EXCHANGE RATE VOLATILITY AND CAUSALITY EFFECT OF SRI LANKA (LKR) WITH ASIAN EMERGING COUNTRIES CURRENCY AGAINST USD

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ABSTRACT

This study an attempt to examine the long-run volatility and causality effects of Sri Lankan (LKR) currency and nine currency of emerging countries in Asia against USD over 17 years i.e., from 01st January, 2002 to 31st December, 2018 by using the Descriptive Statistics (Summary), GARCH (1,1) Model, Correlation and Granger Causality Test. A descriptive statistics and Graphical model were specified and empirical results show a significant currencies movements and the Granger causality test indicates the strong evidence that the causation runs between Sri Lankan currency (LKR / USD) to nine Asian emerging countries currency price behavior against USD. The purpose of the study is to make a finer point with respect to relationship, volatility and causality effect between the Sri Lankan currency and Asian Emerging countries

currency returns against USD. It is found that the significant uni-directional causality effects and relationships among the sample currency data series with LKR against USD. Hence, this result would help to international portfolio managers, multinational corporations, and policymakers for decision-making in the Asian region.

1. INTRODUCTION

Exchange rate volatility has been a constant feature of the International Monetary System ever since the breakdown of the Bretton Woods system of fixed parities in 1971 (**Black, F and Scholes, M (1973).** Many theories were that a change in the exchange rates would affect a firm's foreign operation and overall profits. It is widely acknowledged that international financial markets and exchange rate value of countries currency have become substantially integrated in recent years. On the one hand, the collapse of the Bretton Woods system was followed by greater exchange rate fluctuations. On the other, the liberalization of markets and capital flows in the 1990s was followed by a huge increase in the volume of cross border transactions in both securities and currencies. **Liu et al. (2019) & Lingaraja et.al. (2014 & 2015)** denotes that the merchandise trade and portfolio investment are most helpful in increasing the direct use of currency, while foreign direct investment (FDI) has a stronger effect on promoting vehicle use. **Kathiravan et al., 2019,** investigated the Causal effect among the three weather factors (temperature, humidity, and wind speed) and the returns of the Agriculture Commodity Index called Dhaanya, in India. Hence, the volatility and causality effect of foreign exchange markets has been a topic of interest of academic researchers and practitioners alike.

1.1. THE CONCEPTUAL FRAMEWORK

i) FRONTIER: It is a type of developing country which is more developed than the least developing countries, but too small, risky, or illiquid to be generally considered an emerging market. The term is an economic term which was coined by International Finance Corporation's **Farida Khambata in 1992**. The frontier, or pre-emerging equity markets are typically pursued by investors seeking high, long-run return potential as well as low correlations with other countries economic variables. Some frontier market countries were emerging position in the past, but have regressed to frontier status. Frontiers are countries that because of demographics, development, politics and liquidity are considered less mature than Emerging countries (**Source: MSCI**)

ii) EMERGING: The concept of "Emerging", used in the beginning of the 1980s, was initially developed to designate financial markets located in developing countries. The tem "Emerging Markets" was first coined by World Bank economist, **Antoine W. Van Agtmael, 1981,** to refer to nations undergoing rapid economic growth, currency value, and industrialization. The term is often used interchangeably with 'emerging and developing economies and describe it as economies with low to middle per capita income (**Economy Watch, 2010**). The emerging countries are differentiated from developed, with respect to several qualitative characteristics, such as institutional infrastructure, taxation of dividends and capital gains, capital controls, market regulations, currency value and available information

flows. The quality of these factors is generally lower for emerging countries than for the developed. These conditions affect, to a large extent, trading activity, price formulation, and as a result, the risk-return properties of emerging countries stock markets (**Mohamed E1 Hedi Arouri et al., 2010**).

iii) DEVELOPED: It is a country that is most developed in terms of its economy, currency and capital markets. The country must have high income, but this also includes openness to foreign ownership, ease of capital movement, and efficiency of market institutions. As well, they have highly developed capital and money markets with high levels of liquidity, meaningful regulatory bodies, large market capitalization, and high levels of per capita income. (**Source: MSCI**).

According to the criteria adopted by the Morgan Stanley Capital International (MSCI), the world countries are classified under three categories such as Developed, Emerging and Frontier are grouped into three regional classification by continent wise i.e., 1) Americas, 2) Europe, Middle East & Africa and 3) Asia.

It is clear that there are five counties under developed markets categories in Asia, Nine countries under emerging markets categories in Asia and eight countries under frontier markets categories in Asian continent. The list of Asian countries under three category of classification by MSCI is given in **Figure – 1**
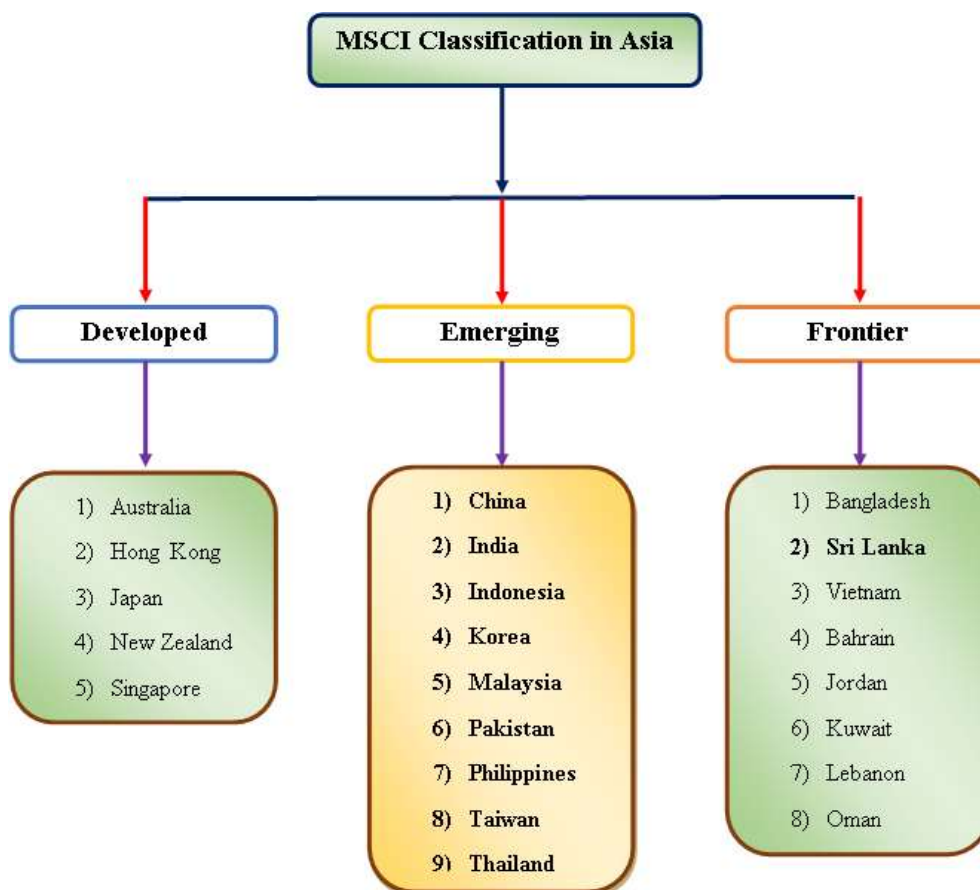
Source: Morgan Stanley Capital International (MSCI) http://www.msci.com as on 30.07.2019.

Figure – 1: List of Countries in the Asian Region under Frontier, Emerging and Developed Categories

2. LITERATURE REVIEW

Yamani, E (2019), investigated the diversification role of currency momentum for carry trade crashes during the turbulent periods surrounding the 1997-1998 Asian financial crisis and the 2007-2008 global financial crisis by used 24 global currencies from December 31, 1996 to May 11, 2017. This study found that the combined strategy was a good hedge with desirable diversification merits in times of financial stress. **Khademalomoom, S and Narayan, P (2019)**, inspected intraday patterns in the currency market for hourly exchange rates of the six most liquid currencies (i.e. the Australian Dollar, British Pound, Canadian Dollar, Euro, Japanese Yen, and Swiss-Franc) vis-à-vis the United States Dollar over the period 2004-2014. It was noted that currencies' behaviour induced by these intraday effects had implications for investors. **Liu et al. (2019),** investigated the currency use in financial transactions using the SWIFT dataset from October 2010 to August 2014. **Kunkler, M and MacDonald, R (2019),** examines the multilateral relationship between oil and G10 currencies during from 31st December 1985 to 31st December 2017. It was found that that the global price of oil moves multilaterally with a group of "oil" currencies: the Norwegian krone, the Australian dollar, the Canadian dollar and the British pound and also it was clearly noted that the Japanese Yen and the Swiss Franc move multilaterally against the group of oil currencies and not against the global price of oil. **McCauley, R and Shu (2019),** investigated how variation in Chinese authorities' renminbi management since the August 2015 exchange rate reform maps on to variation in the co-movement between the renminbi with regional and other emerging market currencies. An efficient market provides, on continues basis, a platform for no opportunities to engage in profitable trading activities. If a market is not efficient, the regulatory authorities normally take necessary steps to ensure that the stocks are correctly priced, leading to stock market efficiency. **Kathiravan et al. (2018),** investigated the effect of three weather factors (temperature, humidity and wind speed), on the returns of the Indian stock market indices (BSE Sensex and S&P CNX Nifty) and used granger causality and Correlation. **Shu et al. (2015),** examined the changes in the RMB/ USD rates in two markets have a statistically and economically significant impact on changes in Asian currency rates against the US dollar during the data between September 2010 (when quotes for the CNH rates became regular) and September 2013. It is suggested that China's regional influence is increasingly transmitted through financial channels. The efficiency of emerging markets is characterized by regular and unexpected changes in variance. It is to be noted that national and international events in countries, pave the way for high volatility (**Lingaraja et al., 2014**). **Ben Rejeb, A and Boughrara, A (2013),** studied the impact of financial liberalization on the degree of informational efficiency in emerging stock markets while considering three types of financial crises, i.e. Banking, Currency and Twin crises. The study revealed that emerging markets were characterized by greater efficiency in recent years. **Tudor, C and Popescu – Dutaa, C (2012),** investigated the issue of Granger causality between stock prices and exchange rates movement for Developed (Australia, Canada, France, Hong Kong, Japan, United Kingdom, and United States) and Emerging financial markets (Brazil, China, India, Korea, Russia and South Africa) during the period from January 1997 to March 2012. This study employed tools like Descriptive Statistics and Granger Causality Tests for the analysis. **Charoenwong et al. (2009),** investigated volatility forecast and compare the predictive power of the implied volatility derived from currency option prices that are traded on the Philadelphia Stock Exchange (PHLX), Chicago Mercantile Exchange (CME), and over-the-counter market (OTC) with four currency pairs from October 1, 2001 to September 29, 2006. It was clearly noted that the implied volatility provides more information about future volatility–regardless of whether it is from the OTC, PHLX, or CME markets–than time series based volatility. **Lagoarde-Segot, T and Brian M. Lucey (2008),** examined the informational efficiency of seven emerging Middle-Eastern North African (MENA) stock markets. The study found that the extent of weak-form

efficiency in the MENA stock markets was primarily explained by differences in stock market size. **Alan T. Wang (2007)**, examined the volatility of currency futures options for Australian dollar (AD), British pound (BP), Canadian dollar (CD), Deutsche mark (DM), and Japanese yen (JY) and used the sample of daily exchange rates and options with maturities from the beginning of January 1998 to the beginning of September 2001. **Dunis, C and Huang, X (2002)**, examined the use of non-parametric Neural Network Regres- sion (NNR) and Recurrent Neural Network (RNN) regression models for forecasting and trading currency volatility, with an application to the GBP/ USD and USD/JPY exchange rates for the period April 1999 – May 2000. This study threw light on the currency option market was inefficient and/or the pricing formulae applied by market participants were inadequate.

From the earlier studies it has been found that researchers examined Risk and Return, volatility and relationship between Foreign exchange market and Stock Market using currency exchange rates and stock market indices price. But no study has been carried out causality effect and volatility of Asian region's currencies under emerging category countries with Frontier country like **Sri Lanka (LKR)** on long run period i.e. 17 years. In order to fill this gap, the present study has been undertaken.

3. PROBLEM STATEMENT OF THE STUDY

Reserve Bank of India (RBI) report indicates the foreign exchange markets experienced a substantial increase in volatility in August 2007 and most of the countries amongst Asian currencies, the US Dollar depreciated by 2.7 per cent against Chinese yuan, but appreciated by 52.2 per cent against Korean won, 24.7 per cent against the Indian rupee, 13.6 per cent against the Malaysian ringgit and 11.9 per cent against Thai baht. The currencies of many emerging and developing economies suffered large depreciations with the onset of the global financial crisis during 2007-09. The exchange rate losses varied largely commensurate with the extent and nature of each country's exposure to trade and global financial operations. Most of the Asian currencies underwent depreciation during 2011 and showed significant volatility, coinciding with the world economic and financial conditions. The international investor tolerance (or expectations) could put downward pressure on the US Dollar and upward pressure on many Asian currencies. In addition, Asia also faces the challenge of surges in short-term capital inflows and the consequent upward pressure on currency values. While some corporates and financial institutions in Asia may remain vulnerable to their home currency depreciations, in aggregate, these economies have moved from running current account deficits to surpluses and stockpiled reserves in US Dollars and Euros. Hence, this study.

3.1. Significance and Importance of the Study

Understanding the causes of exchange rate volatility provides valuable insight for policy makers to design appropriate measures or intervention strategies in mitigating a country's vulnerability to risk in periods of uncertainty. The changes in exchange rates will have both favorable and unfavorable impacts on economic activities and living standard of the public because of the largely globalized trade and finance involving the exchange of currencies. In addition that, identifying the sources of exchange rate volatility is important, as maintaining a competitive and stable exchange rate is necessary for promoting private investment, domestic and foreign, needed to meet the growth and development targets in the country. Hence, this study an attempt to test Causality Effect and Volatility of Sri Lanka Currency (LKR) with Asian Emerging Countries Currency against USD.

4. OBJECTIVES OF THE STUDY

The objectives of this study are as follows:

- To analyse the summary statistics (Mean, Maximum, Minimum and SD) among the selected sample currencies against USD.
- To examine the exchange rate volatility among the selected sample currencies against USD.
- To analyse relationship between Sri Lanka (LKR) and Asian emerging currencies against USD
- To investigate the causality effect between Sri Lanka (LKR) and Asian emerging currencies against USD.

5. HYPOTHESES OF THE STUDY

In the light of the objective of this study, the following Null Hypotheses are developed and tested in the analysis.

NH_{01}: There is no long-run exchange rate volatility among the sample countries currency against USD during the study period.

NH_{02}: There is no long-run significant relationship (movements) between Asian emerging currency and Sri Lanka (LKR) against USD during the study period.

NH_{03}: There is no long-run causality (linkage) effect between Asian emerging currency and Sri Lanka (LKR) against USD during the study period.

6. RESEARCH METHODOLOGY

6.1. Data

For the purpose of the study, we use the MSCI system of nine emerging Asian countries and one Sri Lankan (frontier) country exchange rates (ten currencies) against the US Dollar (numeraire currency). The ten currency universe consists of the following ten currencies: Chinese Yuan Renminbi (CNY), Indian Rupee (INR), Korean Won (KRW), Taiwan New Dollar (TWD), Malaysian Ringgit (MYR), Thai Baht (THB), Indonesian Rupiah (IDR), Philippine Peso (PHP), Pakistani Rupee (PKR) and Sri Lankan Rupee (LKR). The details of sample Countries, Currencies and their Symbols are shown in Table – 1.

Table – 1

The Details of Sample Currencies and Symbols

Nature	Country	Name of the Currency		Symbols/ Sign
Emerging Countries in Asia	China	Chinese Yuan Renminbi	CNY	¥
	India	Indian Rupee	INR	₹
	Korea	Korean Won	KRW	₩
	Taiwan	Taiwan New Dollar	TWD	NT$
	Malaysia	Malaysian Ringgit	MYR	M$
	Thailand	Thai Baht	THB	฿
	Indonesia	Indonesian Rupiah	IDR	Rp
	Philippines	Philippine Peso	PHP	₱
	Pakistan	Pakistani Rupee	PKR	Rs
Frontier	Sri Lanka	Sri Lankan Rupee	LKR	රු

Source: Morgan Stanley Capital International (MSCI) http://www.msci.com as on 30.07.2019

6.2. Data Collection

The countries currency data have been collected from different data base such as FRED Exchange rate UK. The FRED is the Research Division of the Federal Reserve Bank of St. Louis is to discover international historical banking and economic data. The widely used database FRED (Federal Reserve Economic Data) is updated regularly and allows 24/7 access to regional, national and International financial and economic data (Website: https://fred.stlouisfed.org/). And Exchange Rates UK is a site devoted to bringing you the latest currency news, historical data, currency conversion and exchange rates, using mid-market rates updated minutely (22:00 Sun - 22:00 Fri) through the Website: https://www.exchangerates.org.uk/.

6.3. Period of the Study

This study was conducted for the purpose of test the long-run currencies behavior of sample countries. So, we have collected the daily currency exchange rate data against USD for more than 15 years i.e. from 01st January, 2002 to 31st December, 2018.

6.4. Tools Used for Analysis

For the purpose of the study, we used the following tools for analyzing the data such as Descriptive Statistics (Summary), GARCH (1,1) Model (Volatility), Correlation (Relationship), Granger Causality test (Linkages) Chart and Graphs.

6.4.1. Descriptive Statistics

Descriptive Statistics, the Mean, Minimum, Maximum, Standard Deviation, and Jarque-Bera were used **(Gupta. S.P., 2008).** The measures of central tendency include the mean, median and mode, while measures of variability include the standard deviation (or variance), the minimum and maximum values of the variables and Jarque-Bera. The use of logarithms makes graphs symmetrical and look similar to the normal distribution, making them easier to interpret intuitively **(Nick, Todd G., 2007)**.

6.4.2. GARCH (1,1) Model

A deficiency of ARCH (q) models is that the conditional standard deviation process has high frequency oscillations with high volatility coming in short burst. GARCH models (p, q) permit a wider range of behavior, in particular more persistent volatility. **Tim Bollerslev (1986)** proposed a more generalized form of the ARCH (m) model appropriately termed as the GARCH model which has two equations. Numerous parametric specifications for the time varying conditional variance have been proposed in the literature. The following is formula to calculate the GARCH model:

$$\sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1} + \alpha_2 u^2_{t-2} + \ldots + \alpha_q u^2_{t-q} + \beta_1 \sigma^2_{t-1} + \beta_2 \sigma^2_{t-2} + \ldots + \beta_p \sigma^2_{t-p}$$

6.4.3. Correlation Analysis

According to **Tripti Nashier (2015)**, correlation is a statistical tool which measures the degree of relationship between two and more variables. Here, by term relationship, it is meant that the tendency of variable to move together. In the sense, it denotes interdependency amongst variables. The movement of variable may be in positive or negative direction. The correlation

analysis is used to find out the movements of currency exchange rate between the countries over the period of time. Correlation measures the strength of the linear association between two variables of two different countries. The formula for correlation (r) is:

$$r = \frac{1}{n-1} \sum \left(\frac{x - \bar{x}}{s_x} \right) \left(\frac{y - \bar{y}}{s_y} \right)$$

Computationally, the Descriptor systems uses what is sometimes referred to as the sum of squares formula for r.

$$r = \frac{\sum XY - \dfrac{\sum X \sum Y}{N}}{\sqrt{\left(\sum X^2 - \dfrac{(\sum X)^2}{N} \right) \left(\sum Y^2 - \dfrac{(\sum Y)^2}{N} \right)}}$$

6.4.5. Pairwise Granger Causality Test

According to **Brooks, C. (2002),** a variable *X* Granger-causes *Y* if the past changes in *X* can project current values of *Y*. If *X* Granger-causes *Y*, this is called unidirectional causality. If *X* Granger-causes *Y* and *Y* also Granger-causes X then this is considered to be a bi-directional causality linkages**.** Granger causality tests are conducted to test the significance and bidirectional/ unidirectional causality between the foreign exchange and stock market returns. According to **Granger, C.W.J. (1969)**, a variable X is said to 'Granger cause' Y if past values of X help in the prediction of Y after controlling for past values of Y, or equivalently if the coefficients on the lagged values of X are statistically significant.

The computation of daily currency data for this study is made by using E-views (Version - 7.0), MS Excel and SPSS (Version - 21.0).

7. LIMITATIONS OF THE STUDY

The present study has the following limitations.

- The sample currencies consist of only ten from 9 Asian emerging countries and one frontier (Sri Lanka).
- The study is based on secondary data and the period is limited to 17 years from 2002 to 2018.
- The Global Financial Crisis which occurred during September- 2008 is not removed in this data set.
- The study is confined to only foreign exchange rate of samples countries against USD.
- The study does not analyze or consider the economic and political risk factors of the sample countries.

8. ANALYSIS OF LONG-RUN RELATIONSHIP, EXCHANGE RATE VOLATILITY AND CAUSALITY EFFECT BETWEEN THE SRI LANKA (LKR) AND ASIAN EMERGING CURRENCIES AGAINST USD

Table -2

The Results of Descriptive Statistics for the Sample Emerging Asian Countries Currency and Sri Lanka Currency Returns against USD during the Study Period from 01st January, 2002 to 31st December, 2018

Descriptive Statistics / Countries Currency	Mean	Median	Maximum	Minimum	Std. Dev.	Jarque-Bera	Obs.
Emerging Countries in Asia							
CHY / USD	7.09	6.83	8.28	6.04	0.80	505.18	4412
INR / USD	52.42	48.44	74.33	38.48	9.27	470.28	4412
KRW / USD	1113.19	1121.40	1570.10	903.20	102.89	334.83	4412
TWD / USD	31.73	31.84	35.21	28.50	1.70	209.85	4412
MYR / USD	3.60	3.64	4.50	2.94	0.39	162.37	4412
THB / USD	34.99	33.56	44.24	28.60	4.08	464.72	4412
IDR / USD	10490.81	9481.48	15305.29	8097.35	1902.80	631.31	4412
PHP / USD	48.20	47.41	62.27	40.32	4.61	284.60	4412
PKR / USD	82.72	84.85	139.85	56.95	20.64	266.49	4412
Frontier Country (Sri Lanka)							
LKR / USD	119.71	113.60	182.70	93.13	19.68	418.44	4412

Source: https://fred.stlouisfed.org/ and Computed using E-Views (Version – 7).

The results of descriptive statistics for the Sample Emerging Asian Countries Currency and Sri Lanka Currency Returns against USD during the Study Period from 01st January, 2002 to 31st December, 2018 are shown in Table - 2. It is clear from the above Table that during the study period, the currency exchange rate of Malaysia (MYR) earned high mean value of 3.60, followed by China (7.09), Taiwan (31.73) and Thailand (34.99) against USD. At the same time Indonesia (10490.81) and Korea (1113.19) earned low mean value compare with Sri Lankan currency (119.71) against USD during the study period. In terms of foreign exchange rate unpredictability as measured by the standard deviation of daily returns, only two sample currencies namely Indonesia (IDR/USD) assumed the highest risk value (1902.80), followed by Korea (KRW/USD) with the value (102.89) during the study period. This indicates the fact that there was high risk (in the order of currencies, namely, IDR and KRW). It is significant to note that high degree of risk is useful for speculators but the investors may study the country risk and carefully watch the currency value before taking investment decision. We also compute

the Jarque-Bera statistics to test whether the returns are normally distributed. Besides, the Jarque-Bera (JB) values of all ten sample currency were more than 5. Hence, it clearly implied that all the sample were normally distributed. In other words, all the sample currencies were less volatile except Indonesia and Korea during the study period.

Table : 3

Results of Volatility using GARCH (1, 1) Model for Sample Emerging Asian Countries Currency and Sri Lanka Currency Returns against USD during the Study Period from 01st January, 2002 to 31st December, 2018

List of Sample Countries Currency		C	α	β	α+β	P Value
Emerging Asian Countries Currency	China (CHY / USD)	0.0000000	0.01661	0.97985	0.99646	0
	India (INR / USD)	0.0000000	0.07155	0.93670	1.00825	0
	Korea (KRW / USD)	0.0000003	0.06647	0.92787	0.99434	0
	Taiwan (TWD / USD)	0.0000001	0.06522	0.93289	0.99811	0
	Malaysia (MYR / USD)	0.0000000	0.08219	0.92854	1.01073	0
	Thailand (THB / USD)	0.0000003	0.09711	0.88480	0.98190	0
	Indonesia (IDR / USD)	0.0000467	0.22908	0.28190	0.51098	0
	Philippines (PHP / USD)	0.0000098	0.19771	0.36787	0.56559	0
	Pakistan (PKR / USD)	0.0000000	0.02661	0.97049	0.99711	0
Frontier Country (Sri Lanka)						
Sri Lanka (LKR / USD)		0.0000001	0.15805	0.71627	0.87432	0

Source: https://fred.stlouisfed.org/ and Computed using E-Views (Version – 7).

   Table-3 shows the results of volatility, using GARCH (1.1) model, for daily (closing value) currency returns of Asian emerging countries and frontier country (Sri Lanka) against USD, during the study period from 01st January, 2002 to 31st December, 2018. As stated earlier, the sample of nine currency exchange rate against USD from emerging countries in Asia while the one sample from frontier country, namely, Sri Lanka (LKR/ USD). From the Table, it is clearly observed that value of the probability (P-Value) was zero at 99% confidence level. It is worth noting that the values (α+ β) for eight currencies were close to one. The values (α+ β) of ten sample Countries currency exchange rate against USD were 1.01073 (for Malaysia – MYR/ USD), 1.00825 (for India – INR/ USD), 0.99811 (for Taiwan - TWD/ USD), 0.99711 (for

Pakistan – PKR/ USD) 0.99646 (for China- CHY/ USD), 0.99434 (for Korea – KRW/ USD), 0.98190 (for Thailand – THB/ USD), and 0.87432 (for Sri Lanka – LKR/ USD). According to the analysis of GARCH Model, the $\alpha+\beta$ values of ten currencies, Seven out of Nine Asian emerging Countries Currency and one Frontier country currency were close to one. At the same time, the two Asian emerging countries currency i.e., Indonesia (IDR/ USD) was 0.51098 and Philippines (PHP/ USD) was 0.56559 were recorded low volatility during the study period. This indicates the fact that the data of sample currency against USD, for eight countries currency (China, India, Korea, Taiwan, Malaysia, Thailand, Pakistan and Sri Lanka) out of ten were highly volatile, during the study period from 01st January 2002 to 31st December, 2018. Thus the null hypothesis (NH_{01}), **there is no long-run exchange rate volatility among the sample countries currency against USD during the study period from 01st January, 2002 to 31st December, 2018,** was rejected.

The overall results of GARCH (1, 1), for the returns of ten sample currencies against USD, showed that all the parameters in the GARCH (1, 1) were highly significant at 1% significance level. The high degree of significance of α (GARCH term) and β (GARCH term) implied that past volatility highly influenced the current volatility of all the series under study. As both α and β were significant, it revealed that the lagged conditional variance and lagged squared variance had impact on current volatility. From the sum values of co-efficient of $\alpha+\beta$ of the series, it was clearly evident that eight countries currency showed a value which was close to unity or one. At the same time, the currencies like Philippines (PHP) and Indonesia (IDR) were not highly volatile among the sample currencies.

Source: Data taken from Table-3 and Computed using MS office Excel – 2007

Chart –1: Results of Volatility ($\alpha+\beta$) for Sample Emerging Asian Countries Currency and One Frontier (Sri Lanka) Currency against USD during the Study Period from 01st January, 2002 to 31st December, 2018

The results of volatility (both $\alpha+\beta$ value), of all the Nine Asian emerging Countries currency and Frontier Sri Lanka (LKR) exchange rate against USD, during the study period from 01st January, 2002 to 31st December, 2018, are shown in **Chart – 1.** The Chart clearly explains the high rate of volatility in sample emerging counties currency of Asia and Frontier countries

currency. The values of both risk and return (α+ β) were close to one and the Chart represents both high and low volatility of sample currency. It implies that the volatility among the sample currencies, except for Philippines (PHP/ USD) and Indonesia (IDR/ USD) were Low persistent at 1% and 5% significant levels. In other words, less volatility (risk and return) may be transmitted among the sample currency returns. Out of ten sample currencies, Eight currencies, namely, Malaysia – MYR/ USD, India – INR/ USD, Taiwan - TWD/ USD, Pakistan – PKR/ USD, China- CHY/ USD, Korea – KRW/ USD, Thailand – THB/ USD, Sri Lanka – LKR/USD were highly volatile, with more than 98 percent of risk with return (α+ β), during the study period from 01st January, 2002 to 31st December, 2018.

Table - 4

Results of Correlation between Emerging Asian Countries currency and one Frontier (Sri Lanka) Currency against USD during the Study Period from 01st January, 2002 to 31st December, 2018

Countries Currency	CHY/USD	INR/USD	KRW/USD	TWD/USD	MYR/USD	THB/USD	IDR/USD	PHP/USD	PKR/USD
CHY / USD	1								
INR / USD	-0.596843	1							
KRW / USD	-0.044344	0.197421	1						
TWD / USD	0.761231	-0.364017	0.336073	1					
MYR / USD	0.328368	0.456128	0.211706	0.413609	1				
THB / USD	0.848468	-0.251607	0.26342	0.799615	0.526512	1			
IDR / USD	-0.508922	0.909982	0.13816	-0.255788	0.581949	-0.214575	1		
PHP / USD	0.771815	-0.098388	0.133658	0.590955	0.682669	0.810881	-0.002024	1	
PKR / USD	-0.849359	0.884101	0.129311	-0.652293	0.112968	-0.620774	0.800321	-0.402184	1
LKR / USD	-0.695549	0.902257	0.00843	-0.543405	0.340236	-0.520682	0.881288	-0.231668	0.932944

Source: https://fred.stlouisfed.org/ and Computed using SPSS (Version – 21)

Table – 4 exhibits the results of correlation matrix, for sample between Emerging Asian Countries currency and one Frontier (Sri Lanka) Currency against USD during the Study Period from 01st January, 2002 to 31st December, 2018. It is clear that the Sri Lanka (LKR) currency was significant positive correlated with Pakistan Rupee (PKR), Indian Rupee (INR) and Indonesian Rupiah (IDR) with the values (correlation coefficient) of 0.932944, 0.902257 and 0.881288 respectively. It is to be noted that out of nine sample currencies of Asian emerging countries three countries currency (Chinese Yuan –CHY, Taiwan New Dollar – TWD and Thai Baht - THB) were significant negative correlation with Sri Lanka (LKR) with the correlation coefficient values of -0.695549, -0.543405 and -0.520682, respectively. At the same time, the currencies like Malaysian Ringgit (MYR), Korean Won (KRW) and Philippine Peso (PHP) did not have significant correlation with Sri Lanka (LKR) during the study period. In addition to the above fact, there was only minor relationship (interdependence) between Asian emerging countries currency and Sri Lanka (LKR). However, out of nine currencies only three (Malaysia, Korea and Philippines) currencies did not reach significant correlation during the study period. But, remaining six currencies (CHY, INR, TWD, THB, IDR and PKR) were attained significant correlation with Sri Lanka (LKR) against USD during the study period. Hence the null hypothesis (NH$_{02}$), namely, **there is no long-run significant relationship (movements) between Asian emerging currency and Sri Lanka (LKR) against USD during the period from 01st January, 2005 to 31st December, 2005**, was rejected.

The results of Pairwise Granger Causality, for testing the Causality effect between Sri Lanka (LKR) and nine sample currencies of Asian emerging countries against USD, during the period from 01st January, 2002 to 31st December, 2018, are shown in **Table – 5**. The analysis of Asian sample currencies with **Sri Lanka (LKR)** against USD, reveals that only one currency, namely, Thai Baht -THB (Thailand) recorded **no causality linkage (---)** in the both way during the study period. A pair currency, namely, Sri Lanka (LKR/USD) on Chinese Yuan (CHY/USD) earned a value of 4.36797, Indian Rupee (INR/USD) on Sri Lanka (LKR/USD) recorded a value of 6.79359, Korean Won (KRW/USD) on Sri Lanka (LKR/USD) earned a value of 4.15625, Taiwan New Dollar (TWD/USD) on Sri Lanka (LKR/USD) recorded a value of 4.57597, Malaysian Ringgit (MYR) on Sri Lanka (LKR/USD) earned a value of 4.51862, Sri Lanka (LKR/USD) on Indonesian Rupiah (IDR/USD) recorded a value of 5.29903, Philippine Peso (PHP/USD) on Sri Lanka (LKR/USD) with a value of 4.24211 and Sri Lanka (LKR/USD) on Pakistan Rupee (PKR/USD) earned a value of 5.49767 were registered **unidirectional (→ and ←) or one way causality linkage** during the study period on the basis of F- Statistics.
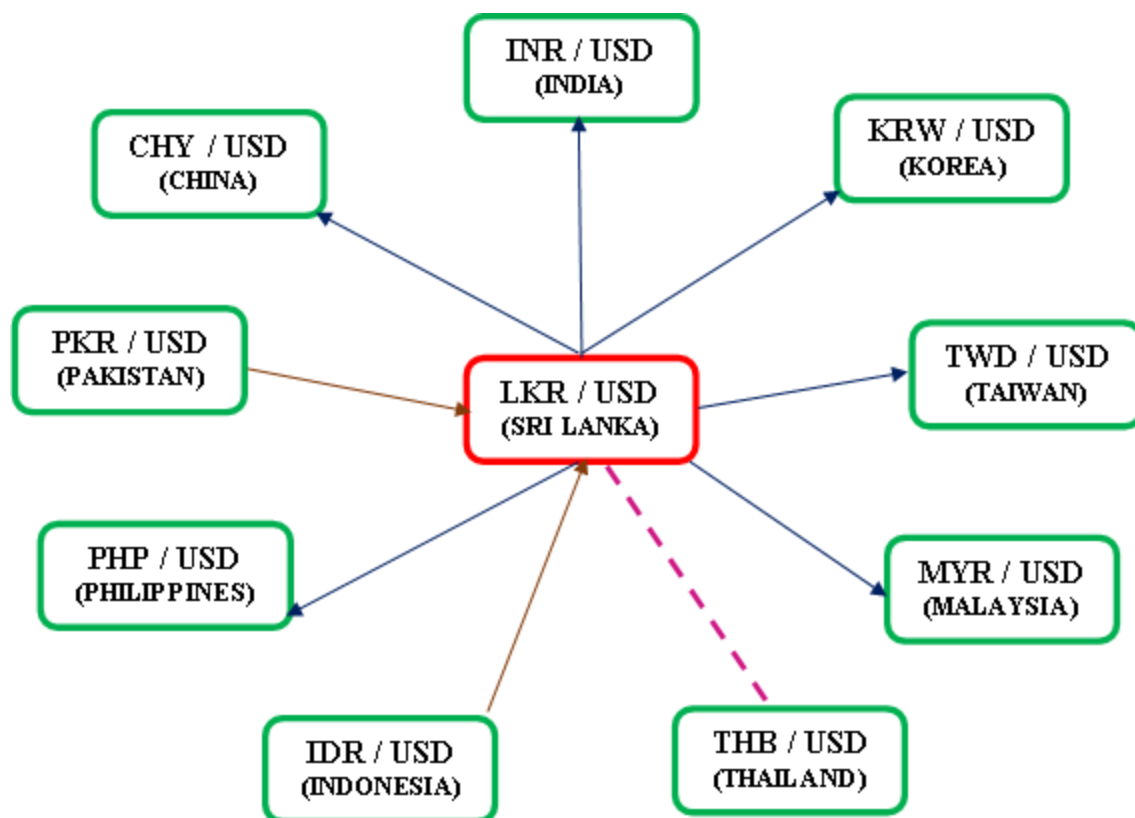
Table – 5

The Results of Pairwise Granger Causality of SRI LANKA (LKR/USD) with Emerging Asian Countries Currency Exchange Rate against USD during the study period from 01st January 2002 to 31st December 2018

Null Hypothesis:	Obs	F-Statistic	Prob.	Result
LKR / USD does not Granger Cause CHY / USD	4410	4.36797	0.0127	Rejected
CHY / USD does not Granger Cause LKR / USD	4410	2.05784	0.1279	Accepted
LKR / USD does not Granger Cause INR / USD	4410	1.69649	0.1834	Accepted
INR / USD does not Granger Cause LKR / USD	4410	6.79359	0.0011	Rejected

LKR / USD does not Granger Cause KRW / USD	4410	0.12073	0.8863	Accepted
KRW / USD does not Granger Cause LKR / USD	4410	4.15625	0.0157	Rejected
LKR / USD does not Granger Cause TWD / USD	4410	0.73626	0.479	Accepted
TWD / USD does not Granger Cause LKR / USD	4410	4.57597	0.0103	Rejected
LKR / USD does not Granger Cause MYR / USD	4410	1.99023	0.1368	Accepted
MYR / USD does not Granger Cause LKR / USD	4410	4.51862	0.011	Rejected
LKR / USD does not Granger Cause THB / USD	4410	0.37717	0.6858	Accepted
THB / USD does not Granger Cause LKR / USD	4410	2.89075	0.0556	Accepted
LKR / USD does not Granger Cause IDR / USD	4410	5.29903	0.005	Rejected
IDR / USD does not Granger Cause LKR / USD	4410	1.73326	0.1768	Accepted
LKR / USD does not Granger Cause PHP / USD	4410	0.11659	0.89	Accepted
PHP / USD does not Granger Cause LKR / USD	4410	4.24211	0.0144	Rejected
LKR / USD does not Granger Cause PKR / USD	4410	5.49767	0.0041	Rejected
PKR / USD does not Granger Cause LKR / USD	4410	0.51015	0.6004	Accepted

Source: https://fred.stlouisfed.org/ and Computed using E-Views (Version – 7).

It is interesting to note that out of nine sample Currencies of Asian emerging countries, only one currency, namely, Thailand Baht (THB) registered **no causality linkages** with Sri Lanka (LKR) against USD. At the same time, the other eight currencies, namely, Chinese Yuan Renminbi, Indian Rupee, Korean Won, Taiwan New Dollar, Malaysian Ringgit, Thai Baht, Indonesian Rupiah, Philippine Peso and Pakistani Rupee experienced **unidirectional linkages** with Sri Lanka (LKR) against USD. Hence the null hypothesis (NH$_{03}$**) - there is no is no long-run causality (linkage) effect between Asian emerging currency and Sri Lanka (LKR) against USD during the study period from 01st January, 2002 to 31st December, 2018,** was partially rejected.

Source: The results of **Table – 5**

NOTE

One way – Unidirectional causality ⟶

No causality relation

Figure – 2: The Dynamic Linkages of **SRI LANKA (LKR/USD)** with Emerging Asian Countries Currency Exchange Rate against USD during the study period from 01st January 2002 to 31st December 2018

Figure - 2 displays the graphical demonstration of two forms of dynamic linkages, for sample currencies of nine Asian emerging countries currency, with the frontier currency of **Sri Lankan Rupee (LKR),** during the period from 01st January 2002 to 31st December 2018**.** The above Figure, formulated with the help of **Table 5** are given at the above Figure. According to **Figure – 2,** out of nine emerging countries currency, seven currencies namely, Chinese Yuan Renminbi (CHY), Indian Rupee (INR), Korean Won (KRW), Taiwan New Dollar (TWD), Malaysian Ringgit (MYR), Indonesian Rupiah (IDR), Philippine Peso (PHP) and Pakistani Rupee (PKR) registered significant degree of **unidirectional linkages** with Sri Lanka (LKR) against USD during the study Period. At the same time, one Asian emerging country currency, namely, Thai Baht (THB), registered **no causality linkage** with the Sri Lanka (LKR) against USD during the study Period.

Graph 1 shows the evolution of the Nine Asian emerging countries and Sri Lankan currency exchange rates against the U.S. Dollar since the beginning of this century i.e., from 1st January, 2002 to till 31st December, 2018. It also shows the paths of the China (CHY/USD), Korean (KRW/USD), Taiwan (TWD/USD), and Thailand (THB/USD) currencies were performed better than U.S. Dollar during the study period. At the same time, the following currencies India (INR/USD), Indonesia (IDR/USD), Malaysia (MYR/USD) Philippines (PHP/USD), Pakistan (PKR/USD) and Sri Lanka (LKR/USD) were equally performed with U.S Dollar till 2014, the graph depicts very large variation in all ten sample currencies over this long data set for 17-year horizon, with broad trends emerging and disappearing, occasional

sharp turns, and quite a few ups and downs. The sample currencies were trajectories do not look qualitatively different from that of a freely floating Chinese Yuan renminbi (CHY). The overall performance of the currency values of sample countries were good and the currencies like Pakistan Rupee (PKR), Sri Lankan Rupee (LKR) and Indonesian Rupiah (IDR) were equally moved from start to end of the study period. It is to be noted that the countries like Indonesia, Malaysia, Pakistan and Sri Lanka were highly affected their currency values from the year 2015 to 2017 against USD.
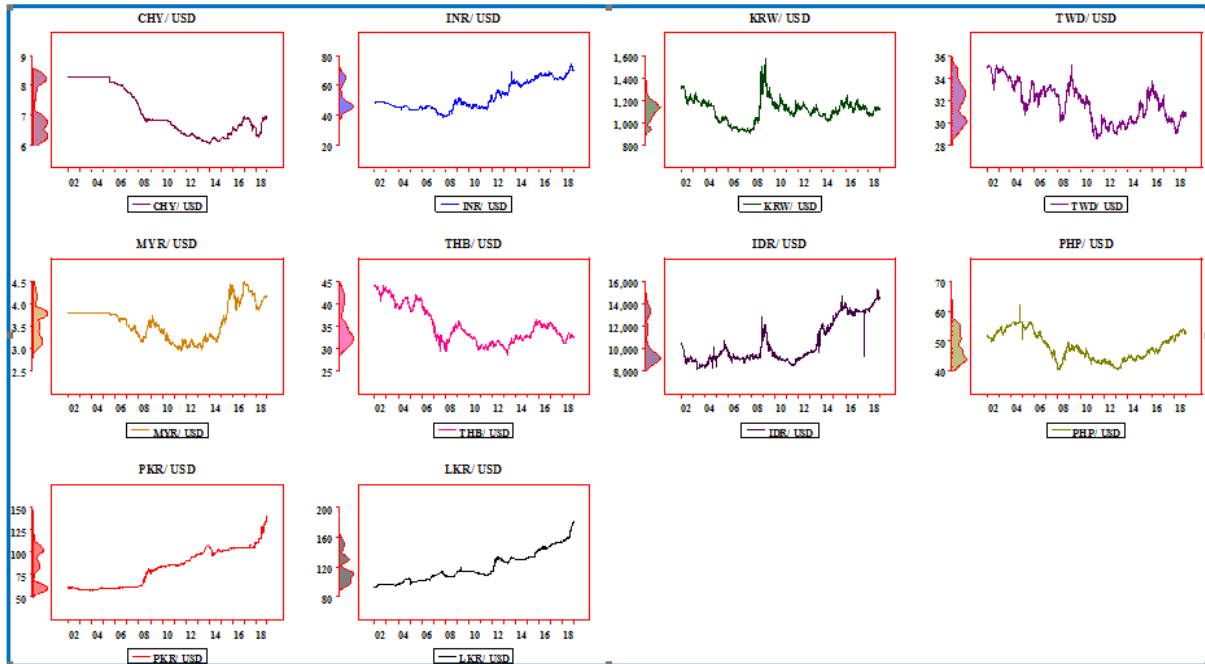
Source: https://fred.stlouisfed.org/ and Computed using E-Views (Version – 7)

Graph – 1: Graphical Expression for SRI LANKA (LKR/USD) and Emerging Asian Countries Currency Exchange Rate against USD during the study period from 01st January 2002 to 31st December 2018 9.0 Conclusion and Recommendations

The present paper empirically investigated the relationship between the volatilities and causality effect between Asian emerging countries and Frontier (Sri Lanka) currency exchange rate against USD for 17 year from 01st January 2002 to 31st December, 2018. In the sample currency pairs namely, CNY/USD, INR/USD, KRW/USD, TWD/USD, MYR/USD, THB/USD, IDR/USD, PHP/USD, PKR/USD and LKR/USD; it is found that the results of GARCH Model only two sample currencies i.e., Indonesia (IDR/ USD) was 0.51098 and Philippines (PHP/ USD) was 0.56559 were recorded low volatility during the study period. At the same time, the remaining 8 counties currency were highly volatile and it good for speculators to make their better investment. The results of Granger causality test show a unidirectional relationship between the exchange rate of Asian emerging countries and LKR against USD except Thailand Baht (THB). Hence, the Sri Lankan currency market investors would focus their portfolio investment plan to Thailand baht. These results, apart from offering a much better understanding of the Volatility, Causality effect in the sample countries may have important implications for currency market efficiency to the selected sample countries. Finally, this study results would help to international portfolio managers, multinational corporations, and policymakers for decision-making in the Asian region.

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