# AN INVESTIGATION OF THE FACTORS AFFECTING EXCHANGE RATE FLUCTUATIONS: A SRI LANKAN EXPERIENCE IN RECENT PAST

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**Abstract**- The stability of the exchange rate is widely discussed topic, which plays a pivotal role in any economy. Miscellaneous types of internal and external factors have been directly effecting on the exchange rate fluctuations on the economic performances of the country. The main objective of this study is to examine the significant macro-economic factors that affect exchange rate fluctuations in Sri Lanka. The study results detected that, the month-end USD/LKR exchange rate is more sensitive with respect to the external factors such as changers in month-end per capita real Gross domestic product, Broad money (M2b) and Reserve Money in a short term and long term manner.

**Keywords**- Vector Error Correlation Model, Co-integration Rank Test and Colombo Stock Exchange

## I. INTRODUCTION

The exchange rate is significant macro-economic variable which used to measure the country's relative level of economic health; especially, it plays a major role in trade, which is significantly affected to the free market economies. Several factors have been directly influenced on exchange rate fluctuations. As a general rule, the changing of inflation has been significantly affecting for exchange rate fluctuations. When the inflation is under the low level, the currency rates has been increasing rapidly low relative to other countries. As a result their goods and services have been increasing in high demands

and its purchasing power increases relative to other currencies.

Theoretically, the strength of the local currency is proportionally affecting for the economic growth of a country. In general, the economic growth measured by gross domestic product of the country (GDP), which is another significant factor effecting for currency fluctuation. The GDP is a monetary value of all final goods and services produced within a period and measures national income and output for a given country economy. According to the literature, three methods are mainly used to determine GDP, namely expenditure approach, output (or production) approach and income approach (Jayathileke, 2014).

Current account balance of the country is another significant factor which is highly effect on exchange rate variations. When, the country imports goods and services than exports, it has to be making considerable deficit on their current account balance. As a result, country has to borrow capital from foreign countries while increasing their currency value.

Reserve money and consolidated broad money (M2b) as components of supply of money are used as proxies. As monetary instruments, these variables are used by the Central Bank of Sri Lanka to control overall economy. Increase of money supply leads to increase in liquidity that eventually consequences in upward movement of

nominal share prices. It is therefore hypothesized that and increase in money supply is positively related to the exchange rate fluctuations.

Political stability and economic performance of the country is another significant factor which effects directly on exchange rate demands. In general, stable country with strong economic performance has attraction of foreign investors. Because of the less political and economic risk, the country gains more foreign capital than other countries which has high risk in political and economic sides. The less risk of political and economic increases value of local currency and it causes to appreciate in exchange rate.

According to the literature, considerable amount of studies can be seen on forecasting exchange rate using different types of time series approaches. Among them univariate and multivariate time series approaches, such as: autoregressive integrated moving average (ARIMA), Autoregressive conditional heteroskedasticity (ARCH) model, Johansen co-integration, Vector Autoregressive Regression and Vector error correlation methodology are widely used to determine the exchange rate affects both on negatively and positively to the economy on a country.

Aristotelous at.al (2001) investigated the impact of exchange-rate volatility and exchange-rate regime on the British exports to the United States data period from 1889 to 1999. The empirical results suggested that exchange rate volatility did not have an effect on the volume of British exports to the US. The empirical results suggested that interest rate and rate of inflation have negative impact on economic growth.

Chit, et al (2018) carried out a study to examine the real exchange rate volatility with respect to the real exports of five emerging East Asian countries among themselves as well as to 13 industrialized countries. According to their empirical findings, the exchange rate volatility has a negative impact on the exports of emerging in East Asian countries. The findings confirm that, the increase in competitiveness of a country relative to others has positive impact on exports.

According to the Central Bank past trade statistics Sri Lanka (Central Bank , 2016), reveals that the trade deficit or import export gap has widened over the past years. The records clearly suggested that, the country has

failed to increase their exports significantly than imports; especially, the exports have grown a mere 4.1% ($ 2.9 billion) while non-oil imports have grown at a faster rate of 8% ($ 7.5 billion). Jayathileke, et. al (2013) carried out a study and investigated the long-run relationship between the economic growth and the inflation of three Asian courtiers namely Sri lanka, India and china.

In Sri Lankan context, limited number of studies can be seen in the literature to find out the macroeconomic relationships with respect to the exchange rate demands. So, the main objective of this current study is to examine the reasons for finding the month-end USD/LKR exchange rate volatility with respect to the macroeconomic relationships in a Sri Lankan context from January 2010 to December 2016 in a long term and short term manner.

The rest of the paper is organized as follows. Next section develops the hypotheses and explains the methodology used in the study. Section three briefly presents the results including VECM results and the paper ends up with the conclusion.

## II. METHODOLOGY

The current study mainly deals with the empirical methodology consist of Unit Root, Johansen co-integration and Vector Autoregressive Regression methodologies which are used to explain the long term and short term predictability and profitability of technical trading strategies.

As an initial step, it is necessary to test the stationary and non-stationary conditions before using them for any further analysis. Theoretically, time series is stationary if a shift in time doesn't cause a change in the shape of the distribution and have a fine constant over the selected time interval; unit roots are one cause for non-stationary. Several methods can be seen in the literature to determine the existence of unit roots or not and measuring their statistical power. Tests include: The Dickey Fuller Test, which is mainly based on linear regression; especially, the serial correlation can be an issue, in which case the Augmented Dickey-Fuller (ADF) test can be used. The Phillips–Perron (PP) test is a modification of the Dickey Fuller test, and corrects for autocorrelation and heteroscedasticity in the errors.

## B. *Vector Error Correction Model*

The Vector Error Correction Modelling (VECM) is Multivariate Time Series approach, which can be used to evaluate the long term as well as short term relationships between the selected variables. Current study, Johansen co-integration with VECM is adapted to examine the long-run as well as short-run dynamic equilibrium relationships between exchange rate fluctuations and related economic growth conditions related to the Sri Lanka.

The proposed methodology is running as follows in equation (1),

(1)

$$\Delta y_t = \delta + \lambda t + \beta y_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta y_{t-i} + \varepsilon_t$$

Where $y_t$ is distributed under the I(1) against the alternative I(0) and p, $\lambda$ and t represent the lag length of the auto regressive process, the coefficient on a time trend and time trend variables respectively (Seneviratna et.al; 2013).

# III. ANALYSIS AND DISCUSSION

## A. *Data Sources*

The data were obtained from daily and monthly financial statements issued by the Central Bank of Sri Lanka, various types of background information and other relevant sources and etc. For Monthly data for seven year period from January 2010 to December 2016 were extracted and tabulated. All the selected macroeconomic variables are listed in Table 1 as follows.

### Table 1. Definition of Variables

| Variables | Definition of Variables |
|---|---|
| $MAER_t$ | Month-end USD/LKR exchange rate |
| $GDP_t$ | Month-end per capita real Gross domestic product |
| $M2b_t$ | Month-end per Broad money (M2b) |
| $RM_t$ | Month-end Reserve Money |
| $GP_t$ | Month-end Gold Price |

Time series plot of the daily USD/SLR exchange rates in Figure 1 shows a significant upward trend pattern with high volatility clustering movements in a long term manner.
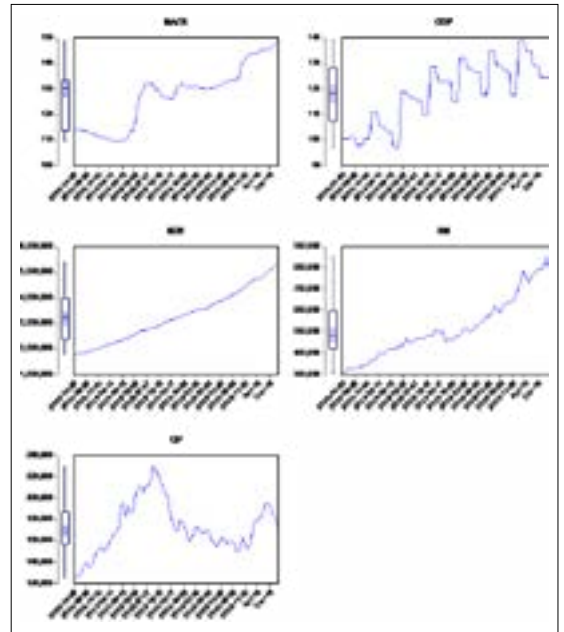


*Figure 1. Time series plot of selected variables*

## B. *Unit Root Test for Stationary Checking*

As an initial step, the stationary conditions of the selected variables are tested by using two unit root test methods namely Augmented Dickey-Fuller (ADF) test and Phillips–Perron (PP) test.

According to the Table 2 ADF and PP results, all the variables are only stationary in a same time in their first differences under the 0.05 level of significance and can be categorized under the I(1) process.

In the next stage, Johansen (trace) co-integration rank test and Maximum Eigenvalue test were employed to test whether there is any co-integrating relationship between the variables. Table 3 shows the number of co-integrating vectors for selected variables.

## Table 2. Results of ADF and PP Tests

| Sector | Significance Results | | Sector | Significance Results | |
|---|---|---|---|---|---|
| | Level data (Prob.*) | | | 1st Diff. (Prob.*) | |
| | ADF | PP Test | | ADF | PP Test |
| $MAER_t$ | 0.3209 | 0.3818 | $MAER_t$ | 0.0001 | 0.0000 |
| $GDP_t$ | 0.0567 | 0.0887 | $GDP_t$ | 0.0000 | 0.0000 |
| $M2b_t$ | 1.0000 | 1.0000 | $M2b_t$ | 0.0000 | 0.0001 |
| $RM_t$ | 0.9769 | 0.9919 | $RM_t$ | 0.0000 | 0.0000 |
| $GP^t$ | 0.7229 | 0.5302 | $M2b_t$ | 0.0000 | 0.0000 |

Note : *MacKinnon (1996) one-sided p-values.

## Table 3. Results of Co-Integration

Unrestricted Co-integration Rank Test _Trace

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | Prob.** |
|---|---|---|---|
| None * | 0.493740 | 98.88919 | 0.0001 |
| At most 1 * | 0.216880 | 43.75203 | 0.1153 |

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

| None * | 0.493740 | 55.13716 | 0.0000 |
|---|---|---|---|
| At most 1 * | 0.216880 | 19.80198 | 0.3550 |

Note : Trace test indicates 1 cointegrating eqn at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

According to the Table 3 results, Unrestricted Co-integration Rank results in trace (0.1153 >0.05) and Max-eigenvalue (0.3550>0.05) test methods suggested that there is a co-integration exist in their first stage at the 0.05 level of significance. It means that, significance association can be seen between the month-end USD/LKR exchange rate with respect to the other selected macro-economic variables in a long term manner.

In the next stage, maximum likelihood method based VECM methodology is set up to investigate the available causality relations between dependent and independent variables. Theoretically, when the variables are co-integrated in same order, maximum likelihood method based on VECM can be performed to find the causality between the underline variables.

The VECM results indicated that C(1) has a negative sign (-13.91666). This result indicates a short run joint causality causes between month-end USD/LKR exchange rate and selected variables. So, as a next step, Wald test statistic is used applied.

## Table 4. Wald Test Results with Respect to the Maer

| ASPI | GDP | GP | M2B | RM |
|---|---|---|---|---|
| Chi-Square | 10.92942 | 11.16415 | 11.30765 | 12.35690 |
| Probability | 0.0042 | 0.0038 | 0.0035 | 0.0021 |

The short-run adjustments along the co-integrating equilibrium relationships were developed to test whether any short run causality exists between independent and dependent variables. The Wald statistic results in Table 5 reveals that, short run causality running from GDP(0.0042<0.05), GP (0.0038<0.05), M2b (0.0035< 0.05), and RM (0.0021< 0.05) to MAER.

## IV. CONCLUSION AND POLICY IMPLICATION

This study sheds light on design and explaining the long term and short term impact of USD/LKR exchange rate movements on the economy of Sri Lanka.

The results detected that, the month-end USD/LKR exchange rate is more sensitive to external factors such as changers in month-end per capita real Gross domestic product, Broad money (M2b), Reserve Money and Gold Price. We strongly believed that these findings will be useful to investors both domestic and internationals and policy makers for make better investments based on the both long-run equilibrium and long-periodic co-movements.

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