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COMPARATIVE STUDY OF STOCK PRICE AND EXCHANGE RATE IN SOUTH ASIAN COUNTRIES

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ABSTRACT: *In this study, the relationship between Stock Price and the Exchange Rate in South Asian countries was examined. For this purpose, the secondary data of Stock Prices for four well known stock markets in South Asia was used which included Bangladesh, India, Pakistan, Sri Lanka and Exchange Rates of eight countries which included Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka was used. Findings of unit root test showed that all times were non-stationary at level while stationary at first difference. Then proceeded towards co-integration test, where by using Johansens bi-variate test findings only 15 pairs showed significant results that is long-term relationship among them. Findings of Vector Error Correction Model showed short-run adjusted relations of above mention long-run related variables. Whereas, the findings of Granger causality test showed that only 22 pairs give significant results of short-run relationship in the absence of long-run relationship.*

Key Words: Stationarity, Stock price, Exchange rate, Unit root, Co-integration, Vector Error Correction Model, Granger Causality.

INTRODUCTION

The relations connecting stock price and exchange rate has established a significant attention of being a major area under discussion of much educational contest, policy makers and practical study of researchers in the last few years [1]. This is logical set that the vital roles of stocks and exchange markets take part in assist economic movements [2].

Malarvizhi and Jaya used Nifty Index of National Stock Exchange to compare the stock market movement with exchange rate. Their study analyzed the dynamic relationship between stock market and exchange rate. United States Dollar had been taken for the study [3]. The results found that there exists a bidirectional causal relationship between exchange rate and Nifty Index. Ndako examined the five financial markets for Sub-Saharan African countries by using two variables [4-9].

MATERIALS AND METHODS

To examine whether stock price and exchange rate are interrelated or not, the time series data of stock market indices of four countries counting as Bangladesh, India, Pakistan and Sri Lanka is used and the time series data of exchange rates of four South Asian countries counting as Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan and Sri Lanka was used. All included countries lies in South Asia.

RESULTS AND DISCUSSION

To check the problem of non stationarity in the data under study we perform unit root test by using ADF test and PP test. The stock price and exchange rate data for the selected countries are tested at level by using both models with trend and without trend. For the Augmented Dickey Fuller test, the lag length is selected by using SIC criterian. Whereas for the Phillips Perron test, the band width is selected by using Newey West Bandwidth selection criteria which is recommended by software. The resulting values of test statistics in Table 4.3 and Table 4.4 for Stock Prices and Exchange Rates at level are evaluated against the standard critical values obtained from software i.e. -3.961415 for a model with trend and -3.432561 for a model without trend. The results obtained for each individual time series shows the presence of non-stationarity for both models with trend and without trend at level whereas shows stationarity at first difference.

Table 1: Results of Unit Root Test at Level

COUNTRIES	ADF Test Statistics		PP Test Statistics	
	With Trend	Without Trend	With Trend	Without Trend
RESULTS OF STOCK PRICE AT LEVEL				
BANGLADESH	-1.3088	-1.3896	-1.2486	-1.3665
INDIA	-2.5078	-1.3316	-2.4263	-1.2974
PAKISTAN	-0.1281	1.0246	-0.2669	0.8913
SRI LANKA	-1.2454	-0.6164	-1.4951	-0.7328
RESULTS OF EXCHANGE RATE AT LEVEL				
AFGHANISTAN	-1.4533	-0.7138	-1.4542	-0.7405
BANGLADESH	-1.7275	-1.0459	-3.0603	-1.2374
BHUTAN	-1.4913	-0.0781	-1.3694	0.0758
INDIA	-1.8684	-0.4978	-1.4977	-0.0376
MALDIVES	-1.7213	-0.5037	-1.7020	-0.4774
NEPAL	-1.3917	0.1333	-1.3454	0.1948
PAKISTAN	-1.9479	1.8244	-2.3551	1.4558
SRI LANKA	-1.9606	-0.2555	-2.9076	-0.6059

Table 2: Results of Unit Root Test at First Difference

COUNTRIES	ADF Test Statistics		PP Test Statistics	
	With Trend	Without Trend	With Trend	Without Trend
RESULTS OF STOCK PRICE AT FIRST DIFFERENCE				
BANGLADESH	-36.0313	-36.0277	-46.7333	-46.7201
INDIA	-48.4034	-48.4109	-48.2993	-48.3072
PAKISTAN	-45.3761	-45.3471	-45.6507	-45.6348
SRI LANKA	-42.1329	-42.1409	-44.2171	-44.2239
Results Of Exchange Rate First Difference				
AFGHANISTAN	-42.3956	-42.3990	-63.3402	-63.3460
BANGLADESH	-18.2092	-18.2056	-116.8719	-116.8283
BHUTAN	-63.9270	-63.8871	-64.0440	-63.9716
INDIA	-10.41024	-10.2941	-50.5799	-50.5438
MALDIVES	-34.6140	-34.6012	-42.9562	-42.9704
NEPAL	-70.9284	-70.8861	-71.6534	-71.5710
PAKISTAN	-31.2443	-31.1265	-105.3947	-105.5626
SRI LANKA	-14.8510	-14.8387	-104.7977	-104.7111

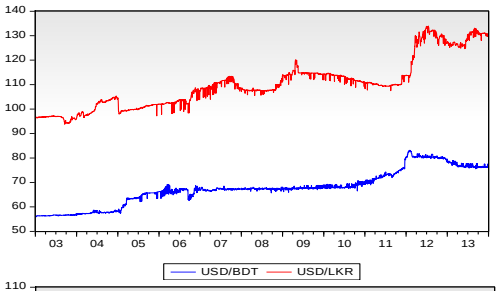
The testing of co-integration is applicable only if the time series of both variable is stationary at first difference i.e. I(1). So after the authentication that the data is stationary at first difference for each time series of both variable, we apply the Johansens bi-variate method for testing co-integration among them. The tests of co-integration are applied on level in order to see whether both series follow a common trend or not, for this purpose the intercept is include and trend factor is excluded. The optimal lag lengths k are selected according to SIC and HQC criterion i.e. and lag length of 2 for the data with 2780 values and lag length of 8 for the data with 4018 values. The resulting value of trace statistics are compared with Mackinnon Critical Values for Johansen Bi-variate Co-integration Test.

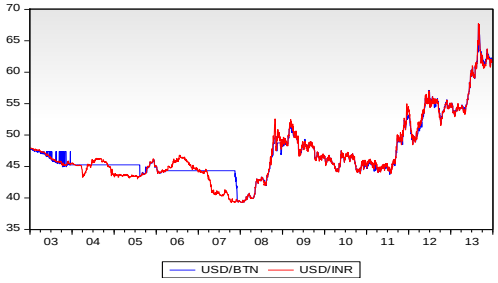
After applying Johansens bi-variate co-integration test, the evidence from the results suggests that the null hypothesis of no co-integration cannot be neglected among any pair of stock markets under study, as the values of trace statistics are less than critical values except for CSE and DSE indices. The result for exchange rate of Afghanistan shows that the null hypothesis of no co-integration cannot be rejected in any case. For the Exchange Rate of Bangladesh and Sri Lanka, Bhutan and India, Bhutan and Nepal, India and Nepal, the evidence from the results suggests that the null hypothesis of no co-integration can be rejected, as the value of trace statistics is greater than critical value. The results of co-integration among Stock Price of BSE-SENEX and Exchange Rate of India, Stock Price of BSE-SENEX and Exchange Rate of Maldives, Stock Price of CSE and Exchanges Rate of Bhutan, India, Maldives, Nepal and Pakistan, Stock Price of DSE and Exchange Rates of India, Maldives and Nepal as the null hypothesis of no co-integration can be rejected showing at least one vector which causes co-integration among them. The result for Stock price of KSE-100 shows that the null hypothesis of no co-integration cannot be rejected in any case. Also the remaining pairs show no co-integration, no common trend in a long-run among them.

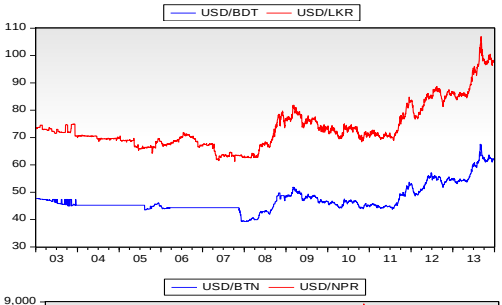
Table 3: Significant results of Johansen Bivariate Co-Integration Test

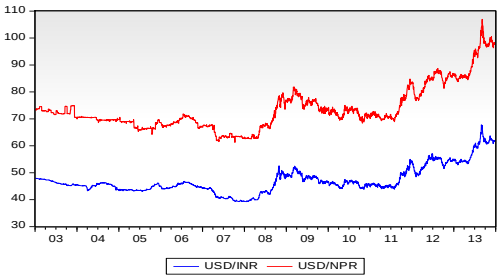
Variables	Null Hypothesis	Alter. Hypothesis	Trace Statistics	Critical Val. 5%	Prob. Val.
CSE & DSE	r=0	r=1	15.60740	15.49471	0.0497
	r=1	r=2	1.937603	3.8414966	0.1639
BDER & SLER	r=0	r=1	15.68354	15.49471	0.0468
	r=1	r=2	2.135540	3.841466	0.1439
BTER & INER	r=0	r=1	17.55255	15.49471	0.0242
	r=1	r=2	0.000181	3.8414966	0.9910
BTER & NPER	r=0	r=1	19.24687	15.49471	0.0129
	r=1	r=2	0.160812	3.8414966	0.6884
INER & NPER	r=0	r=1	34.81748	15.49471	0.0001
	r=1	r=2	0.087127	3.8414966	0.7679
BSE & INER	r=0	r=1	17.62794	15.49471	0.0314
	r=1	r=2	11.09635	3.841466	0.2052
BSE & MDER	r=0	r=1	15.88185	15.49471	0.0437
	r=1	r=2	1.587635	3.841466	0.2077
CSE & BTER	r=0	r=1	19.11856	15.49471	0.0136
	r=1	r=2	1.898538	3.841466	0.1682
CSE & INER	r=0	r=1	27.03274	15.49471	0.0006

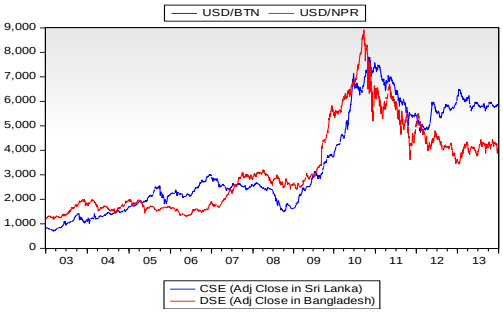
	r=1	r=2	4.417532	3.8414966	0.0356
CSE & MDER	r=0	r=1	35.82502	15.49471	0.0001
	r=1	r=2	0.397957	3.841466	0.5281
CSE & NPER	r=0	r=1	20.93756	15.49471	0.0068
	r=1	r=2	2.938298	3.8414966	0.0865
CSE & PKER	r=0	r=1	18.10225	15.49471	0.0198
	r=1	r=2	3.122373	3.841466	0.0772
DSE & INER	r=0	r=1	17.58913	15.49471	0.0238
	r=1	r=2	2.076973	3.8414966	0.0942
DSE & MDER	r=0	r=1	35.97936	15.49471	0.0001
	r=1	r=2	1.799289	3.841466	0.1798
DSE & NPER	r=0	r=1	15.67755	15.49471	0.0461
	r=1	r=2	4.794496	3.8414966	0.0285











The graphical representation of those variables that show co-integration is also presented. By the visual examination of these combine graphs, it can be seen that these variables actually show common trend. The graphs shows common trend which is being shared by both variables in a long-run, whereas a small amount of deviations in trends may diverge the variables from the short-run equilibrium relationship but they are not enough to diverge the variables from long-run equilibrium relationship.

If the variables are non-stationary at level but stationary at first difference and are cointegrated then moves towards Vector Error Correction Model. By using Vector Error Correction Model, the short-run adjustments among two variables are examined in order to get a stable long-run relationship (Stavarek, 2005). The optimal number of lags length for estimated model is selected according to AIC and SIC Criterion between 2 and 5 (Stavarek, 2005). The obtained resulting values of t-statistics are in parentheses after taking modulus is compared with standard values of t-statistics for large observations i.e. 1.282 for 10%, 1.645 for 5%, and 2.576 for 1% level of significance. The inference of the resulting output of the VECM direct towards the variety of results. As mentioned after short-run adjustment of model, the significant outcomes of estimated coefficients $\lambda_1$and λ_2 of Z_{T-1} demonstrate the percent change of independent variable which affects dependent variable in a long-run. On the other side, the significant outcomes of lags of independent and dependent variable demonstrate the change in dependent variable due to percent adjustment in a

Table 3.4: Significant results of Granger Causality Test

Null Hypothesis:	Obs.	F-Stat.	Prob.
BSE-SENEX ⇒ KSE-100	2869	8.46183	0.0002
BSE-SENEX ⇒ MDER	2869	3.74618	0.0237
BSE-SENEX ⇒ SLER	2869	5.05560	0.0064
CSE ⇒ DSE	2869	3.03911	0.0481
CSE ⇒ BTER	2869	0.09793	0.9067
DSE ⇒ AFER	2869	3.96476	0.0191
KSE-100 ⇒ MDER	2869	3.63608	0.0265
KSE-100 ⇒ SLER	2869	4.50115	0.0112
BDER ⇒ NPER	4017	15.7012	2×10^{-7}
BDER ⇒ PKER	4017	4.64345	0.0097
BDER ⇒ SLER	4017	5.12690	0.0060
BTER ⇒ CSE	2869	3.10141	0.0452
BTER ⇒ INER	4017	20.4542	1×10^{-9}
BTER ⇒ NPER	4017	47.3603	5×10^{-21}
BTER ⇒ SLER	4017	3.96482	0.0190
INER ⇒ DSE	2869	5.08447	0.0063
INER ⇒ BDER	4017	7.77779	0.0004
INER ⇒ BTER	4017	47.5359	4×10^{-21}
INER ⇒ NPER	4017	46.8356	8×10^{-21}
INER ⇒ PKER	4017	15.8439	1×10^{-7}
INER ⇒ SLER	4017	11.9621	7×10^{-6}
MDER ⇒ PKER	4017	4.67642	0.0094
NPER ⇒ BDER	4017	12.6475	3×10^{-6}
NPER ⇒ BTER	4017	12.9631	2×10^{-6}
NPER ⇒ INER	4017	20.1787	2×10^{-9}
NPER ⇒ PKER	4017	5.99986	0.0025
NPER ⇒ SLER	4017	5.40598	0.0045
PKER ⇒ BDER	4017	19.5062	4×10^{-9}
PKER ⇒ NPER	4017	3.10506	0.0449

lag of dependent variable and due to percent adjustment in a lag of independent variable in a short-run.

From the concluded results, many exposed uni-variate and bi-variate relations among the variables are as follow:

CONCLUSIONS AND SUGGESTIONS

In this study the findings of unit root test both Augmented Dickey Fuller and Phillips Perron test show that all the time series under study give non-stationary results at level while stationary results at first difference by comparing both t-statistics and p-values. As under study time series are stationary at first differnce i.e. I(1) fulfils the basic assumption of applying co-integration, so we move towards co-integration to check the long-run relationships of said variables. For the findings of co-integration, bi-variate Johansens co-integration test was applied. From the results it was examined that out of 66 only 15 pairs show co-integration i.e. long-term relationship among them. The significant uni-variate relation exists among 11 pairs including CSE DSE, BDER SLER, BTER INER, BTER NPER, INER NPER, BSE MDER, CSE BTER, CSE MDER, CSE NPER, CSE PKER and DSE MDER whereas significant bi-variate relation exists among 4 pairs including BSE INER, CSE INER, DSE INER and DSE NPER in a long-run. Then Vector Error Correction Model was used to examine the short-run relationship of above mention variables in the presence of long-run relationship.

This model provides direction of causation among to variables and also short-run adjustments to provide more stable long run relationship. Findings show that the uni-directional causation run positively from BSE to INER, BSE to MDER, CSE to PKER, BDER to SLER, and causation run negatively from CSE to MDER, DES to CSE, DSE to MDER, INER to DSE, INER to BTER. The bi-directional causation runs positively among CSE and INER, CSE and NPER whereas causation runs negatively among DSE and NPER, CSE and BTER. BTER effects NPER positively and NPER effects BTER negatively, INER effects NPER positively and NPER effects INER negatively in a short-run with the presence of long-run.

The outcomes of VAR model present short-run analysis in the absence of long-run relationship, the results showed that out of 66 only 29 pairs were significance. The Granger causality test detected 22 uni-directional pairs and 7 bi-directional pairs. The findings of uni-directional pairs include causation run from BSE-SENEX to KSE-100, BSE-SENEX

to MDER, BSE-SENEX to SLER, CSE to DSE, DSE to AFER, KSE-100 to MDER, KSE-100 to SLER, BDER to SLER, BTER to SLER, INER to DSE, INER to BTER, INER to PKER, INER to SLER, MDER to PKER, NPER to SLER. Whereas, the findings of bi-directional relationship include causation runs between CSE and BTER, BDER and NPER, BDER and PKER, BTER and INER, BTER and NPER, INER and NPER, NPER and PKER.

REFERENCES

1. Rjoub, H. Stock prices and exchange rates dynamics: Evidence from emerging markets. African Journal of Business Management, **6**(13): 4728-4733 (2012).
2. Richards, N. D. and J. Simpson. The Interaction between Exchange Rates and Stock Prices: An Australian Context. International Journal of Economics and Finance, **1**(1):3-23 (2009).
3. Malarvizhi, K. and M. Jaya. An analytical study on the movement of Nifty index and exchange rate. International Journal of Marketing and Technology, **2**(7): 274-282 (2012).
4. Ndako, U. B. 2013. Dynamics of Stock Prices and Exchange Rates Relationship: Evidence from Five Sub-Saharan African Financial Markets. Journal of African Business, **14**(1): 47–57 (2013).
5. Ismail, M. T. and Z. B. Isa. The Interactions of Stock Price and Exchange Rate in Malaysia. Regional Conference on Mathematics, Statistics and Applications. University Sains Malaysia. Penang (2006).
6. Anlas, T. The Effects of Changes in Foreign Exchange Rates On ISE-100 Index. Journal of Applied Economics and Business Research, **2**(1): 34-45 (2012).
7. Lean, H. H., P. Narayan, and R. Smyth. Exchange Rate and Stock Price Interaction in Major Asian Markets: Evidence for Individual Countries and Panels allowing for Structural Breaks. The Singapore Economic Review, **56**(2): 255–277 (2011).
8. Muhammad, N. and A. Rasheed. Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries. The Pakistan Development Review, **41**(4): 535-550 (2002).
9. Libdeh, H. A. and M. Harasheh. Testing for correlation and causality relationships between stock prices and macroeconomic variables: The case of Palestine Securities Exchange. International Review of Business Research Paper, **7**(5): 141-154 (2011)
10.