

# Dynamic Relationship between Stock Price and Exchange Rate: Evidence from Pakistan, China and Srilanka

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## Abstract

*This study was carried out to explore the dynamic relationship between exchange rate and stock prices. The monthly data is taken from January 2003 to December 2014 for Pakistan, China and Srilanka. The time series data for stock prices is in daily closing indices and for exchange rate is in local currency in terms of Dollar. The long run relationship between stock prices and exchange rate was tested by using johansen and juselius cointegration approach. This study found significant long run integration between the two variables for China and Pakistan. However the analyses show no evidence of any long run relationship between two variables for Srilanka. These analyses are important for government and policy maker while making strategies they have to keep in mind the relationship between the two variables.*

Keywords: Exchange rate, stock prices, cointegration, granger causality.

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## 1. Introduction

Due to deregulation and globalization of foreign equity markets and adoption of floating exchange rate system in foreign exchange market it led the researcher to explore the dynamic relationship between the foreign exchange market and equity markets. Deregulation provided opportunities for foreign investors to invest in international countries. The exchange rate became more volatile after the advent of floating exchange rate system. This became crucial for policy makers and practitioners to explore the association between the two markets. There are various models of exchange rate determination like "Flow oriented" models which is based on determination of exchange rate in terms of country current account. As keeping in mind these things the exchange rate is determined through a point of time by the country's account of net asset position and on its asset markets. The changes in assets position also affect the exchange rate of country (Dornbusch and Fischer, 1980). The various moments in stock prices may also affect exchange rate of country. Concerning the other model which holds capital account of balance of payments which are called stock models. These models are further divided into Asset models and monetary models. Monetary models says that the asset price is relative to exchange rate means that the future expected stock prices are to be based on the future expected changes in the exchange rate (Gavin, 1989). The Asset model of the says that if prices of stocks rises domestically so investors will try to invest domestically so increase in the stock prices domestically may also causes the appreciation of the currency which will lead to the rises in stock prices demand and also will lead to increase in rise of interest rate domestically. So in this case price of stock and exchange rate of foreign has negative relationship (see, Macdonald and Taylor, 1992; Branson, 1983 and Frenkel 1976). There are number of studies of many researchers who aimed to provide insights of the stock prices integration with the exchange rates. But many studies reveal inconsistent results with the point of time. The studies are divided into direct relationships between two variables like (Aggarwal, 1981; Giovannini and Jorion, 1987; and Roll, 1992). While also many studies provided negative association between variables like

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(Soenen and Hennigar, 1988). Many of the studies provide no evidence between two variables like (Bhattchariya and Mukherjee, 2003; Chow et al, 1997; Solnik, 1987; Franck and Young 1972). Muhammad and Rasheed, (2002) found mixed results while studying diverse mix economies. So the inconsistent results provide no predictable relationship between the two variables.

This study aims to provide insights of integration between exchange rate and stock prices for sample of diverse mix Asian economies: Pakistan, Srilanka and China. The rationale behind doing the study is to check the relationship for developed, developing and emerging economy.

### **1.1 Research Questions**

- 1) Is there exists any long run relationship between stock price and exchange rate?

### **1.2 Research Objectives**

- 1) To explore long run relationship between stock price and exchange rate.

## **2. Literature Review**

The literature provides a number of inconsistent results regarding the associationship of exchange rate and stock prices. Franck and Young (1972) have made an attempt to explore the relationship between stock price and exchange rate and find no significant evidence of integration between variables. An attempt made by Aggarwal (1981) to explore the dynamic relationship between exchange rate of Dollar with the stock prices indices of US and found evidence of significant integration between the variables. Later on the results of Aggarwal (1981) are confirmed again by the attempt made by Giovannini and Jorion (1987). Another study made by Soenen and Henniger (1988) for the same economy but employed different time period for their analyses. They found contrast results prior to the previous studies by showing evidence of significant negative association between stock and exchange market. While examining the effects on stock market for various macroeconomic variables including exchange rate found no significant impact of exchange rate changes on stock market (Solnik, 1987). While examining the US multinational companies prior to the exchange rate found moderate associationship between variables (Jorion, 1990). Bahmani and Sohrabian (1992) have made an attempt to examine S&P 500 and US dollar with cointegration and Granger causality. Their results reveals bidirectional causality in short run while no long run relationship between two variables. Their results are supported by finding no long run association between variables by the attempt made by (Nieh and Lee, 2001) for the G-7 countries. Ajayi and Mougou (1996) found significant positive long run and negative short run impact of stock market on currency. Yu (1997) made a study on three countries Tokyo, Hong Kong and Singapore by taking daily data for their analysis and found no evidence for Singapore. They find bidirectional flow for Tokyo and found that stock prices are granger cause by exchange rate. Pakistan, India, Philippines and South Korea are studied by the (Abdalla and Murinde, 1997) by using cointegration and Granger causality for period 1985 to 1994. They found evidence of unidirectional flow from exchange rate to stock price for Pakistan, South Korea and India and from stock prices to exchange market only for Philippines. Ajayi et al (1998) have empirically investigated the establish market of USA and emerging economies of Korea and Malaysia. They found no evidence of associationship between the two variables for Malaysian economy while bidirectional for the economies of USA and Korea. While investigating the Malaysian economy for the two variables (Mansoor, 2000) found no evidence of any associationship. Wu (2000) has carried a study to examine the economy of Singapore for two variables and found evidence of unidirectional flow from exchange rate to stock price. Granger, Huang and Yang (2000) have made an attempt to study the East Asian countries. In case of Philippines variations in stock prices leads to variations in exchange rates. The Indian stock market is investigated for macroeconomic variables

including exchange rate by (Bhattacharya and Mukherjee, 2003). They found no significant evidence of any integration between stock prices and exchange rate. The study undertaken by (Muhammad and Rasheed, 2002) for four Asian countries named Pakistan, Srilanka, India and Bangladesh. They found no evidence of any relation between two variables in terms of India and Pakistan. However their results reveal bidirectional flow in case of Srilanka and Bangladesh. Doong et al (2005) have investigated 6 equity markets of Asia and found bidirectional causality in case of Indonesia, Korea, Thailand and Malaysia. While concluded significant negative relationship in all equity markets except Thailand. Vygodia (2006) while examining small and large caps stocks in USA found significant causality in large cap to exchange while found no causality for small caps to exchange rate. Pan et al (2007) while examining the relationship of exchange rate and stock prices in seven Asian countries found significant bidirectional causality in case of Hong Kong while they found unidirectional causal flow from stock to exchange market for Singapore and Korea while exchange rate to stock prices for Japan Thailand and Malaysia.

### 2.1 Hypothesis

H1: There is long run relationship between stock price and exchange rate.

H0: There is no long run relationship between stock price and exchange rate.

## 3. Data and Methodology

In this study monthly time series Data is taken from January 2004 to December 2013 for the equity markets of Pakistan (Karachi stock exchange), China (Shanghai stock exchange) and Srilanka (Colombo stock exchange). The exchange rate is taken in local currency for each economy in terms of Dollar: Pakistan (Pakistani Rupee), China (Chinese Yen) and Srilanka (Srilankan Rupee). The data for the three stock markets are taken from Yahoo finance.com and data for exchange rate is taken from OANDA.com. This study is based on time series data for which it is necessary to check the stationarity of the data which is the preliminary process of employing the regression model. The stationarity is checked by two methods: Augmented Dickey Fuller (ADF) and Philips-Perron (PP) test. In this study both tests have been applied for checking stationarity variables.

Augmented Dickey Fuller (1979) test is based on following regression model

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^m \Delta Y_{t-1} + \mu_t$$

Where  $\Delta$  represents differences,  $\alpha$ ,  $\beta$  and  $\delta$  are coefficients and  $y$  is variable to be estimated. Phillips Perron (1988) test is based on first order auto regressive model on following

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \mu_t$$

Where  $\Delta$  represents differences,  $\alpha$  is coefficients  $\beta$  is slope and  $y$  is variable to be estimated. For estimating the long run relationship between the variables Johansen and Juselius (1990) is under taken. This test is based on two test Trace and maximum Eigen value test. Both tests are applying the procedure of maximum likelihood.

The maximum eigenvalue test is based on the following equation

$$\lambda_{max} = -T \ln(1 - \lambda_r + 1)$$

Where  $T$  shows the observations and  $\lambda_{r+1}, \lambda_{r+2}, \dots, \lambda_n$  represent the  $n-r$  smallest squared canonical correlations.

The trace test uses the following equation

$$\lambda_{trace} = -T \sum \ln(1 - \lambda_i)$$

If two series are integrated it is said that at least unidirectional flow exists between the variables. The causality analyses are checked by applying the Granger (1988) procedure between the variables which is based on the following equations

$$\Delta SP_t = \beta_0 + \sum_{i=1}^q \beta_{1i} \Delta SP_{t-1} + \sum_{i=1}^q \beta_{2i} \Delta ER_{t-1} + \mu_t$$

$$\Delta ER_t = \beta_0 + \sum_{i=1}^q \beta_{1i} \Delta ER_{t-1} + \sum_{i=1}^q \beta_{2i} \Delta SP_{t-1} + \mu_t$$

Where  $SP_t$  and  $ER_t$  shows the stock prices and exchange rates returns.

#### 4. Empirical results

The First step is to check correlations between the stock prices and exchange rate for the three selected Asian countries. The second step is to check stationarity of time series data by applying unit root tests.

##### 4.1 Correlation matrix

Table (1)

Pakistan			China			Srilanka		
	PK <sub>ER</sub>	PK <sub>SP</sub>		C <sub>ER</sub>	C <sub>SP</sub>		S <sub>ER</sub>	S <sub>SP</sub>
PK <sub>ER</sub>	1		C <sub>ER</sub>	1		S <sub>ER</sub>	1	
PK <sub>SP</sub>	0.57846	1	C <sub>SP</sub>	0.45509	1	S <sub>SP</sub>	0.68621	1

Correlation analysis is carried out to know about the relationship between exchange rate and stock prices. The analyses for Pakistan reveal that there is integration between the two markets. There is also evidence of positive association between the two variables for China. The results for Srilanka also found evidence of correlation between stock prices and exchange rate. However correlation analysis is considered to be weaker method for examining long run relationship. So for this purpose cointegration analysis is carried out.

##### 4.2 Unit root test results

Table (2)

Variables	ADF		PP	
	Level	1 <sup>st</sup> Diff.	Level	1 <sup>st</sup> Diff
PK <sub>ER</sub>	0.396846	-7.369801	0.287236	-7.792017
PK <sub>SP</sub>	-0.968694	-9.217110	-1.071387	-9.188796
C <sub>ER</sub>	-0.465942	-6.649628	-0.374413	-7.292332
C <sub>SP</sub>	-1.355229	-10.02517	-1.788883	-10.57572
S <sub>ER</sub>	-0.791206	-7.448653	-0.805510	-7.608182
S <sub>SP</sub>	-1.348508	-9.161860	-1.402052	-9.415763
Critical Values				
1%	-3.486551	-3.486551	-3.486551	-3.487046
5%	-2.886074	-2.886074	-2.886074	-2.886290
10%	-2.579931	-2.579931	-2.579931	-2.580046

The unit root analyses are represented in Table (2). The analyses reveal that all the variables are non stationary at level. The ADF test and PP test confirms the stationarity of the variables at first difference. Now cointegration test can be applied to know about the long run relationship between variables.

### 4.3 Bivariate Johansen and Juselius cointegration Test

Table (3)

Variables	Trace Statistics		Prob.	Maximum Eigen stat.		Prob.
Pakistan	None	21.02917*	0.0014	None	17.87535*	0.0030
	At most	3.153825		At most	3.153825	
China	None	17.98984*	0.0051	None	15.95104*	0.0069
	At most	2.038798		At most	2.038798	
Srilanka	None	10.54117	0.0976	None	8.927333	0.1234
	At most	1.613838		At most	1.613838	

The JJ cointegration test is followed in order to know about the long run relationship between exchange rate and stock prices. For this purpose suitable lag value is selected in order to test the cointegrating vectors. The lag value is selected on the basis of VAR statistics by the confirmation of schwarz criterion. For Pakistan the VAR statistics shows significant lag value of 2. For China VAR statistics implies suitable lag value of I lag. For Srilanka VAR statistics reveals significant value of lag 2.

Table (3) represents the bivariate cointegration between the selected variables for each economy. By evaluating results in case of Pakistan it is found that the selected variables; exchange rate and stock price have long run relationship with each other. Both trace and maximum eigen value reject the null hypothesis by representing the cointegrating vectors. There is also significant long run associationship between selected variables in case of China. However there is no evidence any integration of exchange rate and stock prices in long run in case of Srilanka.

### 4.4 Granger Causality Test

Table (4)

Countries	Results	F- Stat	Prob.
Pakistan	KSE does not Granger Cause PKR	1.54021	0.2083
	PKR does not Granger Cause KSE	3.52411	0.0175
China	CY does not Granger Cause SSE	0.36137	0.5489
	SSE does not Granger Cause CY	0.77273	0.3812
Srilanka	CSE does not Granger Cause SKR	3.36368	0.0382
	SKR does not Granger Cause CSE	0.78279	0.4596

Table (4) represents the granger causality test for the three markets. Granger causality is applied on the variables which is stationary at level The data is converted to first difference to make stationary in order to test the lead lag relationship. The analysis of granger causality implies that there is no causality between the selected variable in case of China. The analyses of Pakistan reveal significant unidirectional flow from exchange rate to stock market. There is also significant unidirectional flow from stock price to exchange market in case of Srilanka.

## 5. Discussions and Conclusion

The relationship of two economic variables is found to be an issue of debate for many researchers to explore the dynamics between stock price and exchange rate. This study is undertaken to know about the level of relationship for developing, developed and emerging Asian countries. This is to test whether the two variables exhibits same integration for developed emerging and developing Asian economies. However this study reveals

inconsistent results for the diverse mix economies. In case of developed country China this study found significant long run association between stock and exchange market. However the analyses of granger causality reveal no evidence of lead lag relationship between the variables in case of China. The results of Pakistan show significant results of long run association between exchange rate and stock prices. This study also found unidirectional flow from exchange rate to stock market in developing country like Pakistan. The results of unidirectional spillover between variables for Pakistan are consistent with Abdalla and Murinde (1997). However these results are contradicted with the previous studies like Muhammad and Rasheed (2002) who found no relationship. While analyzing emerging market of Srilanka this study found no association between the two variables. However significant causality is found from stock price to exchange rate for Srilanka.

These analyses are important for policy makers and government authorities to know about the relationship between the two economic variables and to make decisions for economic development. Especially in case of Pakistan and China that the analyses reveal long run association between two variables. However in case of emerging market Srilanka this study found no relationship between the two variables.

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