–6.09	52	–3.56	–2.91	–2.59
IPI	–0.53	–8.02	–2.42	–7.96	52	–3.56	–2.91	–2.59
Sigma	–6.00	–18.31	–7.81	–18.19	52	–3.56	–2.91	–2.59
Bangladesh								
Real Export	–3.90	–9.94	–4.06	–9.78	52	–3.56	–2.91	–2.59
Real Ex. Rate	–1.38	–7.75	–1.50	–7.71	52	–3.56	–2.91	–2.59
IPI	–0.84	–13.24	–5.79	–13.14	52	–3.56	–2.91	–2.59
Sigma	–7.26	–18.50	–7.52	–18.35	52	–3.56	–2.91	–2.59
India								
Real Export	–3.47	–9.71	–3.45	–9.62	52	–3.56	–2.91	–2.59
Real Ex. Rate	–0.67	–7.63	–2.68	–7.58	52	–3.56	–2.91	–2.59
IPI	–0.92	–13.70	–5.89	–13.58	52	–3.56	–2.91	–2.59
Sigma	–7.02	–15.22	–6.96	–15.04	52	–3.56	–2.91	–2.59
Malaysia								
Real Export	–2.53	–7.12	–2.54	–7.09	52	–3.56	–2.91	–2.59
Real Ex. Rate	–5.22	–10.24	–5.47	–10.12	52	–3.56	–2.91	–2.59
IPI	–5.27	–8.76	–5.22	–8.67	52	–3.56	–2.91	–2.59
Sigma	–2.76	–8.65	–3.68	–8.56	52	–3.56	–2.91	–2.59
New Zealand								
Real Export	–4.37	–13.81	–5.66	–13.62	52	–3.56	–2.91	–2.59
Real Ex. Rate	–1.07	–5.33	–1.82	–5.26	52	–3.56	–2.91	–2.59
IPI	–2.08	–9.37	–3.22	–9.49	52	–3.56	–2.91	–2.59
Sigma	–6.69	–21.99	–12.36	–21.73	52	–3.56	–2.91	–2.59
Singapore								
Real Export	–1.97	–7.36	–1.63	–7.65	52	–3.56	–2.91	–2.59
Real Ex. Rate	–2.10	–4.87	–1.96	–4.90	52	–3.56	–2.91	–2.59
IPI	–2.88	–6.81	–2.83	–6.76	52	–3.56	–2.91	–2.59
Sigma	–2.50	–5.59	–2.48	–5.52	52	–3.56	–2.91	–2.59
United Kingdom								
Real Export	–2.66	–16.83	–4.76	–17.57	52	–3.56	–2.91	–2.59
Real Ex. Rate	–1.23	–6.60	–2.60	–7.98	52	–3.56	–2.91	–2.59
IPI	–0.96	–6.49	–1.79	–6.48	52	–3.56	–2.91	–2.59
Sigma	–6.86	–17.37	–7.01	–17.22	52	–3.56	–2.91	–2.59
United State								
Real Export	–1.52	–16.58	–7.34	–16.35	50	–3.56	–2.91	–2.59
Real Ex. Rate	–1.02	–5.46	–1.78	–5.42	50	–3.56	–2.91	–2.59
IPI	–0.84	–4.47	–11.28	–4.45	50	–3.56	–2.91	–2.59
Sigma	–6.54	–14.08	–6.47	–13.97	50	–3.56	–2.91	–2.59

Table 4

Johansen Co-integration Tests for Exports

	Trace Statistics				Maximum Eigen value			
H_0	r =0	r ≤ 1	r ≤ 2	r ≤	r=0	r ≤ 1	r ≤ 2	r ≤ 3
H_1	r ≥ 1	r ≥ 2	r ≥3	r = 4	r=1	r =2	r=3	r =4
Australia	89.44	36.07	13.05	0.56	53.37	23.02	12.49	0.01
Bangladesh	106.66	55.94	23.52	4.65	50.72	32.42	18.87	0.09
India	48.66	22.04	5.89	0.46	26.62	16.15	5.43	0.01
Malaysia	82.77	44.82	20.66	5.12	37.95	24.13	15.53	0.10
New Zealand	94.99	48.47	20.85	5.89	46.52	27.62	14.96	0.11
Singapore	58.28	22.26	12.08	4.49	36.02	10.18	7.59	0.09
UK	61.06	27.90	12.49	2.95	33.16	15.41	9.54	0.05
US	87.32	53.19	22.40	5.25	34.13	30.79	17.15	0.09

CRITICAL VALUES

H_0	r =0	r ≤ 1	r ≤ 2	r ≤ 3
H_1	r ≥ 1	r ≥ 2	r ≥3	r = 4
Australia				
5%	47.21	29.68	15.41	3.76
1%	54.46	35.65	20.04	6.65
Bangladesh				
5%	62.99	42.44	25.32	12.25
1%	70.05	48.45	30.45	16.26
India				
5%	47.21	29.68	15.41	3.76
1%	54.46	35.65	20.04	6.65
Malaysia				
5%	62.99	42.44	25.32	12.25
1%	70.05	48.45	30.45	16.26
New Zealand				
5%	62.99	42.44	25.32	12.25
1%	70.05	48.45	30.45	16.26
Singapore				
5%	62.99	42.44	25.32	12.25
1%	70.05	48.45	30.45	16.26
UK				
5%	62.99	42.44	25.32	12.25
1%	70.05	48.45	30.45	16.26
US				
5%	62.99	42.44	25.32	12.25
1%	70.05	48.45	30.45	16.26

The cointegrating vectors are given in Table 5, which shows that for each country the impact of industrial production is positively related to the volume of exports except Australia, Bangladesh and Singapore. The expected sign of i_t is positive. It indicates that the higher the economic activity in importing country, the higher the demand for exports. However, the negative sign shows that the higher economic activity in importing country leads to decrease in the volume of exports. It implies that Pakistani commodities are considered as inferior goods in Australia, Bangladesh and Singapore. The relation of real exchange rate to the volume of export is expected to be positive. It infers that a higher real exchange rate implies a lower relative price, the volume of export increases. Empirical evidence shows that the positive signs for its relationship in case of Australia, Malaysia, Singapore, and UK where as negative sign are observed for Bangladesh, India, New Zealand, and US. The volatility of exchange rate has expected negative sign in all countries. Our results support the study of Cushman (1983, 1986, 1988). However, the values are statistically insignificant.

The causal relationship between X_t and σ_t results are presented in Table 6. The results indicate that the error correction B_{t-1} is negative and statistically significant in case of Australia, New Zealand, Singapore and US. It implies that in case of Australia only 62.9 percent of the adjustment occur in one quarter while 15 percent for New

Table 5

Estimates of the Cointegrating Vectors
Normalised Cointegrating Coefficients: 1 Cointegrating Equation

	C	IPI	REALER	SIGMA	TREND
Australia	–15.22859	–0.01731	1.439075	–0.453074	0.006610
(SE)		(0.00645)	(0.35952)	(0.13225)	(0.00496)
Bangladesh	–9.645260	–0.07147	–7.476717	43.41214	0.208156
(SE)		(0.01716)	(1.84368)	(9.68269	(0.04970
India	–41.01216	0.277747	–8.655595	73.81995	–0.441842
(SE)		(0.12552)	(5.99738)	(41.1737)	(0.21724)
Malaysia	–14.30675	0.00445	0.558717	–0.206157	–0.026084
(SE)		(0.001)	(0.145)	(0.083)	(0.007)
New Zealand	–13.79132	0.025208	–0.040659	–2.753048	0.017008
(SE)		(0.01785)	(0.66603)	(1.4431)	(0.016)
Singapore	–28.8486	–0.01515	6.452054	–0.069974	0.005612
(SE)		(0.002)	(0.692)	(0.039)	(0.003)
UK	–12.46691	0.071259	–2.666413	0.578221	–0.044750
(SE)		(0.01995)	(1.14127)	(0.23344)	(0.01027)
US	–31.60342	0.174814	0.633217	–6.227301	–0.202581
(SE)		(0.48479)	(6.44742)	(17.4195)	(0.50272)

Table 6

Regression Results for Error Correction Models

Variables	Australia	Bangladesh	India	Malaysia	New Zealand	Singapore	UK	US
Constant	–0.013	–0.220	0.080	0.920	0.021	–0.007	0.033	0.042
	(0.03)	(0.11)	(0.08)	(0.043)	(0.03)	(0.046)	(0.02)	(0.03)
	(–0.41)	(–1.84)	(0.93)	(0.28)	(0.81)	(–0.163)	(1.36)	(1.32)
ΔR.Exp(–1)	0.341**	–0.15	–0.28***	–0.499	–0.34**	–0.81	–0.70*	–0.037*
	(0.16)	(0.12)	(0.14)	(0.22)	(0.15)	(0.19)	(0.17)	(0.16)
	(2.08)	(–1.26)	(–1.82)	(–2.30)	(–2.20)	(–0.94)	(–4.03)	(–2.29)
ΔR.Exp(–2)	–0.231	–0.632*	0.136	–0.38	–0.27***	–0.163	–0.26***	–0.163
	(0.18)	(0.12)	(0.15)	(0.24)	(0.138)	(0.166)	(0.15)	(0.139)
	(–1.28)	(–5.21)	(0.89)	(–1.58)	(–1.97)	(–0.97)	(–1.71)	(–1.20)
ΔIPI(–1)	0.024***	–0.002	–0.007	–0.000	0.012	–0.002	–0.19	–0.016
	(0.01)	(0.01)	(0.01)	(0.000)	(0.01)	(0.00)	(0.01)	(0.020)
	(1.69)	(–0.54)	(–0.72)	–(1.02)	(1.46)	(–0.71)	(–1.28)	(–0.78)
ΔIPI(–2)	0.001	0.004	–0.036**	0.000	–0.004	0.001	–0.004	0.011
	(0.015)	(0.00)	(0.01)	(0.004)	(0.01)	(0.0027)	(0.00)	(0.021)
	(0.09)	(0.96)	(–3.47)	(0.092)	(–0.47)	(0.572)	(–0.26)	(0.53)
ΔR.ER(–1)	0.42	–0.670	–2.264	0.000	–1.31	1.976	0.30	1.12
	(0.86)	(1.89)	(2.56)	(0.62)	(0.80)	(1.80)	(0.51)	(0.97)
	(0.48)	(–0.35)	(–0.88)	(0.014)	(–1.63)	(1.097)	(0.59)	(1.149)
ΔR.ER(–2)	–0.21	–0.668	0.150	0.006	0.598	–2.91	0.86	–0.875
	(0.78)	(1.87)	(2.54)	(0.055)	(0.78)	(1.65)	(0.47)	(0.98)
	(–0.26)	(–0.35)	(0.05)	(0.115)	(0.76)	(–1.75)	(1.84)	(–0.89)
ΔSigma(–1)	–0.162***	–5.66	–0.574	0.030	–0.155	0.051	0.08***	0.041
	(0.10)	(5.59)	(7.04)	(0.049)	(0.173)	(0.049)	(0.04)	(0.08)
	(–1.59)	(–1.01)	(–0.08)	(0.698)	(–0.89)	(1.044)	(1.82)	(0.45)
ΔSigma(–2)	–0.050	–2.36	–0.793	0.0448	–0.039	–0.021**	0.05***	0.026
	(0.075)	(3.38)	(5.07)	(0.047)	(0.11)	(0.052)	(0.03)	(0.055
	(–0.66)	(–0.69)	(–0.15)	(0.946)	(–0.37)	(–3.98)	(1.72)	(–0.47)
B_{t-1}	–0.629**	–0.020	–0.035	–0.002	–0.15***	–0.38**	–0.20	–0.18***
	(0.22)	(0.019)	(0.02)	(0.035)	(0.07)	(0.218)	(0.133)	(0.105)
	(–2.85)	(–1.01)	(–0.16)	–0.64)	(–1.86)	(–1.73)	(–1.51)	(–1.72)
R^2	0.485	0.527	0.349	0.37	0.445	0.387	0.531	0.370
Adjusted R^2	0.367	0.425	0.192	0.11	0.316	0.23	0.422	0.225
AIC	–0.337	0.5783	1.829	0.613	–0.440	–0.74	–0.824	–0.401
N	52	52	52	52	52	47	52	52

Zealand, 38 percent in Singapore and 18 percent for US. In case of remaining countries the negative sign is observed. However, the results are statistically insignificant. The coefficient of error correction terms of industrial production (i_t), real exchange rate and on real export show an ambiguous result.

The results also indicate an ambiguous relationship between exchange rate volatility and exports of all countries, undertaken in this study e.g. in case of Australia, Singapore and UK. The result also shows a negative and significant impact on real exports. However, the estimation of the other countries shows the statistically insignificant results. The reason is that the Pakistan economy is dollar economy and its exports and imports depend on dollar value. That is why bilateral exchange rate indicated lesser effect on real export.

6. SUMMARY AND CONCLUDING REMARKS

Impact of exchange rate volatility on exports growth between Pakistan and leading trade partners has been investigated. The countries are selected under various regional economic blocks such as SAARC, ASEAN, European, and Asia-Pacific regions. Cointegration and error-correction techniques are used to establish the empirical relationship between exchange rate volatility and exports growth, using quarterly data from 1991:3 to 2004:2. The results indicate that the volatility of exchange rate has negative and significant effects both in the long run and short run with Australia, New Zealand, UK, and US, where the volume of trade with Pakistan is comparatively consistent and less volatile. The relationship between exports growth and exchange rate volatility for Australia, Singapore and UK is observed only in long run perspective. However, for countries like Bangladesh and Malaysia no empirical relationship is observed between export growth and exchange rate volatility.

REFERENCES

Ahmed, M., N. Haque, and S. I. Talukder (1993) Estimating Export Demand Function for Bangladesh: An Application of Co-integration and Error Correction Modeling. *The Bangladesh Development Studies* 21, 89–104.

Akhtar, M., and R. S. Hilton (1984) Effects of Exchange Rate Uncertainty on German and U.S. Trade. *Federal Reserve Bank of New York Quarterly Review* 9, 7–16.

Arize, A. (1995) The Effects of Exchange Rate Volatility on U.S. Exports: An Empirical Investigation. *Southern Economic Journal* 62, 34–43.

Asseery, A., and D. A. Peel (1991) The Effects of Exchange Rate Volatility on Exports. *Economic Letters* 37, 173 –177.

Baak, S., A. Al-Mahmood, and S. Vixathep (2002) Exchange Rate Volatility and Exports from East Asian Countries to Japan and U.S. University of Japan. (Manuscript).

Bahmani-Oskooee, M. (1984) On the Effects of Effective Exchange Rates on Trade Flows. *Indian Journal of Economics* 256, 57–67.

Bahmani-Oskooee, M. (1986) The Determinants of Trade Flows: The Case of Development Countries. *Journal of Development Economics* 20, 107–123.

Bailey, M. J., G. S. Tavlas, and M. Ulan (1987) The Impact of Exchange Rate Volatility on Export Growth: Some Theoretical Consideration and Empirical Results. *Journal of Policy Modeling* 9, 225–243.

Baum, C. F., C. Mustafa, and N. Ozkan (2002) Exchange Rate Effects on the Volume of Trade Flows: An Empirical Analysis Employing High-Frequency Data. Boston College. (Manuscript.)

Bayes, A. M., I. Hossain, and M. Rahman (1995) *Independent Review of Bangladesh's Development External Sector.* Centre for Policy Dialogue, Dhaka: Bangladesh.

Chowdhury, A. R. (1993) Does Exchange Rate Volatility Depress Trade Flows? Evidence from Error-Correction Models. *The Review of Economics and Statistics* 75, 700–706.

Coes, D. (1981) The Crawling Peg and Exchange Rate Uncertainty. In J. Williamson (ed.). New York: SDT. Martin's Press, 113–136.

Cushman, D. O. (1983) The Effects of Real Exchange Rate Risk on International Trade. *Journal of International Economics* 15, 45–63.

Cushman, D. O. (1986) Has Exchange Risk Depressed International Trade? The Impact of Third Country Exchange Risk. *Journal of International Money and Finance* 5, 361–379.

Cushman, D. O. (1988) US Bilateral Trade Flows and Exchange Rate Risk During the Floating Period. *Journal of International Economics* 25, 317–330.

DeGrauwe, P. (1988) Exchange Rate Variability and the Slowdown in Growth of International Trade. *IMF Staff Papers* 35, 63–84.

Engle, R. E., and C. W. Granger (1987) Cointegration and Error Correction, Representation, Estimation and Testing. *Econometrica* 55, 251–276.

Gotur, P. (1985) Effects of Exchange Rate Volatility on Trade: Some Further Evidence. *IMF Staff Papers* 32, 475–512.

Hooper, P., and S. W. Kohlhagen (1978) The Effects of Exchange Rate Uncertainty on the Price and Volume of International Trade. *Journal of International Economics* 8, 483–511.

Houthakkar, H. S., and S. Magee (1969) Income and Price Elasticities in World Trade. *Review of Economics and Statistics* 51, 111–125.

International Monetary Fund (1984) Exchange Rate Volatility and World Trade. (IMF Occasional Papers No. 28.)

Kabir, R. (1988) Estimating Import and Export Demand Function: The case of Bangladesh. *The Bangladesh Development Studies* 115–127.

Kenen, P. T., and D. Rodrick (1986) Measuring and Analysing the Effects of Short Run Volatility in Real Exchange Rates. *The Review of Economics and Statistics* 68, 311–315.

Koray, F., and W. D. Lastrapes (1989) Real Exchange Rate Volatility and U.S. Bilateral Trade: A VAR Approach. *The Review of Economics and Statistics* 71, 708–712.

Kumar, R. and R. Dhawan (1991) Exchange Rate Volatility and Pakistan's Export to the Developed World, 1974–1985. *World Development* 19, 1225–1240.

Pere, E., and A. Steinherr (1989) Exchange Rate Uncertainty and Foreign Trade. *European Economic Review* 33, 1241–1264.

Rana, P. (1983) *The Impact of Generalised Floating on Trade Flows and Reserve Needs: Selected Asian Developing Countries.* New York: Garland Publishers.

Thursby, M. C., and J. G. Thursby (1987) Bilateral Trade Flows, Linders Hypothesis, and Exchange Risk. *The Review of Economics and Statistics* 69, 488–495.

Warner, D. F., and M. E. Kreinin (1983) Determinants of International Flows. *The Review of Economics and Statistics* 65, 96–104.