

# **Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries**

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## **Abstract**

This paper examines whether stock prices and exchange rates are related to each other or not. Both the long-run and the short-run association between these variables are explored. The study uses monthly data on four South Asian countries, including Pakistan, India, Bangladesh and Sri-Lanka, for the period January 1994 to December 2000. We employed cointegration, vector error correction modeling technique and standard Granger causality tests to examine the long-run and short-run association between stock prices and exchange rates. The results of this study show no short-run association between the said variables for all four countries. There is no long-run relationship between stock prices and exchange rates for Pakistan and India as well. However, for Bangladesh and Sri Lanka there appear to be a bi-directional causality between these two financial variables. Our results have implications for investors, policy makers and academicians.

JEL Classification: G15, C32

## **Introduction:**

The issue of whether stock prices and exchange rates are related or not has received considerable attention after the East Asian crises. During the crises the countries affected saw turmoil in both currency and stock markets. If stock prices and exchange rates are related and the causation runs from exchange rates to stock prices then crises in the stock markets can be prevented by controlling the exchange rates. Moreover, developing countries can exploit such a link to attract/stimulate foreign portfolio investment in their own countries. Similarly, if the causation runs from stock prices to exchange rates then authorities can focus on domestic economic policies to stabilize the stock market. If the two markets/prices are related then investors can use this information to predict the behavior of one market using the information on other market<sup>1</sup>.

Most of the empirical literature that has examined the stock prices-exchange rate relationship has focused on examining this relationship for the developed countries with very little attention on the developing countries. The results of these studies are, however, inconclusive. Some studies have found a significant positive relationship between stock prices and exchange rates (for instance Smith (1992), Solnik (1987), and Aggarwal (1981)) while others have reported a significant negative relationship between the two (e.g., Soenen and Hennigar (1998)). On the other hand, there are some studies that have found very weak or no association between stock prices and exchange rates (for instance, Franck and Young (1972), Eli Bartov and Gordon M. Bodnor (1994)).

On the issue of causation, the evidence is also mixed. Some studies (for instance, Abdalla and Murinde (1997)) have found causation runs from exchange rates to stock prices while other reported a reverse causation (e.g., Ajayi and Mougoue (1996)). Bahmani-Oskooee and Sohrabian (1992), however, claim there is a bi-directional causality between stock prices and exchange rates in the short-run but not in the long-run.

There is no theoretical consensus on the relationship between stock prices and exchange rates either. For instance, portfolio balance models of exchange rate determination postulate a negative relationship between stock prices and exchange rates and that the causation runs from stock prices to exchange rates. In these models individuals hold domestic and foreign assets, including currencies, in their portfolio. Exchange rates play the role of balancing the demand for and supply of assets. An increase in domestic stock prices lead individuals to demand more domestic assets. To buy more domestic assets local investors would sell foreign assets (they are relatively less attractive now), causing local currency appreciation<sup>2</sup>. An increase in wealth due to a rise in domestic asset prices will also lead investors to increase their demand for money, which in turn raises domestic interest rates. This again leads to appreciation of domestic currency by attracting foreign capital. Another channel for the same negative relationship is increase in foreign demand

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<sup>1</sup> Investors can use this information for speculation and to hedge their return on foreign investment.

<sup>2</sup> Here exchange rate is defined as the price of one unit of foreign currency in local currency terms. Thus currency appreciation means lowering/decrease in exchange rate. Hence, the relationship between stock prices and exchange rates is negative.

for domestic assets due to stock price increase. This would also cause a domestic currency appreciation.

In contrast, a positive relationship between stock prices and exchange rates with direction of causation running from exchange rates to stock prices can be explained as follows: a domestic currency depreciation makes local firms more competitive, leading to an increase in their exports. This in turn raises their stock prices<sup>3</sup>.

A weak or no association between stock prices and exchange rates can also be postulated. The asset market approach to exchange rate determination treats exchange rate to be the price of an asset (price of one unit of foreign currency). Therefore, like prices of other assets the exchange rates are determined by expected future exchange rates. Any news/factors that affect future values of exchange rate will affect today's exchange rate. The factors/news that causes changes in exchange rates may be different from the factors that cause changes in stock prices. Under such scenario, there should be no link between the said variables<sup>4</sup>.

From the above discussion it is clear that there is no empirical or theoretical consensus on the issue of whether stock prices and exchange rates are related and the direction of causation if they are related. This paper provides further empirical evidence on the above two issues. It uses monthly data from four South Asian countries, Pakistan, India, Bangladesh and Sri-Lanka, and employed cointegration and error correction modeling approach to examine these issues. The paper is organized as follows: In the next section we review some empirical studies. Section three discusses empirical methodology and data, while section four present empirical results. In section five we provide concluding remarks.

## **2. Previous Empirical Studies:**

Franck and Young (1972) was the first study that examined the relationship between stock prices and exchange rates. They use six different exchange rates and found no relationship between these two financial variables.

Aggarwal (1981) explored the relationship between changes in the dollar exchange rates and change in indices of stock prices. He uses monthly U.S. stock price data and the effective exchange rate for the period 1974-1978. His results, which were based on

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<sup>3</sup> The relationship would be negative if many firms use lots of imported inputs in their production. Increase in their cost of production due to currency depreciation might reduce firms' sales and profits that might lead to a fall in their stock prices.

<sup>4</sup> If there are some common factors that affect both stock prices and exchange rates (for instance interest rates) then we might expect an association between these two financial variables. No association can also be explained as follows: A domestic currency depreciation raises the price of those firms that export goods to other countries, but if these firms import many of its inputs from abroad the stock price may not rise as the cost of production will increase making these firms less competitive. On the other hand, firms not exporting their products to other countries but importing raw materials may find a fall in their stock prices as currency depreciation may cause their sales/profits to decline.

simple regressions, showed that stock prices and the value of the U.S. dollar is positively related and this relationship is stronger in the short run than in the long run.

Solnik (1987) examined the impact of several variables (exchange rates, interest rates and changes in inflationary expectation) on stock prices. He uses monthly data from nine western markets (U.S., Japan, Germany, U.K., France, Canada, Netherlands, Switzerland, and Belgium). He found depreciation to have a positive but insignificant influence on the U.S. stock market compared to change in inflationary expectation and interest rates.

Soenen and Hanniger (1988) employed monthly data on stock prices and effective exchange rates for the period 1980-1986. They discover a strong negative relationship between the value of the U.S. dollar and the change in stock prices. However, when they analyzed the above relationship for a different period, they found a statistical significant negative impact of revaluation on stock prices.

Mohsen Bahmani- Oskooee and Ahmad Sohrabian (1992) analyzed the long-run relationship between stock prices and exchange rates using cointegration as well as the casual relationship between the two by using Granger causality test. They employed monthly data on S&P 500 index and effective exchange rate for the period 1973-1988. They concluded that there is a dual causal relationship between the stock prices and effective exchange rate, at least in the short-run. But they were unable to find any long-run relationship between these variables.

Smith (1992) uses a Portfolio Balance Model to examine the determinants of exchange rates. The model considers values of equities, stocks of bonds and money as important determinants of exchange rates. The results show that equity values has a significant influence on exchange rates but the stock of money and bond has little impact on exchange rates. These results imply not only that equities are an important additional factor to include in portfolio balance models of the exchange rate, but also suggest that the impact of equities is more important than the impact of government bonds and money.

Libly Rittenberg (1993) employed the Granger causality tests to examine the relationship between exchange rate changes and price level changes in Turkey. Since causality tests are sensitive to lag selection, therefore he employed three different specific methods for optimal lag selection [i.e, an arbitrarily selected, Hsiao method (1979), and the SMAR or subset model auto regression method of Kunst and Marin (1989)]. In all cases, he found that causality runs from price level change to exchange rate changes but there is no feedback causality from exchange rate to price level changes.

Eli Bartov and Gordon M. Bodnor (1994) concluded that contemporaneous changes in the dollar have little power in explaining abnormal stock returns. They also, found a lagged change in the dollar is negatively associated with abnormal stock returns. The regression results showed that a lagged change in the dollar has explanatory power with respect to errors in analyst's forecasts of quarterly earnings.

Ajayi and Mougoue (1996) show that an increase in aggregate domestic stock price has a negative short-run effect on domestic currency value but in the long-run increases in stock prices have a positive effect on domestic currency value. However, currency depreciation has a negative short-run effect on the stock market.

Yu Qiao (1997) employed daily stock price indices and spot exchange rates obtained from the financial markets of Hong Kong, Tokyo, and Singapore over the period from January 3, 1983 to June 15, 1994 to examine the possible interaction between these financial variables. His results, based on the Granger causality test, show that the changes in stock prices are caused by changes in exchange rates in Tokyo and Hong-Kong markets. However, no such causation was found for the Singapore market. On the reverse causality from stock prices to exchange rates, his results show such causation for only Tokyo market. Therefore, for Tokyo market there is a bi-directional causal relationship between stock returns and changes in exchange rates. He also uses vector autoregressive model to analyze a long-run stable relationship between stock prices and exchange rates in the above Asian financial markets. His results found a strong long-run stable relationship between stock prices and exchange rates on levels for all three markets.

Issam S.A. Abdalla and Victor Murinde (1997) applied cointegration approach to examine the long-run relation between stock price index and the real effective exchange rate for Pakistan, Korea, India and Philippines. They use month data from January 1985 to July 1994. Their study found no long-run relationship for Pakistan and Korea but did find a long-run relationship for India and Philippines. They also examine the issue of causation between stock prices and exchange rates. Using standard Granger causality tests they found a unidirectional causality from exchange rates to stock prices for both Pakistan and Korea. Since a long-run association was found for India and Philippines they use an error correction modeling approach to examine the causality for these countries. The results show a unidirectional causality from exchange rate to stock prices for India but for Philippines the reverse causation from stock prices to exchange rates was found.

Clive W.J Granger, Bwo-Nung Huang and Chin Wei Yang (1998) examine the causality issue using Granger causality tests and Impulse response function for nine Asian countries. They use daily data for the period January 3, 1986 to November 14, 1997. The countries included in their study are: Hong Kong, Indonesia, Japan, South Korea, Malaysia, Philippines, Singapore, Thailand and Taiwan. For Japan and Thailand they found that exchange rates leads stock prices with positive correlation. The data from Taiwan suggests stock prices leads exchange rates with negative correlation. No relationship was found for Singapore and bi-directional causality was discovered for the remaining countries.

Li Lian Ong and H.Y.Izan (1999) use Nonlinear Least Square method to examine the association between stock prices and exchange rates. . They found that U.S. share price returns fully reflect information conveyed by movements in both the Japanese yen and the French France after four weeks. Their results, however, suggest a very weak

relationship between the U.S equity market and exchange rates. They concluded that depreciation in a country's currency would cause its share market returns to rise, while an appreciation would have the opposite effect.

Amare and Mohsin (2000) examine the long-run association between stock prices and exchange rates for nine Asian countries (Japan, Hong Kong, Taiwan, Singapore, Thailand, Malaysia, Korea, Indonesia, and Philippines). They use monthly data from January 1980 to June 1998 and employed cointegration technique. The long-run relationship between stock prices and exchange rates was found only for Singapore and Philippines. They attributed this lack of cointegration between the said variables to the bias created by the “omission of important variables”. When interest rate variable was included in their cointegrating equation they found cointegration between stock prices, exchange rates and interest rate for six of the nine countries.

### **3. Empirical Methodology and Data:**

To examine the long-run relationship between stock prices and exchange rates we employ the standard technique of cointegration. In particular, Johansen (1988, 1991) and Johansen and Juselius (1990) bivariate cointegration tests are applied. This methodology is extensively discussed in the literature and therefore has not been discussed here. Please see the above references for details. To implement the Johansen test we first examine the time series properties of the said variables. We use Augmented Dickey Fuller (ADF) and Phillips-Perron tests to find out the order of integration of both the series. If these series are found to be of the same order of integration then we can apply the cointegration tests.

To examine the issue of causation we can employ error correction modeling approach or the standard Granger causality tests depending upon whether there is a long-run relationship between stock prices and exchange rates or not. In the absence of any cointegrating relationship between the above variables standard Granger causality tests would be applied. The error correction modeling approach is explained as follows:

If two variables,  $Y_t$  and  $X_t$ , are cointegrated, then there exists an error-correction representation of the form

$$\Delta Y_t = \alpha_0 + \beta_0 Z_{t-1} + \sum \gamma_{0i} \Delta Y_{t-i} + \sum \delta_{0i} \Delta X_{t-i} + \varepsilon_{0t} \quad \{3.1\}$$

$$\Delta X_t = \alpha_1 + \beta_1 Z_{t-1}^* + \sum \gamma_{1i} \Delta X_{t-i} + \sum \delta_{1i} \Delta Y_{t-i} + \varepsilon_{1t} \quad \{3.2\}$$

where  $\Delta$  is the first differenced operator (i.e.,  $\Delta Y_t = Y_t - Y_{t-1}$ ),  $\varepsilon_{it}$  is iid with zero mean and constant variance and  $Z_{t-1}$  and  $Z_{t-1}^*$  are the lagged residuals obtained from the following cointegration regressions:

$$Y_t = a_0 + b_0 X_t + Z_t \quad \{3.1\}'$$

$$X_t = a_1 + b_1 Y_t + Z_t^* \quad \{3.2\}'$$

The above error-correction models (i.e, equations {3.1} and {3.2}) can be used to draw inferences about causality between economic variables. In equation {3.1}, X causes Y if

either  $\beta_0$  is statistically significant (the long-run causality) or the  $\delta_{0i}$ 's are jointly significant (short-run causality)<sup>5</sup>. If both  $\beta_0$  and  $\beta_1$  are statistically significant, this indicates bi-directional long-run causality (see Granger 1988; or Jones and Joulfaian 1991 for details). If  $\beta_0 = \beta_1 = 0$ , i.e., there is no long-run equilibrium relationship between Y and X, then the above causality test reduces to the standard Granger causality test.<sup>6</sup> Granger (1983) pointed out that the error-correction approach allows for the finding that X Granger causes Y, even if the coefficients on lagged changes in X are not jointly significant. By including lagged residuals from the cointegrating regression, the error-correction model introduces an additional channel through which Granger causality can emerge (Miller and Russel 1990).

Data: To examine whether stock prices and exchange rates are related using data from four South Asian countries we employ major stock prices indices of these countries and the exchange rates between the currencies of these countries with the U.S. dollar (for instance Rs./\$, rates for Pakistan). The data on South Asian stock market indices (KSE100 index for Pakistan, BSE200 index for India, CSE Sensitive index for Sri Lanka and DSE All Share Price index for Bangladesh) and exchange rates are obtained from various issues of the Emerging Stock Markets Fact book. All the indices are denominated in local currency units. The study uses monthly data for the period January 1994 – December 2000<sup>7</sup>.

#### **4. Empirical Results:**

Prior to testing for cointegration, unit root tests are performed on each of the national stock indices and the exchange rate series to determine the order of integration of these series. We employed the Augmented Dickey-Fuller test<sup>8</sup> and the Phillips-Perron test, with and without a deterministic trend<sup>9</sup>, to conduct the unit root tests. The tests are performed for the entire sample on both the levels and first differences of the stock indices and exchange rates series. Table 1 and Table 2 report the results of these tests.

Table 1 reveals that the null hypothesis of a unit root in the level series cannot be rejected in the stock prices and exchange rates series of Pakistan, India and Sri Lanka but can be rejected for both stock price and exchange rate series of Bangladesh. This indicates that

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<sup>5</sup> Similarly, Y causes X if either  $\beta_1$  is statistically significant (the long-run causality) or the  $\delta_{1i}$  's are jointly significant (short-run causality).

<sup>6</sup>The use of the standard Granger causality test when the variables are cointegrated may leads to misleading results (because of employing a misspecified model).

<sup>7</sup> For Bangladesh the data was available from January 1996, therefore, sample period for Bangladesh is January 1996 to December 2000.

<sup>8</sup> The optimal lag length was selected based on the criteria first suggested by Campbell and Perron (1991). Their recommended procedure works as follows: we estimated the ADF equation with a long lag order (say 6) and tested the significance of the last lag. If it was found significant we assumed this to be the optimal lag length. If the coefficient of the last length was insignificant we dropped the last lag and re-estimated the ADF equation with one less lag order and tested the significance of the last lag order. This procedure was repeated until we get the last coefficient significant.

<sup>9</sup> We report the results of these tests with deterministic trend if the trend in the DAF equation was found to be significant. Otherwise, we report the results without trend.

both the series are non-stationary in case of Pakistan, India and Sri Lanka. Table 2 reports that the null hypothesis of a unit root in the first difference of stock price indices and exchange rates series is rejected for these three countries. Therefore, all the series of these three countries are integrated for order one, i.e.,  $I(1)$  and for Bangladesh they are  $I(0)$ . This means we can apply cointegration tests for Pakistan, India and Sri Lanka to examine the long-run relationship. In case of Bangladesh, we can simply run a regression using ordinary least square method (provided the residuals satisfy all usual properties) and examine the long-run relationship by simply testing the statistical significance of the relevant slope coefficient.

Table 1 and Table 2 here

Next we examine whether the stock prices and exchange rates are cointegrated. As mentioned above we employ Johansen cointegration approach<sup>10</sup> to examine the long-run relationship between these variables. Table 3 reports the results of the pair wise cointegration tests<sup>11</sup> with different lag orders<sup>12</sup>.

Table 3 reveals that there is no long-run equilibrium relationship between stock prices and exchange rates for Pakistan and India. These results are robust to the choice of lag order. The Engle and Granger (1987) cointegration tests confirm this finding<sup>13</sup>. In case of Bangladesh there is a long-run relationship between the said variables. These results are also robust to the choice of lag order<sup>14</sup>. The results for Sri Lanka show a long-run relationship for lag 1 and lag two but for higher lag order we do not find any cointegration between these variables. Thus cointegration tests are found to be sensitive to the choice of lag order. The Engle and Granger test, however, finds a cointegrating relationship between stock prices and exchange rates for Sri Lanka. We therefore, conclude a long-run relationship between these variables for Sri Lanka.

Table 3 here

India and Pakistan conducted nuclear tests in 1998. The stock and currency markets of these countries were severely affected by these nuclear tests. We therefore decided to conduct cointegration tests for the pre-nuclear test period as well. The results of the cointegration tests for this period (i.e., January 1994 – April 1998) are reported in Table 4. These results do not alter the conclusion derived above for the entire sample. The stock and currency markets appear to be independent of each other in case of Pakistan and India. Our results confirm the finding of Abdalla and Murinde for Pakistan. Their

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<sup>10</sup> The cointegrating equation includes a constant term.

<sup>11</sup> Between Johansen's two likelihood ratio tests for cointegration, the trace test shows more robustness to both skewness and kurtosis (i.e., normality) in residuals than the maximum eigenvalue test (see Cheung and Lai (1993) for details; therefore, we employ only the trace test to perform the cointegration tests.

<sup>12</sup> The results of the cointegration tests can be sensitive to the choice of lag order, therefore, we report the cointegration tests for lag order one to four to examine whether the cointegration results are robust to the choice of lag order.

<sup>13</sup> These results are not reported here but are available from the authors upon request.

<sup>14</sup> Even though we do not need to apply cointegration tests for Bangladesh we did it to confirm the long-run relationship between the said variables.

study also finds no long-run relationship for Pakistan for the sample period 1985-1994. However, their study did find a cointegrating relationship for India for the sample period 1985-1994.

Table 4 here

To examine the issue of causation we employ the standard Granger causality tests for Pakistan and India. The results of Granger causality tests are reported in Table 5 & Table 6 for Pakistan & India respectively for lag orders 1 to 4. These tables provide some interesting results: There seem to be no short-run association between stock prices and exchange rates either. Neither stock prices lead exchange rates nor exchange rates lead stock prices. These results are robust to the choice of lag order. This finding is in contrast to the finding of Abdalla and Murinde who find exchange rates Granger cause stock prices in case of Pakistan and India.

Table 5 & 6 here

For Sri Lanka and Bangladesh we employ the error correction models (equation 3.1 and 3.2) to examine the long-run and short-run causality, Significance of the  $\beta_0$  indicates causation runs from stock prices to exchange rates while significance of  $\beta_1$  indicates a reverse causation that runs from exchange rates to stock prices. To examine the short-run causality we employ an F-test. If  $\delta_{0i}$ 's are jointly significant using an F-test, this indicates a short-run causation from stock prices to exchange rates while significance of  $\delta_{1i}$ 's indicates a reverse causation. These results are reported in Table 7 & 8.

Table 7 & 8 here

Table 7 reveals that results for the long-run causation are sensitive to the choice of lag order in case of Bangladesh. For lag order 1 and 2 there is a unidirectional causation that runs from stock prices to exchange rates. However, there is a bi-directional causality for higher lag order. In case of Sri Lanka (Table 8) there is a bi-directional long-run causality. Table 7 & 8 also reveal that there is no short-run causation in either direction for Bangladesh and Sri Lanka.

## **5. Conclusion:**

This paper examined the long-run and short-run association between stock prices and exchange rates for four South Asian countries for the period January 1994 to December 2000. We employed monthly data and applied cointegration, error correction modeling approach and standard Granger causality tests to examine the long run and short-run association. Our results show no long run and short-run association between stock prices and exchange rates for Pakistan and India. No short-run association was also found for Bangladesh and Sri-Lanka. However, there seem to be a bi-directional long-run causality between these variables for Bangladesh and Sri Lanka. Our results suggest that in South Asian countries stock prices and exchange rates are unrelated (at least in the short-run), therefore, investors cannot use information obtained from one market (say stock market) to predict the behavior of other market. Moreover, authorities in these countries cannot

use exchange rate as a policy tool to attract foreign portfolio investment; rather they should use some other means to do this (e.g., use interest rates, reduce political uncertainty, improve law and order situation, produce conducive investment climate etc.). The above results provide evidence against the portfolio balance models of exchange rates determination that postulate a uni-directional causation that runs from stock prices to exchange rates, neither do these results support the traditional models that hypothesized causation from exchange rates to stock prices. We, however, suggest that the significance of our results could possibly be improved upon by applying daily or weekly data. The use of more frequent observations may better capture the dynamics of stock and currency market interrelationships. Another possible extension is to employ the firm level data for these countries and examining the above relationship for those firms that are engaged in international trade (e.g., multinational firms) and for those firms that are not directly affected by exchange rates.

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Table 1: Unit Root Tests at Level

Country	Lag	ADF Test Statistic	PP Test Statistic
<b>Pakistan</b>			
EPAK	0	-2.923	-2.931
PPAK	0	-2.208	-2.208
<b>India</b>			
EIND	0	-2.381	-2.381
PIND	2	0.458	0.458
<b>Bangladesh</b>			
EBANG	0	-3.99**	-3.993**
PBANG	3	-3.653**	-1.101
<b>Sri Lanka</b>			
ESRI	2	-1.179	-1.477
PSRI	0	-3.097	-3.097

Critical values: 1% (\*) -4.0713; 5% (\*\*) -3.4639

Table 2: Unit Root Tests at First Difference

Country	Lag	ADF Test Statistic	PP Test Statistic
<b>Pakistan</b>			
EPAK	4	-5.233*	-8.022*
PPAK	0	-9.115*	-9.115
<b>India</b>			
EIND	0	-7.513*	-7.513*
PIND	2	-4.511*	-8.238*
<b>Bangladesh</b>			
EBANG	0	-8.428*	-8.428*
PBANG	3	-4.247*	-4.891*
<b>Sri Lanka</b>			
ESRI	4	-3.815**	-10.685*
PSRI	0	-10.983*	-10.809*

Critical values: 1% (\*) -3.5153; 5% (\*\*) -2.8986

Table 3: Co-integration Test (Trace Test Statistics): Sample 1994:01 – 2000:12

Country	L=1	L=2	L=3	L=4
<b>Pakistan</b> Null hypothesis Alter. Hypothesis r = 0            r = 0 r = 1            r = 2	16.164 6.553	18.277 8.078	15.411 6.527	15.946 5.671
<b>India</b> Null hypothesis Alter. Hypothesis r = 0            r = 0 r = 1            r = 2	13.583 4.588	17.118 3.469	13.322 3.840	12.778 4.985
<b>Bangladesh</b> Null hypothesis Alter. Hypothesis r = 0            r = 0 r = 1            r = 2	23.167** 10.393	20.456** 6.831	28.245* 12.317	25.271* 8.811
<b>Sri Lanka</b> Null hypothesis Alter. Hypothesis r = 0            r = 0 r = 1            r = 2	26.149** 5.6	25.772** 6.682	23.00** 7.404	22.24** 5.302

Significance Levels: 1% (\*); 5% (\*\*)

Table 4: Co-integration Test (Trace Test Statistics): Sample: 1994:01 to 1998:04

Country	L=4	L=3	L=2	L=1
<b>Pakistan</b> Null hypothesis Alter. Hypothesis r = 0            r = 0 r = 1            r = 2	14.631 6.193	15.278 6.313	14.718 5.407	12.739 5.505
<b>India</b> Null hypothesis Alter. Hypothesis r = 0            r = 0 r = 1            r = 2	9.015 3.971	8.616 2.625	14.876 2.764	10.086 3.824

Significance Levels: 1% (\*); 5% (\*\*)

Table 5: Granger-causality test: Pakistan

Hypothesis	Lag	F-statistic	Prob. Values
PPAK $\Rightarrow$ EPAK EPAK $\Rightarrow$ PPAK	1 1	0.748 0.045	0.389 0.832
PPAK $\Rightarrow$ EPAK EPAK $\Rightarrow$ PPAK	2 2	1.988 0.019	0.143 0.981
PPAK $\Rightarrow$ EPAK EPAK $\Rightarrow$ PPAK	3 3	1.279 0.071	0.287 0.975
PPAK $\Rightarrow$ EPAK EPAK $\Rightarrow$ PPAK	4 4	1.547 0.256	0.198 0.904

Significance Levels: 1% (\*); 5%(\*\*)

Table 6: Granger-causality tests: India

Hypothesis	Lag	F-statistic	Prob. Values
PIND $\Rightarrow$ EIND EIND $\Rightarrow$ PIND	1 1	0.019 0.425	0.888 0.516
PIND $\Rightarrow$ EIND EIND $\Rightarrow$ PIND	4 4	0.183 1.163	0.946 0.3337
PIND $\Rightarrow$ EIND EIND $\Rightarrow$ PIND	2 2	0.137 2.033	0.872 0.139
PIND $\Rightarrow$ EIND EIND $\Rightarrow$ PIND	3 3	0.203 1.467	0.894 0.232

Significance Levels: 1% (\*); 5%(\*\*)

Table 7: Vector Error Correction Models (Long & Short-run Causation): Bangladesh

Hypothesis	Lag	t-statistic	F-statistic
PBANG $\Rightarrow$ EBANG EBANG $\Rightarrow$ PBANG	1 1	-3.78* 1.54	0.0296 0.4449
PBANG $\Rightarrow$ EBANG EBANG $\Rightarrow$ PBANG	2 2	-3.69* 0.99	0.2549 0.4466
PBANG $\Rightarrow$ EBANG EBANG $\Rightarrow$ PBANG	3 3	-2.45* 3.10*	0.2095 0.3934
PBANG $\Rightarrow$ EBANG EBANG $\Rightarrow$ PBANG	4 4	-3.19* 2.26*	0.1475 0.2476

Significance Levels: 1% (\*); 5%(\*\*)

Table 8: Vector Error Correction Models (Long & Short-run Causation): Sri Lanka

Hypothesis	Lag	t-statistic	F-statistic
PSRI $\Rightarrow$ ESRI ESRI $\Rightarrow$ PSRI	1 1	-2.50* -4.04*	0.0789 14.005*
PSRI $\Rightarrow$ ESRI ESRI $\Rightarrow$ PSRI	2 2	-2.87* -3.36*	0.2129 1.2277
PSRI $\Rightarrow$ ESRI ESRI $\Rightarrow$ PSRI	3 3	+2.83* +2.68*	0.1148 1.1952
PSRI $\Rightarrow$ ESRI ESRI $\Rightarrow$ PSRI	4 4	-3.76* -1.61*	0.0873 1.1166

Significance Levels: 1% (\*); 5%(\*\*)