

# Impact of dynamic exchange rates on exports of Post liberalized economy of Sri Lanka

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**ABSTRACT:** This study aimed to find the relationship between exchange rates and exports even after the liberalization of trade in Sri Lankan context using the quantitative approach method. The data for the period of 1950 to 2014 were collected from the annual report of the central bank of Sri Lanka. The export was the dependant variable and Exchange rate of French Frank, Exchange rate of Indian Rupee, Exchange rate of Japanese Yen, Exchange rate of Sterling Pound and Exchange rate of US dollar were the independent variables in this study. All the variables used in this study were stationary at it data level I(0). There is a considerable close interrelationship between the variables of EXT, EFF, EJY, ESP, and EUD. The value of R-squared was 0.980653 which was less than Durbin-Watson Statistic (1.059311). There was no serial correlation in the residuals of this model because the Propability value of corresponding observed R – squared (11.02781) was more than 5%. There is a negative associationship between the export and the exchange rates of Japanese Yen, Indian Rupees and Sterling Pound and there is a direct associationship between the export and the exchange rates of French Frank and US dollar. To adjust the Balance of Payment deficit, depreciation or devaluation of US dollar or French Frank was effective in the arena of international trade.

**Key Words :** exchange rate, liberalization, export, dummy variable, balance of payment

## Introduction

Since the 1980s, the economic reforms of Sri Lanka have been instrumental in promoting its trade sector. In 1977, the government in Sri Lanka implemented reformative policies in economics and finance. The previous regime adopted the strategies to improve the development of trade which is inward oriented. But the new government implemented the policies to liberalize trade by lifting all the restrictions which are detrimental even to attract foreign investment to Sri Lanka. In this new policy implementation, the barriers to exports were removed and the exchange rates were stabilized for the stability in the Balance of Payment in Sri Lanka (Athukorale and Jayasuriya, 1994. Vijayakumar (2013) clearly mentioned that “In spite of liberalization led to economy at 8.2% of economic growth in 1978 which is immediate positive effects on the economy, government was unable to maintain same growth and growing employment opportunities in successive years because of diverting the more resources on ethnic war and youth unrest”

The new government was switching the policy of exchange rate from fixed exchange to managed floating exchange rate under the new reforms of trade liberalization. In this exchange rate system, the value of the domestic currency against the foreign currency was devalued. Due to the devaluation under the system of managed floating exchange rate, the exports from Sri Lanka increased considerably by paving the way to the reforms of the trade liberalization regime (White and Wignaraja, 1992).

The exchange rate policy in 2014 focused on smoothing short term volatility in the exchange rate, thereby ensuring stability in the foreign exchange market. The Sri Lankan rupee appreciated against the US dollar during the first three quarters of the year, warranting some intervention by the Central Bank in order to avoid overly appreciation. The appreciation pressure was mainly due to the increase in foreign exchange inflows in the form of export earnings, workers' remittances and other financial inflows on account of international sovereign bonds, government securities, foreign loans to the government and private sector and foreign investment in the CSE. Accordingly, the rupee appreciated by 0.29 per cent against the US dollar by the end of the third quarter of 2014. However, with increased import demand and net outflows associated with the government securities market exerted pressure on the Sri Lankan rupee in the last quarter of 2014 to depreciate by 0.47 per cent against the US dollar resulting in an overall annual depreciation of 0.23 per cent. Accordingly, the year end and annual average exchange rates against the US dollar stood at Rs. 131.05 and Rs. 130.56, respectively (Central Bank of Sri Lanka, 2014). Thus, exchange rate of Sri Lankan currency with other major currencies in the currency market influences the exports and imports of Sri Lanka empirically. As such, this study analyses statistically the relationship between the exports and the various major exchange rates of the currencies with Sri Lankan currency.

## Literature Review

Hooy Chee Wooi and Chan Tze Haw (2008) studied the bilateral trade agreement between China and Malaysia and the balance of their trade under their present exchange rate of the two countries using a function which consisted of the variables such as real exchange rates in the bilateral trade agreement, foreign income and their domestic income of the countries by collecting monthly data from January 1990 to January 2008. They used GARCH effect in their testing of this model. Their tesg resulted in the major role of the real exchange rates in the bilateral trade agreement between the two countries and also they found that the elasticity coefficient of the long run relationship between the bilateral trade and real exchange rate is compatible with the analysis of Marshal-Lerner condition. Vijayakumar (2014) found that "the real exchange

rate has significantly positive influence on the trade balance of Sri Lanka both in the short- run and the long-run. The Granger causality test confirms the fact that real exchange rate (RER) Granger causes trade balance of Sri Lanka”

Andrew Hughes Hallett and Juan Carlos Martinez Oliva (2010) analyzed the stability of foreign trade, currency markets and international portfolio balances with the help of a model which captured the interactions between current account balances and the international asset portfolios for domestic and foreign investors in a stock-flow framework. They argued that the stability of such interaction might be affected by shifts in the preferences of investors; by the relative rate of return of different assets; as well as, more importantly, by the institutional arrangements. Philipp Engler, et. al. (2013) investigated the impact of a fiscal devaluation using DSGE model calibrated to the euro area, modeled as a revenue-neutral shift from employers’ social contributions to the Value Added Tax. They found that a fiscal devaluation carried out in ‘Southern European countries’ had a strong positive effect on output, but a mild effect on the trade balance of these countries. And also, the negative effect on ‘Central-Northern countries’ output was weak. Nega Muhabaw Kassie (2015) tried to assess the movement of real effective exchange rate and external sector development such as export, import & trade balance of Ethiopia using descriptive analysis to incorporate the two major devaluation period from the year 1985/86 to 2012/13. He revealed that the depreciation of the real effective exchange rate improved the export performance, however it didn’t discourage import. He recommended from his study among others, promoting import substitution strategy through subsidies to the domestic industries and reducing taxes to their imported semi finished inputs and awareness creation in favor of the home produced substitutes should be made to reduce import expense.

Jun Yang, et. al. (2012) analyzed the ex-ante, short-term impacts of the Chinese Renminbi appreciation on the Chinese and world economies using the novel approach of modeling nominal exchange rate adjustment in the Global Trade Analysis Project, a global computable general equilibrium model. They found from the results that the Chinese economy would be affected negatively, with lower real gross domestic product, lower employment rates, and a decline in the trade surplus and Chinese currency appreciation had a positive impact on the GDP of the major countries and regions, but by a small margin. Finally they concluded that with a higher Chinese exchange rate, trade balances for other trading partner countries, with the exception of the United States, improved. Ashok Parikh (2004) studied the impact of liberalization on trade deficits and current accounts of developing countries using the panel data of 42 countries (both time-series and cross-section dimension) to estimate the effect of trade liberalization and growth on trade balance while controlling for other factors

such as income terms of trade. He found from his study that trade liberalization promoted growth in most cases, the growth itself had a negative impact on trade balance and this in turn could have negative impacts on growth through deterioration in trade balance and adverse terms of trade. He concluded that trade liberalization could constrain growth through adverse impact on balance of payments. There are a number of studies considerably relevant to this study internationally, but this sort of studies in Sri Lankan context is hardly found in any academic works. This is the gap of this study. Thus, this study is mostly significant and one of the contributions in connection with the Balance of Payment and the different exchange rates of major currencies with the Sri Lankan currency.

### Objective and Methodology

The main objective of the study is to find out the relationship between exchange rates and exports after the liberalization of trade in Sri Lanka. The annual data for the period from 1950 to 2014 of the different exchange rates and exports in Sri Lanka are used in this study. The data are collected from Annual Report of Central Bank of Sri Lanka. Export is used as dependent variable. The Exchange rates (Sri Lanka Rupees per unit of foreign currency) of US dollar, Pound Sterling, Japanese Yen, Indian Rupee, French Frank and Dummy (D) are used as the independent variables. The dummy variable is defined as 1 for trade liberalization and 0 for non liberalization. All the variables are transformed into the Natural Logarithms to measure the percentage changes in the model. Therefore, the following equation is estimated:

$$EXT = f(EFF, EIR, EJY, ESP, EUD, D).....(1)$$

$$\ln EXT_t = X_0 + X_1 \ln EFF_t + X_2 \ln EIR_t + a_3 \ln EJY_t + \alpha_4 \ln ESP_t + \alpha_5 \ln EUD_t + \alpha_6 D + e_t.....(2)$$

Where,

$\ln EXT$  = Natural logarithm of Export

$\ln EFF$  = Natural logarithm of Exchange rate of French Frank

$\ln EIR$  = Natural logarithm of Exchange rate of Indian Rupee

$\ln EJY$  = Natural logarithm of Exchange rate of Japanese Yen

$\ln ESP_t$  = Natural logarithm of Exchange rate of Sterling Pound

$\ln EUD_t$  = Natural logarithm of Exchange rate of US dollar

D = Dummy variable

$\epsilon$  = The error term with the conventional statistical prosperities

$x_0, x_1, x_2, x_3, \alpha_4, \alpha_5$  = Coefficients of the model



The stationarity of the time series data is tested using Augmented Dickey-Fuller (Damordar Gujarati 2005). Cointegration test is performed to identify the existence of the long run relationship between the variables. Error correction mechanism and Granger Causality test are used to find the short run relationship and causal relationship between various exchange rates and export. Using E-Views, Minitab and Excel statistical software, the data are analyzed.

## Results and Discussion

### Unit root tests (ADF test)

The table 01 portrays those results of the ADF for the model with intercept, trend and intercept and none. It can be concluded that the null hypothesis of non stationarity (having unit root) cannot be rejected at 5% level at the level forms of all the variables, rather it is accepted. But the time series data (lnEXT) at its first difference is stationary because the null hypothesis of non-stationarity is rejected for all the variables (Test statistic value > Test critical value at 5% level). As such, all the six variables are integrated of order one I(1). It is concluded that all the time series data are not suffering from the problem of spuriousness at the first difference. As a result, all the variables can be used in this model at the first difference. It means the wrong conclusions and findings may be leading to meaningless and biased results.

Table 01: ADF test results

Variable	ADF test	Intercept/ constant		Trend and Intercept		None/Neither intercept nor trend		Overall Decision
		Test statistic value	Test Critical Value (5%)	Test sta- tistic value	Test Critical Value (5%)	Test statis- tic value	Test Critical Value (5%)	
<i>lnEXT</i>	First Dif- ference	8.18	2.90	8.54	3.48	2.46	1.94	Stationary
<i>lnEFF</i>	First Dif- ference	7.59	2.91	8.02	3.50	3.40	1.94	Stationary
<i>lnEIR</i>	First Dif- ference	6.83	2.90	6.77	3.48	6.81	1.94	Stationary
<i>lnEIY</i>	First Dif- ference	8.45	2.90	8.40	3.48	3.74	1.94	Stationary
<i>lnESP</i>	First Dif- ference	6.46	2.90	6.53	3.48	5.66	1.94	Stationary
<i>lnEUD</i>	First Dif- ference	7.43	2.90	7.50	3.48	1.97	1.94	Stationary

Grange Causality test (Vector Auto Regression Estimate)

The table below shows the causal relationship between the variables according to the results of E-Views. From Table – 02, all the null hypotheses are rejected because the value of probability is less than 5% at lag value of 4. Export can cause exchange rate of French Frank. There is a two way causal relationship between exchange rate of Japanese Yen and exchange rate of French Frank. Exchange rate of Sterling Pound can cause exchange rate of French Frank and exchange rate of US dollar can cause exchange rate of French Frank. Exchange rate of Sterling Pound can cause exchange rate of US dollar. As a result, there is a considerable close interrelationship between the variables of EXT, EFF, EJY, ESP, and EUD. This model (ex. Consisting of two variables) is estimated as follows:

**Table 02: Granger Causality Test**

<b>Null Hypothesis:</b>	<b>F-Statistic</b>	<b>Prob.</b>
<b>EXT does not Granger Cause EFF</b>	<b>3.28908</b>	<b>0.0202</b>
<b>EJY does not Granger Cause EFF</b>	<b>4.12994</b>	<b>0.0068</b>
<b>EFF does not Granger Cause EJY</b>	<b>3.14575</b>	<b>0.0244</b>
<b>ESP does not Granger Cause EFF</b>	<b>4.92300</b>	<b>0.0025</b>
<b>EUD does not Granger Cause EFF</b>	<b>4.22246</b>	<b>0.0060</b>
<b>ESP does not Granger Cause EUD</b>	<b>3.30378</b>	<b>0.0174</b>

### **Regression result:**

As per the OLS method, the output is shown in the table (Table 03) below. This model is mostly significant because most of the variables (03 variables out of 06 variables) are significant to run the model and to explain the relationship

between the dependant variable and the dependant variable. The estimated coefficient of EFF indicates that 1% change of increase in exchange rate of French Frank increases export only by 0.39%. There is a positive relationship between those two variables. When the exchange rate of US dollar increases by 1 percent, export increases by 1.33 percent. Thus, EFF and US dollar are directly related to EXT with various magnitude of significance. The rest of the independent variables are inversely related to the dependent variable with the inclusiveness of the dummy variable as well. Out of six variables, three independent variables are significant to explain the relationship between the dependant and independent variables. Thus, 50 percent of the independent variables are significant in this model. Next is the P – value of corresponding F – Statistic which is less than 5%. It means that all the independent variables used in the study are significant and jointly influence the independent variable (EXT).

The value of R-squared is 0.980653 which is less than Durbin-Watson Statistic (1.059311). It means the percentage of the fitness of this model is 98 or the data used in this model is nicely fitted. Further, only 2 percent of outside factors (residuals/external influence) influence this model to explain the relationship between the dependant and independent variables. The quick way of finding the problem of spuriousness is based on the Durbin-Watson Statistic. If the value of R<sup>2</sup> is less than DW Statistic, there is no problem of spuriousness in this model. It means this model is free from senselessness. Therefore, 98 percent of the inside variables (internal influence) used in this model is relevant to fit this model. The internal influence of the variables used in this model is very high.

Table 03: Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.857781	0.989762	1.876998	0.0669
LOG(EFF)	0.388774	0.136487	2.848438	0.0065
LOG(EIR)	-0.328686	0.191229	-1.718808	0.0924
LOG(EJY)	-0.407094	0.145516	-2.797584	0.0075
LOG(ESP)	-0.006033	0.233043	-0.025889	0.9795
LOG(EUD)	1.326847	0.284295	4.667144	0.0000
DU	-0.040251	0.223699	-0.179934	0.8580

R-squared	0.980653	Mean dependent var	6.746766
Adjusted R-squared	0.978129	S.D. dependent var	0.981573
S.E. of regression	0.145163	Akaike info criterion	-0.899423
Sum squared resid	0.969321	Schwarz criterion	-0.639196
Log likelihood	30.83472	Hannan-Quinn criter.	-0.799353
F-statistic	388.6001	Durbin-Watson stat	1.059311
Prob(F-statistic)	0.000000		

$$\ln \text{EXT} = 1.85 + 0.39 \ln \text{EFF} - 0.33 \ln \text{EIR} - 0.41 \ln \text{EJY} - 0.006 \ln \text{ESP} + 1.33 \ln \text{EUD} - 0.04 \text{DU}$$

The Dummy variable is inversely related to the dependant variable. It means after the trade liberalization in Sri Lanka, the export is affected by 0.04 unit of change. Before the trade liberalization, the amount of change (0.04) is zero.

### Correlation Test of Residuals

According to the table there is no serial correlation in the residuals of this model because the Probability value of corresponding observed R – squared (11.02781) is more than 5%. Thus, the Null Hypothesis of “Residuals are not serially correlated” cannot be rejected, rather it is accepted. It means the disturbance/residual term relating to any observation is not influenced by the disturbance/residual term relating to any other observation  $\{E(u_i u_j) = 0\}$  and  $i(\text{observations})$  is not equal to  $j(\text{observations})$ . The results of Breusch-Godfrey Serial Correlation LM Test are shown in the following table 06:

Table 06: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	5.780301	Prob. F(2,44)	0.0059
Obs*R-squared	11.02781	Prob. Chi-Square(2)	0.0040

### Heteroscedasticity Test of Residuals

Since the Probability value of corresponding observed R-squared is more than 5%, the residuals are not heteroskedastic because the Null Hypothesis



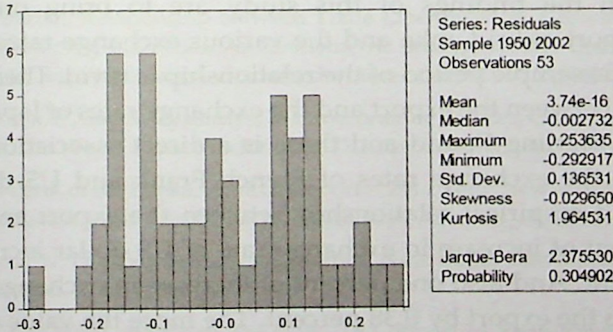
of “the residual is not heteroskedastic” cannot be rejected, instead it can be accepted. Therefore, the residuals are homoskedastic. The variation of residuals (u.) around the regression line (which is the line of average relationship between the dependant and the independent variables) is the same across the independent variables. It neither increases nor decreases as the independent variables vary. The results of heteroskedacity test of residuals are given in the following table 04:

Table 04: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.133791	<b>Prob. F(6,46)</b>	0.0673
Obs*R-squared	11.53935	<b>Prob. Chi-Square(6)</b>	0.0731
Scaled explained SS	4.192101	<b>Prob. Chi-Square(6)</b>	0.6507

**Jarque-Bera (JB) Test of Normality**

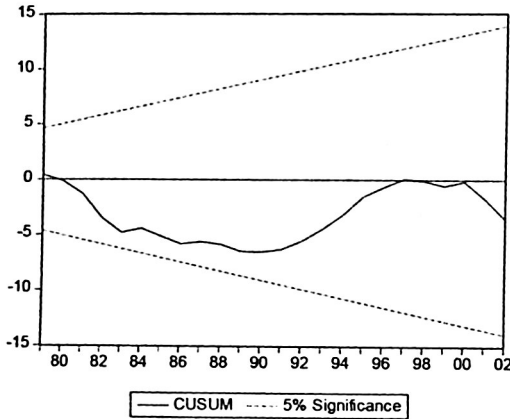
This is one of the model adequacy tests. This test first computes the skewness and kurtosis measures of the OLS residuals. Such test is known as normality test which is used to find out whether error tem follows the normal distribution. The normality test of residual is given in the following figure - 01:



The corresponding P-value of Jarque-Bera Statistic is more than 5% (30.49%). Therefore, the null hypothesis that residuals are normally distributed can be accepted and the residuals of this model are normally distributed.

### Stability test

The stability of this model is proved from the following figure 02 because it (CUSUM) is located within the 5% significant level. Therefore, the relationship between the variables is empirically stable. Within the region of 5% percent significance, the stability of the model is ensured by the location of CUSUM stability curve.



### Conclusion

The conclusions with the findings of this study are to bring out the relationship between export of Sri Lanka and the various exchange rates. The empirical proof during the sample period of the relationship is vivid. There is a negative associationship between the export and the exchange rates of Japanese Yen, Indian Rupees and Sterling Pound and there is a direct associationship between the export and the exchange rates of French Frank and US dollar. There is a significant and empirical relationship between the export and US dollar because one percent of increase in exchange rate of US dollar increases the exports by 1.33 percent. And also one percent of increase in exchange rate of French Frank increases the export by 0.38 percent. The more the value of Sri Lanka Rupee per unit of foreign currency (exchange rate) in connection with US dollar, the more is the export in Sri Lankan context empirically. Currency depreciation or devaluation in relation to the US dollar motivates the export earnings of Sri Lanka because the power of US dollar to purchase the Sri Lanka Rupee increases. And at the same time, imports to Sri Lanka decreases due to the currency depreciation. The same findings can be applied to the exchange rate of French Frank. But the more is the value of other exchange rates of Indian

Rupee, Japanese Yen and Sterling Pound per unit of Sri Lanka Rupee, the less is the export and vice versa. When the value of these exchange rates increases, the export decreases by various quantities. The depreciations or devaluation of Sri Lankan currency is detrimental to the exports empirically with the comparison of US dollar and French Frank in Sri Lankan context.

## **Recommendation**

The policy makers and economic analysts in Sri Lanka can be directed and guided to understand these empirical results statistically. The ways to improve and increase the exports of Sri Lanka can be identified by them by understanding the trend of the value of Sri Lankan Rupee per unit of various types of foreign currencies. To adjust the Balance of Payment deficit, depreciation or devaluation of US dollar or French Frank is effective in the arena of international trade. The guideline that the depreciation of US dollar is more effective than the depreciation of French Frank to increase the export of Sri Lanka is found in this empirical study to the policy makers, economic analysts and the government of Sri Lanka.

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