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

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Abstract

The study empirically investigates the effect of exchange rate volatility on exports growth between Pakistan and leading trade partners. The countries are selected to determine the bilateral relationship between Pakistan and the other countries 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 result indicates that the volatility of exchange rate has negative and significant effects both in the long run and short run with major trade partners namely UK and US. Similar pattern was observed in case of Australia, Bangladesh, and Singapore, where the volume of trade with Pakistan is comparatively consistent and less volatile. The relationship between exports growth and exchange rate volatility for India and Pakistan is observed only in long run perspective. However, of countries like New Zealand and Malaysia no empirical relationship is observed between export growth and exchange rate volatility.

Key words: Exchange Rate, Volatility, Export growth, Regional integration

1. Introduction.

The impact of exchange rate volatility on the volume of international trade has been studied intensively since the late 1970's when the exchange rate moved from fixed to flexible exchange rate, means facing a volatile real exchange rate. The theory says that higher exchange rate volatility will reduce trade by creating uncertainty about future profit from export trade. By using the forward markets and by managing the timing of payments and receipts the firm can reduce the uncertainties in the short run. In the long run, exchange rate volatility may also affect trade indirectly by influencing firm's

investment decision. However, the commercial investors have limited possibilities of trading claims to future operational cash flows. Thus they are forced to shift away from risky markets. According to these arguments, traders are risk averse, and hedging is expensive or impossible; therefore, exchange rate volatility will reduce risk adjusted profit from foreign trade.[1]

The high degree of volatility and uncertainty of exchange rate movements since the beginning of the generalized floating in 1973 have led policy makers and researchers to investigate the nature and extent of the impact of such movements on the volume of trade. However, these studies deals with the effects of exchange rate volatility on trade flows have yielded mixed results. On one hand, a number of studies have argued that exchange rate volatility will impose costs on risk averse market participants who will generally respond by favouring domestic to foreign trade at the margin. The arguments views traders as bearing undiversified exchange risk; if hedging is impossible or costly and traders are risk averse, risk adjusted expected profits from trade would fall when exchange risk increases.

Pakistan follows the flexible exchange rate system since 1982. At the initial stage the fluctuation of exchange rate is very nominal. However, exports evolved broadly in line with total world imports. Pakistan's share in world imports 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. In 2002-2003 the share was 0.17 percent. This suggests that Pakistan's exports performance was based on the volatility of exchange rate. Only one empirical study is available regarding to Pakistan's context. Kumar and Dhawan (1991) estimated the 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 objective of this paper is to investigate the effect of exchange rate volatility on exports growth between Pakistan and other leading trade partners during 1991-2003. The countries are selected from various regions to capture the varying impact of level and degrees of bilateral relationship between Pakistan and other countries. Therefore regional countries included 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 . The data description is provided in section three followed by discussion of results in section four. The summary and concluding remarks are given in section five.

[1] A very risk averse exporter who worries about the decline in revenue may export more when risks are higher. On the other hand a less risk averse individual may not be considered with worst possible outcome and, considering the returns on exports less attractive, may decide to export less when risks are higher.

2. Literature Review and Theoretical Framework

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); De Grauwe (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 analyze 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 also 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. Akhter 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 Akhter and Hilton (1984). He added the countries in Akhter and Hilton (1984) models i.e. France Japan, UK and increasing 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 regard 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 Bahamani-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 analyze 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 Ttalukder (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 hypothesized 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% rise in a foreign income would raise the demand for Bangladeshi exports by 23%.

3. Econometric Models and Specification

It is concluded that different studies have different results. The reasons are different methodology, the different sample period, and different estimation techniques. The characteristics of the above studies are: they did not recognize that trade flows and the variables explaining the as relative price measures and outputs are likely to be non-stationery; the econometric methodology used in these studies used only the problems of e short run perspective, that is why if result found any evidence regarding to the relationship between volatility and trade flows it is most likely medium or short run relationship.

Based on the above discussion the following equation is estimated:

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

where X_t denotes real exports from Pakistan to other countries selected 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 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 we used export unit index, which is based on Pakistan currency. Real exports of Pakistan define as

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

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 non-availability of quarterly data on GDP. Many study has been 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

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

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

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

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

We test 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).

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.

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

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. According to Granger (1988) in a cointegrated system of two series expressed by an ECM representation, causality must run in at least one way. Within the ECM formulation of equation (1) X_t does not granger cause σ_t if $\alpha_1 = \alpha_3 = 0$.

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 taken from several issues of Monthly Statistical Bulletin published by State Bank of Pakistan.

5. Estimation and interpretation of Results

Table 1 shows the export of Pakistan to Australia, Bangladesh, India, Malaysia, New Zealand, Singapore, UK and US during the study period. The data shows that a large portion of trade goes to the US and UK. However, consistency is found in Newzealand, Australia, Bangladesh, and India.

Cointegration test requires the series of all variables to be stationary. Augmented Dickey Fuller (1979) unit root test, which also checks for serial correlation is performed. The results presented in table 2 indicates that series of all four variables are each I(1) with constant and time trend in the data at the level. Subsequently Johanson (1988, 1991) cointegration test is employed. This test is more appropriate when more than two variables are used in the equation and it also can make use of I(0) variables. 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 implies the presence of one cointegrating relationship for all four variables in all countries. The ADF statistics of at the level of all series are lower than the critical value which implies the presence of unit roots of all four variables i.e.each I(1). However, the results derived form first difference of the variables reject the null hypothesis of a unit root at least five percent level of significance.

The cointegrating vectors are given in table 4, which shows that for each country the impact of industrial production is positively related to the volume of exports except New Zealand, Singapore, and UK. 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. This implies that that Pakistani commodities are considered as inferior goods in New Zealand, Singapore, and UK. The value of coefficient i_t is ranging from –0.317 to 18.405. The relation of real exchange rate to the volume of export is expected to be positive. It indicates that a higher real exchange rate implies a lower relative price, and as result the volume of exports increases. Empirical evidence shows that the positive signs for its relationship in case of Australia, Bangladesh, Malaysia, Singapore, and UK. Whereas negative signs are for India, New Zealand, and US. It implies that our demand for exports in these countries is inelastic. The volatility of exchange rate has expected negative relationship with real export in all countries. It supports to the study of Cushman (1983, 1986, 1988); Akhtar and Hilton (1984); Kenen and Rodrick (1986); Thursby and Thursby (1987); De Grauwe (1988); Pere and Steiner (1986); Koray and Lastrapes (1989); and Arize (1995).

The causal relationship between X_t and σ_t are presented in tables 5 within the ECMs form. Atmost three lags are used for each independent variable to conserve degree of freedom and AIC is used for model selection. While error correction terms B_{t-1} appearing

as regressors reflect long run dynamics or in other words the system converges to the long run equilibrium implied by cointegrating regression. The coefficient of B_{t-1} represents the response of the dependent variables in each period to departure from equilibrium. The coefficients on the lagged values of ΔX_t, $\Delta\sigma_t$, $\Delta\iota_t$, and Δp_t are short run parameters measuring the short run immediate impact of independent variable on ΔX_t. The results indicates that the error correction terms B_{t-1} are negative sign and statistically significant in case of Australia, Bangladesh, India, and Singapore. It indicates that a measure of the average speed at which export volume adjusts to a change in equilibrium conditions. The absolute values of the error correction terms indicate that the movement of real export towards eliminating disequilibrium with in a quarter varies from one country to another. e.g. in case of Australia only 246% of the adjustment occur in one quarter while 80.7% in Bangladesh, 3.5% in India, 37.8% in Singapore and 69.1% for US. and UK. The negative sign are observed for error correction model in case of New Zealand and Malaysia, which provide the evidence of adjustment. However, the values are statistically insignificant.

The coefficient on the industrial manufacturing production (i_t) and real exchange rate on real export show how the average speed of export adjusts or it may differ. It depends the adjustment in response to industrial production or real exchange rate. The result is ambiguous regarding to the relation ship between real exchange rate and exports demand and industrial production..

Our main focus is to see the impact of exchange rate volatility on export of all countries, which are taken in this study. It indicates the ambiguous results, e.g. in case of Australia and Singapore the result shows negative and significant impact on real export. However the estimation of the other countries show the statistically insignificant result. The reason is that the Pakistan economy is Dollar economy and its exports and imports depend on Dollar. That is why bilateral exchange rate is less effect on real export. However the result regarding to US is negative and insignificant even Pakistan economy is Dollar economy. It is an important empirical finding.

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 result indicates that the volatility of exchange rate has negative and significant effects both in the long run and short run with UK, US, Australia, Bangladesh, and Singapore, where the volume of trade with Pakistan is comparatively consistent and less volatile. The relationship between exports growth and exchange rate volatility for India and Pakistan is observed only in long run perspective. However, of countries like New Zealand and Malaysia no empirical relationship is observed between export growth and exchange rate volatility.

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TABLE # 1

EXPORT OF PAKISTAN

Years	Australia		Bangladesh		India		Malaysia	
	Export	**%**	**Export**	**%**	**Export**	**%**	**Export**	**%**
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

TABLE # 1 (Contd.)

EXPORT OF PAKISTAN

Years	Singapore		New Zealand		United Kingdom		United State	
	Export	**%**	**Export**	**%**	**Export**	**%**	**Export**	**%**
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

TABLE # 2
AUGMENTED DICKEY FULLER TEST (ADF)

Variables	With Intercept		With intercept and trend		N	Critical values		
	Level	Ist diff.	Level	Ist diff.		1%	5%	10%
AUSTRALIA								
Real Export	-3.29	-3.18	-3.18	-3.29	42	-4.20	-3.52	-2.60
Real Ex. Rate	-1.56	-1.65	-1.55	-1.56	42	-3.58	-2.90	-2.60
IPI	-1.40	-2.24	-1.39	-1.40	42	-3.60	-2.93	-2.60
Sigma	-3.67	-3.57	-3.55	-3.67	42	-3.55	-3.50	-2.60
BANGLADESH								
Real Export	-5.49	-10.77	-5.49	-10.77	49	-4.16	-3.50	-3.18
Real Ex. Rate	-0.93	-8.41	-1.90	-4.72	49	-4.16	-3.50	-3.18
IPI	-1.26	-4.81	-5.71	-8.92	49	-4.16	-3.50	-3.18
Sigma	-3.61	-6.20	-3.39	-6.29	49	-4.16	-3.50	-3.18
INDIA								
Real Export	-2.45	-4.72	-2.43	-4.68	49	-4.16	-3.52	-4.68
Real Ex. Rate	-2.23	-5.73	-2.57	-5.67	49	-4.16	-3.52	-4.68
IPI	-4.75	-8.07	-4.87	-7.97	49	-4.16	-3.52	-4.68
Sigma	-3.89	--7.30	-3.84	-7.21	49	-4.16	-3.52	-4.68
MALAYSIA								
Real Export	-2.53	-7.12	-2.54	-7.09	52	-4.15	-3.5	-3.18
Real Ex. Rate	-5.22	-10.24	-5.47	-10.12	52	-4.15	-3.5	-3.18
IPI	-5.27	-8.76	-5.22	-8.67	52	-4.15	-3.5	-3.18
Sigma	-2.76	-8.65	-3.68	-8.56	52	-4.15	-3.5	-3.18
NEW ZEALAND								
Real Export	-3.23	-7.72	-4.37	-2.28	52	-4.16	-3.51	-3.18
Real Ex. Rate	-1.43	-7.39	-3.39	-6.23	52	-4.16	-3.51	-3.18
IPI	-1.03	-5.76	-2.63	-1.98	52	-4.16	-3.51	-3.18
Sigma	-2.28	-6.23	-5.78	-6.86	52	-4.16	-3.51	-3.18
SINGAPORE								
Real Export	-1.97	-7.36	-1.63	-7.65	52	-4.48	-3.5	-3.17
Real Ex. Rate	-2.10	-4.87	-1.96	-4.90	52	-4.48	-3.5	-3.17
IPI	-2.88	-6.81	-2.83	-6.76	52	-4.48	-3.5	-3.17
Sigma	-2.50	-5.59	-2.48	-5.52	52	-4.48	-3.5	-3.17
UNITED KINGDOM								
Real Export	-2.35	-7.79	-4.22	-7.74	50	-4.20	-3.52	-2.60
Real Ex. Rate	-1.48	-6.46	-2.89	-6.46	50	-3.58	-2.90	-2.60
IPI	-5.14	-8.14	-5.28	-8.04	50	-3.60	-2.93	-2.60
Sigma	-3.53	-6.45	-3.49	-6.38	50	-3.55	-3.50	-2.60
UNITED STATE								
Real Export	-1.32	-6.99	-5.89	-6.91	50	-4.15	-3.50	-3.18
Real Ex. Rate	-1.11	-4.30	-1.94	-4.26	50	-4.15	-3.50	-3.18
IPI	-1.16	-2.79	-1.12	-2.93	50	-4.15	-3.50	-3.18
Sigma	-2.69	-6.26	-2.92	-6.19	50	-4.15	-3.50	-3.18

TABLE # 3

JOHANSEN CO-INTEGRATION TESTS FOR EXPORTS

	Trace Statistics				Maximum Eigen value			
H_0 H_1	r =0 r ≥ 1	r ≤ 1 r ≥ 2	r ≤ 2 r ≥3	r ≤ r = 4	r=0 r=1	r ≤ 1 r =2	r ≤ 2 r=3	r ≤ 3 r =4
Australia	74.92	31.77	17.99	8.33	43.15	13.78	9.66	0.18
Bangladesh	48.84	18.70	6.74	0.53	30.14	11.96	6.21	0.01
India	97.22	45.68	23.45	11.01	51.54	22.23	12.44	0.21
Malaysia	82.77	44.82	20.66	5.127	37.95	24.13	15.53	0.10
NewZealand	38.01	18.28	7.77	1.96	19.73	10.51	5.81	0.04
Singapore	58.28	22.26	12.08	4.49	36.02	10.18	7.59	0.09
UK	79.5	32.93	14.03	5.26	46.57	18.90	8.77	0.10
US	82.49	50.79	23.4	8.56	31.70	27.39	14.84	0.16

CRITICAL VALUES

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

TABLE # 4

ESTIMATES OF THE COINTEGRATING VECTORS

Normalized Cointegrating Coefficients: 1 Cointegrating Equation

	C	IPI	REALER	SIGMA	TREND
Australia	-16553.68	18.4051	1135.969	-18.25019	-62.02171
(SE)		(7.727)	(325.47)	(27.741)	(16.909)
Bangladesh	-17.72808	0.05479	1.252041	-0.038411	-0.158740
(SE)		(0.007)	(0.758)	(0.034)	(0.021)
India	-1.217113	0.02736	-1.293533	-0.609022	-0.020162
(SE)		(0.037)	(0.712)	(0.927)	(0.063)
Malaysia	-14.30675	0.00445	0.558717	-0.206157	-0.026084
(SE)		(0.001)	(0.145)	(0.083)	(0.007)
New Zealand	333.4465	-0.31763	-25.73272	-80.29313	1.188937
(SE)		(1.453)	(112.22)	(352.425)	(5.251)
Singapore	-28.8486	-0.01515	6.452054	-0.069974	0.005612
(SE)		(0.002)	(0.692)	(0.039)	(0.003)
UK	-32.42368	-0.12285	5.621857	-3.346387	-0.139836
(SE)		(0.843)	(44.356)	(22.920)	(0.908)
US	-14.4417	0.0063	-0.4381	0.0077	-0.0321
(SE)		(0.005)	(0.398)	(0.035)	(0.005)

TABLE # 5
REGRESSION RESULTS FOR ERROR CORRECTION MODELS

Variables	AUSTRALIA	BANGLADESH	INDIA	MALAYSIA	NEWZEALAND	SINGAPORE	UK	US
Constant	995.23 (559.02) (2.23)	-0.220 (0.11) (-1.84)	-0.006 (0.078) (-0.087)	0.920 (0.043) (0.28)	0.080 (0.05) (1.44)	-0.007 (0.046) (-0.163)	0.025 (0.03) (0.84)	-0.011 (0.05) (-0.19)
ΔR.Exp(-1)	-3.524** (2.18) (-2.61)	0.310 (0.26) (1.18)	-0.78 (0.27) (-2.82)	-0.499 (0.22) (-2.30)	-0.266 (0.28) (-0.94)	-0.81 (0.19) (-0.94)	-0.466 (0.16) (-2.80)	0.087 (0.29) (0.29)
ΔR.Exp(-2)	-3.335** (2.80) (-2.19)	-0.273 (0.18) (-1.55)	-0.312 (0.26) (-1.19)	-0.38 (0.24) (-1.58)	-0.112 (0.78) (-0.14)	-0.163 (0.166) (-0.97)	-0.166 (0.164) (-1.009)	-0.033 (0.226) (-0.14)
ΔR.Exp(-3)	-3.833 (2.387) (-1.61)	-0.078 (0.16) (-0.48)		-0.106 (0.192) (-0.515)	-0.051 (0.28) (-0.17)			-0.264 (0.17) (-1.51)
ΔIPI(-1)	-129.32 (72.52) (-1.78)	0.029 (0.02) (1.82)	-0.022 (0.00) (-2.74)	-0.000 (0.000) -(1.02)	-0.011 (0.10) (-1.04)	-0.002 (0.00) (-0.71)	0.004 (0.00) (1.15)	-0.014 (0.025) (-0.544)
ΔIPI(-2)	-129.80 (91.02) (-1.425)	0.023 (0.01) (1.87)	-0.001 (0.00) (-1.44)	0.000 (0.004) (0.092)	-0.009 (0.10) (-0.77)	0.001 (0.0027) (0.572)	-0.00 (0.00) (-0.24)	0.02 (0.026) (0.75)
ΔIPI(-3)	-100.98 (68.66) (-1.47)	0.019 (0.01) (2.70)		0.000 (0.00) (0.82)	0.003 (0.019) (0.26)			0.053 (0.028) (1.91)
ΔR.ER(-1)	-4148** (2303.41) (-2.801)	0.402 (1.75) (0.23)	0.377 (0.21) (1.76)	0.000 (0.62) (0.014)	-0.656 (0.36) (-1.67)	1.976 (1.80) (1.097)	1.11 (0.99) (1.12)	0.415 (1.15) (0.36)
ΔR.ER(-2)	-3441.00 (1912.46) (-1.799)	0.045 (1.67) (0.07)	0.238 (0.19) (1.21)	0.006 (0.055) (0.115)	-0.379 (0.37) (-1.02)	-2.91 (1.65) (-1.75)	-0.919 (0.976) (-0.94)	-1.235 (1.77) (-1.049)
ΔR.ER(-3)	-2628.96 (1556.42) (-1.689)			0.037 (0.040) (0.918)	-0.354 (0.37) (0.95)			0.76 (1.19) (0.63)
ΔSigma(-1)	-169.3** (70.70) (-2.39)	-0.071** (0.03) (-2.85)	0.093 (0.06) (1.53)	0.030 (0.049) (0.698)	-0.862 (1.61) (-0.53)	0.051 (0.049) (1.044)	-0.019** (0.040) (-2.487)	-0.022** (0.06) (-2.32)
ΔSigma(-2)	-51.25 (119.79) (-0.42)	0.016 (0.04) (0.28)	0.070 (0.06) (1.14)	0.0448 (0.047) (0.946)	-1.246 (1.5) (-0.83)	-0.021** (0.052) (-3.98)	-0.059 (0.46) (-1.27)	-0.004 (0.059) (-0.027)
ΔSigma(-3)	100.92** (59.19) (-2.70)	0.076 (0.04) (1.94)		0.060 (0.04) (1.52)	-0.008 (1.55) (-0.05)			-0.017 (0.056) (-0.30)
B_{t-1}	-2.46** (1.59) (-2.54)	-0.807** (0.316) (-2.55)	-0.035** (0.009) (-3.64)	-0.002 (0.035) -0.64)	-0.027 (0.114) (-0.23)	-0.378** (0.218) (-2.73)	-0.014** (0.035) (-2.39)	-0.691** (0.38) (-2.77)
R^2	0.83	0.71	0.405	0.37	0.47	0.387	0.37	0.50
Adjusted R^2	0.37	0.59	0.257	0.11	0.14	0.23	0.21	0.30
AIC	12.49	0.334	1.766	0.613	16.19	-0.74	-0.1456	-0.20394
N	35	46	46	46	45	47	46	46