

Exploring the Nexus between Exchange Rate and Stock Price: A Case of Sri Lanka

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Abstract— Stock market and exchange rate play a dominant role in the economy of any country whether it is developed or developing countries. The regulatory board and Government have to pay attention on the stock market performance and exchange rate fluctuation because any minor change in them will affect the economy in several ways. Therefore, knowing the short-run and long-run causal relationship between the exchange rates and stock price is essential. This paper endeavors to discover the causal relationship between them by using the monthly data on All Share Price Index (ASPI) of the Colombo Stock Exchange and five exchange rates namely Euro, Indian Rupee, Japanese Yen, UK Sterling Pound and US Dollar for the periods from January 2005 to December 2019 in the empirical analysis. Augmented Dickey-Fuller unit root test shows that the variables are non-stationary at the level and become a stationary on the first difference. Even though all selected variables have the same integration order, neither variables are co-integrated based on the Johansen's Co-integration Test, and the Granger Causality Test reveals that no short-run causal relationships between both.

Keywords— Exchange Rate, All Share Price Index, Unit Root, Johansen's Co-integration and Granger Causality

I. INTRODUCTION

Past few decades, the association between Exchange Rate (ER) and the stock price has been recognized as one of the debatable topic among the academic researchers, financial economists and practitioners [1,2]. While both developed and developing countries have paid more attention to it because of the increasing trend of international trade and financial liberalization [3]. According to the reference [4] the ER fluctuations impact on the input price and assets denominated in other country currencies. Frequently changing input and assets price influence the profit of the firm and it directly affects the stock price of the firm [3]. Hence, Share prices of the firm who engaged in international trade are affected by the ER fluctuations. And also the share price of the firm who are not involved in the international trade may be indirectly affected due to interaction with the domestic firms who are involved in the international trade.

With the end to the 30-year civil war in 2009, in Sri Lankan stock market has shown an incredible rapid growth. The Sri Lankan government has contributed to creating a smooth open investment environment during the post-war era [5]. The reason is that it can make available needed funds required for investment and for the development of the nation's economy [6]. Later on the contribution of foreign investors in Colombo Stock Exchange (CSE) has been increased as well as domestic's investor has actively participated in the stock market investment. Foreign investor's views return on the stock market investment in terms of their domestic currency, and

changes in ER affect their return [7]. As well as stock price is determined by the Interest rate while ER influences on Interest rate [1]. So ER indirectly affects the stock price. Therefore, investors seek to determine the relationship between ER and stock price when they make investment decisions.

There is a lack of studies examine the relationship between ER and stock price among developing countries [8]. Only a few previous studies covered the relationship between ER and stock price in Sri Lanka. These studies don't give a clear background about the relationship between both variables. Reference [9] expose that the ER has a significant relationship with capital markets whereas [3] reveals that there is no relationship between the ER and stock prices. Reference [10] suggests that uphill movement of the ER may lead to the high performance of stock price in Colombo Stock Exchange (CSE). In contrast result of the [11] study suggest that ER has a negatively related to stock return. Reference [12] finds there is a significant positive relationship between ER and stock price while [13] has reported a significant negative relationship between them. On the other hand, [4] suggest there is a very weak association between ER and stock prices. Thus these existing research studies provided mixed results. It points out the gap in understanding of the relationship between ER proxies and stock price in the emerging nation.

There are many various economic theories proposing a theoretical relationship between ER and stock prices such as "Flow oriented" and "Stock-oriented". The "Flow

oriented" is known as "Good Market" approaches. This approach suggests that changes in ER impact on international competitiveness and trade balances or current account, which eventually influence on real income and output [14]. Generally, stock price express as the present values of future cash flows of firms and it should be adjusted to the economic perspectives. Hence, the "Flow oriented" approach shows a positive relationship between ER and stock prices. For example depreciation in domestic currency creates the local firms more competitive in the international market because local firms' costs of exports are very cheaper than others and eventually it leads to increase firms' income and increase firms' stock prices. On the other hand, Stock-oriented or Portfolio Balance" approaches views ER as equating the supply and demand for financial assets such as bonds and share. This approach suggests that found a negative relationship between ER and stock prices [7]. Hence, ER fluctuation may affect or may be affected by stock price changes.

From the above discussion, it is clear that there is any empirical or theoretical studies didn't provide the answer to the issue of whether ER and stock prices are related or not. The main aim of this paper is to investigate the causal relationships between ER and stock market prices in Sri Lanka.

Rest of the paper is organized as follows, Section I contains the introduction; Section II contains the related work of empirical studies, problem statement and objectives of the study; Section III discusses empirical methodology, Section IV describes results and discussion of the study; And finally, Section V concludes the paper and made presents future scope.

II. LITERATURE REVIEW

ER is the rate at which the nation's currency expresses in terms of foreign currency [1]. It is one of the essential meters to measure the country's relative economic health, especially with the rise in the world trade, capital and stock price movements [15]. Reference [16] said that the stock market plays a vital in the economy of any country. So, the ER and stock market are the two fundamental financial markets in any economy and finding the relationship among them is essential. Therefore, there are a lot of researchers have made an attempt to determine the causality between the ER and stock price in past years. This section discusses some of the previous workers that are related to this study.

Reference [17] note there is no significant association between the stock market and the six different ER. On the other hand, [18] find that there is weakly associated between stock prices and ER in the US stock market by using the nonlinear least square method. Meanwhile, [13] suggest that the ER has a significantly strong negative relationship with stock prices in the US by using monthly data from 1980-1986. In contrast, [19] shows that stock prices and ER is positively related and this relationship is

stronger in the short run than in the long run by using monthly U.S. stock price data and the effective exchange rate for the period 1974–1978.

Reference [20] conducted the study to find the long-run co-integration among the variables of ER and stock price in four Asian countries namely Pakistan, Korea, India and Philippines for the period 1985-1994 by using co-integration approach and come up with the conclusion that no causality exists in Pakistan and Korea while supported its presence in rest of two countries. In further [21] examine the relationship between the ER and stock markets in seven Asian countries by using the data for the period from 1988 to 1998 and find that ER are significantly correlated with stock markets.

Reference [3] examines the relationship between the All Share Price Index (ASPI) of the Colombo Stock exchange and the four ER namely the Indian rupee, Japanese yen, UK pound and US dollar expressed as the amounts of Sri Lankan rupees per unit of each currency on a monthly basis for period 1986-2004 by using the Johansen's co-integration test and find that no long-run relationship between ASPI and any of the four exchange rates. Consequently using the granger causality test and find that unidirectional relationship from stock prices to the US dollar exchange rate.

Many researchers conducted their research study either in the context of a developed or developing country. However, [22] examine both and find that a unidirectional relationship from the stock market to the foreign exchange market on developed nations and no consistent relationship in developing nations. The association relationship between the ER and stock price may be varied from one study to another because it may depend on the geographical area, economic conditions, relations with the international world, domestic conditions etc. Hence, previous studies shows inconsistency outcome.

Statement of the Problem

In an open economy, the levels of domestic and foreign interest rates are impacted by the expectations of relative currency values and changes in the interest rates will affect present value of firms' assets [1]. It indicates that ER plays a considerable part in the movements of stock prices [23]. Investor can make the investment decision when they have sufficiency idea regarding the price volatility of market indicators but most of the investors don't have enough knowledge regarding the influence of one indicator on the other. And ER and stock market is fundamental market in any economic, so the regulatory board and Government take a necessary policy to maintain the both market smoothly. As well as previous studies provided inconclusive outcome. Therefore finding the relationship between ER and stock prices may help the researchers, fundamentalist, regulatory board and Government and investors to predict the trend of Sri Lankan stock market. In this background, the study has raised the following research questions:

- *Is there any long-run causal relationship exists between ER and stock prices in Sri Lanka?*
- *Is there any short-run causal relationship exists between ER and stock prices in Sri Lanka?*

Objectives

The objectives of the this study are as follows

- *To find the long-run relationship exists between ER and stock prices in Sri Lanka*
- *To find the short-run relationship exists between ER and stock prices in Sri Lanka*

III. METHODOLOGY

This study has adopted in quantitative techniques to examine the association between ER and stock prices in Sri Lankan Context and is conducted by using monthly data for the periods from January 2005 to December 2019 and employs time series data which covers 15 years and 180 observations per selected variables. There are five ER variables using as independent variables in this study namely EURO, Indian Rupee (INR), Japanese Yen (JPY), UK Sterling Pound (UKSP) and US Dollar (USD) expressed as the amounts of Sri Lankan rupees per unit of each currency while ASPI variables using as dependent variable.

Data is obtain from the secondary sources, i.e., databases of the Colombo Stock Exchange Central Bank Annual Reports, 2005-2019, economic and social statistics in Sri Lanka 2005-2019 and monthly bulletin from Central Bank website.

The collected data is analyzed using E-Views 11 to produce descriptive statistics and econometrics tests. Descriptive statistics display the summary of the behavior of the variables in this study. And the econometrics tests carried out in this research study to prove the objective of study. In the first step, the econometrics tests are carried out the unit root test to see whether the selected ER and ASPI are stationary series at the level, first difference and second difference test by using Augmented Dicky Fuller (ADF). If variables are stationary at level, it would be express that there is no long-run relationship exist the selected variables. If selected variables are stationary at first level, the study will be moved to lag length selection which is choosing the minimum Akaike Information Criterion (AIC). Conversely, Johansen Co-integration test is used to find whether there is a long-run relationship occurs between selected variables. Finally granger causality test is carried out to see whether there is short-run relationship occurs between ER and stock price.

IV. RESULTS AND DISCUSSION

Descriptive Statistics Analysis

Table 1:-Descriptive Statistics for the Variables

	ASPI	EURO	INR	JPY	UKSP	USD
Mean	4904.51	161.02	2.36	1.25	199.64	128.29
Median	5825.45	160.80	2.35	1.28	203.07	126.76
Maximum	7798.00	208.06	2.88	1.69	237.57	182.13
Minimum	1503.00	120.08	2.06	0.86	162.49	99.39
Std. Dev.	1945.24	20.08	0.18	0.23	18.04	22.58
Skewness	-0.46	0.12	0.53	-0.04	-0.05	0.79
Kurtosis	1.57	2.78	2.98	2.13	2.02	2.69

Table 1 describes the summary of descriptive statistics for the selected variables in Sri Lanka. Totally 180 monthly observations of all the selected variables have been used to assess the descriptive statistics.

Table 1 shows that there is a huge difference between the minimum and maximum value of the selected variables. It also indicates that there is wide fluctuation in the movement of ER and ASPI and both have grown rapidly during the study period. Especially the gap between the Maximum value of ASPI (7798) and minimum value of ASPI (1503) is high; because the stock market performance was very weak during the pre-war period then Sri Lankan stock market has shown an incredible growth during the post-war. Out of five ER, the UKSP exchange rate has the highest mean, median, maximum and minimum it means that a higher amount of Sri Lankan rupees needed to purchase one UKSP than the amount of Sri Lankan rupees needed to purchase one unit of the other currencies. ASPI has the highest standard deviation and the INR has the lowest standard deviation. INR has the highest kurtosis (2.984) while ASPI has the lowest kurtosis (1.57).

Unit Root Test

The ADF unit root test will be carried out to determine whether selected variables data are stationary or non-stationary. The hypothesis for ADF is

H_0 :- Series is non-stationary

H_1 :- Series is stationary

The null hypothesis will be rejected if T-statistic is less than critical value or p-value is less than 5%, otherwise, the null hypothesis can't be rejected. Table 2 and 3 displays the summary result of the ADF test at level and first difference for each series respectively.

Table 2:-ADF unit Root Test Result for the ER and ASPI at Level

Variable	Model type	T-statistic	Critical value at 5% level	p value	Results
ASPI	Intercept	-1.79	-2.88	0.38	ASPI is non-stationary
	Trend and Intercept	-2.29	-3.44	0.44	
	None	0.07	-1.94	0.70	
EURO	Intercept	-1.41	-2.88	0.57	EURO is non-stationary
	Trend and Intercept	-2.66	-3.44	0.25	
	None	0.94	-1.94	0.91	
INR	Intercept	-2.31	-2.88	0.17	INR is non-stationary
	Trend and Intercept	-2.32	-3.44	0.42	
	None	0.23	-1.94	0.75	

JPY	Intercept	-1.09	-2.88	0.72	JPY is non-stationary
	Trend and Intercept	-1.95	-3.44	0.62	
	None	0.98	-1.94	0.91	
UKSP	Intercept	-1.94	-2.88	0.31	UKDP is non-stationary
	Trend and Intercept	-2.44	-3.44	0.36	
	None	0.44	-1.94	0.81	
USD	Intercept	0.72	-2.88	0.99	USD is non-stationary
	Trend and Intercept	-1.57	-3.44	0.79	
	None	2.61	-1.94	0.99	

Table 3:-ADF Unit Root Test Result for the ER and ASPI after First Difference

Variable	Model type	T-statistic	Critical value at 5% level	p value	Results
ASPI	Intercept	-4.12	-2.88	0.00	ASPI is stationary
	Trend and Intercept	-4.15	-3.44	0.01	
	None	-4.05	-1.94	0.00	
EURO	Intercept	-10.29	-2.88	0.00	EURO is stationary
	Trend and Intercept	-10.27	-3.44	0.00	
	None	-10.23	-1.94	0.00	
INR	Intercept	-8.99	-2.88	0.00	INR is stationary
	Trend and Intercept	8.98	-3.43	0.00	
	None	-9.01	-1.94	0.00	
JPY	Intercept	-9.16	-2.88	0.00	JPY is stationary
	Trend and Intercept	-9.14	-3.44	0.00	
	None	-9.07	-1.94	0.00	
UKSP	Intercept	-9.43	-2.88	0.00	UKSP is stationary
	Trend and Intercept	-9.42	-3.44	0.00	
	None	-9.42	-1.94	0.00	
USD	Intercept	-8.13	-2.88	0.00	USD is stationary
	Trend and Intercept	-8.26	-3.44	0.00	
	None	-7.62	-1.94	0.00	

All the six variables are non-stationary at level meanwhile those become a stationary at first difference. So these variables are denoted as I (1) series. According to [24] Johansen co-integration test is used to find the co-integrating relationships among the selected economic variable when variables are non-stationary at level and it can be converted into stationary by first differencing. Therefor result of unit root test of selected variables concluded that proceeding the second step of the analysis for finding the co-integrating relationships among ER and stock price.

Lag Length Determination

In this research study is conducted the Johansen co-integration test for identifying the long-run association among the selected variables. Before running the Johansen co-integration test, the researcher needs to determine the appropriate lag length because it will influence the true result of co-integration test.

Table 4: Result of Lag Length Determination

Variables	Akaike Information Criterion (AIC)				
	Lag Length				
	1	2	3	4	5

ASPI & EURO	19.45	19.42*	19.46	19.48	19.49
ASPI & INR	10.61	10.55*	10.59	10.62	10.66
ASPI & JPY	9.84	9.74*	9.77	9.78	9.80
ASPI & UKSP	19.79	19.71*	19.75	19.76	19.79
ASPI & USD	17.49	17.30*	17.35	17.38	17.37

Table 4 presents the result of lag length determination by using the AIC criteria. According to the [7] AIC are the best criteria to determine the true lag length for co-integration test. The rule of thumb in selecting the best lag length is to observe the lowest AIC value [7]. Table 4 concluded that lag length for all the selected variables is two.

Johansen Co-integration Test

After choosing the lag length the Johansen co-integration test is carried out to find whether there is co-integration between the selected five ER and stock price in Sri Lanka.

Table 5:-Result of Johansen Co-integration Test

Variables	Hypothesized No. of CE (s)	Trace Statistics	Critical value at 5% level	p value	Max-Eigen Value	Critical value at 5% level	p value	Decision
ASPI & EURO	$r = 1$	4.45	15.49	0.86	2.71	14.26	0.96	Non Co-integrated
	$r \leq 1$	1.74	3.84	0.19	1.74	3.84	0.19	Non Co-integrated
ASPI & INR	$r = 1$	8.02	15.49	0.46	5.75	14.26	0.65	Non Co-integrated
	$r \leq 1$	2.26	3.84	0.13	2.26	3.84	0.13	Non Co-integrated
ASPI & JPY	$r = 1$	6.27	15.49	0.66	4.74	14.26	0.77	Non Co-integrated
	$r \leq 1$	1.53	3.84	0.22	1.53	3.84	0.22	Non Co-integrated
ASPI & UKSP	$r = 1$	9.67	15.49	0.30	6.81	14.26	0.51	Non Co-integrated
	$r \leq 1$	2.86	3.84	0.09	2.86	3.84	0.09	Non Co-integrated
ASPI & USD	$r = 1$	3.06	15.49	0.96	2.92	14.26	0.95	Non Co-integrated
	$r \leq 1$	0.14	3.84	0.71	0.14	3.84	0.71	Non Co-integrated

Table 5 shows Trace Statistics and Max-Eigen Statistics indicated different result of the Johansen co-integration test for the ER and stock prices. The only null hypothesis of no co-integration vector hypothesis is rejected at 5% level of significance. When Trace Statistics and Max-Eigen Statistics value is greater than zero and smaller than Critical value at 5% level, it shows that a long-run equilibrium relationship exists between both variables. However, the result of the Johansen co-integration test doesn't meet that rule. Therefore, It concluded that there is no co-integration between selected ER and stock price in Sri Lanka. This indicates that there is no stable relationship and co-movement in the long run between the ER and stock price in Sri Lanka.

Granger Causality Test

Table 6:-Granger Causality Test Results

Causality		F-Statistic	p value	Direction of causality
From	To			
ASPI	EURO	0.28702	0.7508	No causality
EURO	ASPI	0.00073	0.9993	
ASPI	INR	1.14282	0.3213	No causality

INR	ASPI	0.6007	0.5496	No causality
ASPI	JPY	0.14582	0.8644	
JPY	ASPI	0.99869	0.3705	No causality
ASPI	UKSP	0.36484	0.6948	
UKSP	ASPI	1.41749	0.2451	No causality
ASPI	USD	2.49169	0.0857	
USD	ASPI	0.61083	0.5441	

This study hadn't been found any co-integrating relationship between ER and stock price. Then granger causality test is carried out to examine whether there is a short-run causal relationship existed between each of the selected variables. Table 6 shows the result of the Granger causality test. According to the result, there is no short-run causal relationship existed between stock prices and selected five ER namely EURO, INR, JPY, UKSP and USD in Sri Lankan context.

V. CONCLUSION AND FUTURE SCOPE

This study endeavors to investigate whether there is a short-run and long-run causal relationship between stock prices and the ER of the Sri Lankan rupee against five currencies, namely the EURO, INR, JPY, UKSP and USD. It concluded there is no short run and long run causal relationship existed between ER and stock price in Sri Lanka. There may be a reason is that most of the listed firms in Sri Lanka who import the ingredient for their product from the other countries such as USA, UK, India and etc. and they export their product to the foreign countries thereby changes in net income effect may be near to zero when ER fluctuated. Therefore it doesn't influence the stock price.

This research study used the monthly data for examining the objective of the study. In the future research could have been developed with additional test on different time frequencies other than monthly data such as daily, weekly. It may be give deep understanding the relationship among these.

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