AN ECONOMETRIC ANALYSIS BETWEEN EXCHANGE RATE REGIMES AND ECONOMIC GROWTH IN SRI LANKA

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Abstract

This study aims to examine the relationship between the exchange rate regime and economic growth of Sri Lanka using annual time series data which covers the period from 1980 to 2017 empirically. ADF method has been used to check stationary. Vector Autoregressive model has been used to select a lag length for the data. Johansen Cointegration test used to determine the long-run relationship between variables. For the dynamic stability of long-run equilibrium Vector Error Correction Model (VECM) has been used to find out whether the error term of long-run equations has adjusted to converge towards long-run equilibrium and its speed of adjustment. Results of this study demonstrate that all variables are non-stationary at the level, however, becomes stationary at first difference. Vector Autoregressive model suggested one lag that has been used throughout the econometric analysis. Johansen Cointegration results explain that there exists a long-run relationship among variables under study. According to the long run VECM model, results have identified that exchange rate and inflation are negatively related to economic growth in Sri Lanka. Further, this study explains that there is a positive relationship between the exchange rate regimes and economic growth of Sri Lanka in the long run. This study concluded that independent floating regime has a positive impact on GDP of Sri Lanka than the managed floating regime. Hence, this study suggests that Sri Lankan government want to control the government intervention in determining the exchange rate, as well as they want to give the full freedom to the market to determine the exchange rate.

Keywords: ADF test, Economic growth, Exchange rate regimes, inflation and Johansen Co-integration

1. Introduction

Economic growth is an increase in the production of economic goods and services, compared from one period of time to another. It can be measured in nominal or real (adjusted for inflation) terms. Traditionally, aggregate economic growth is measured in terms of gross national product (GNP) or gross domestic product (GDP), although alternative metrics are sometimes used (Kunset, 2006). The factors affecting economic growth can be the determinants of the value of particular currency for in order to another. Exchange rate is the value of the national currency in terms of another country's national currency.

Increasing trend of the Exchange rate indicates the currency depreciation. Currency depreciation is one of the monetary issue most of the countries are facing today. Even it is a serious issue, it makes the trade balance favorable, moves the balance of payment towards the surplus and boosts the country's economy.

Although, Sri Lanka is experiencing currency depreciation since 1977 it is unable to experience the benefits of the depreciation. Contrastingly, it is recording the deficits in the trade balance and balance of payment. As well as exchange rate is allowed to depreciate itself in order to solve the balance of payment deficit problem. Since Sri Lanka faces the difficulties in accumulating the internal resources of the country in order to finance the deficits.

Sri Lanka's economy grew only by around 3.1% in 2017 and in 1970, an American dolor was transacted for Rs.5.95 Sri Lankan rupees which increased as Rs.40 after two decades from 1970. But Sri Lankan Rupee reached an all-time high of 183 in December of 2018 and a record low of 93.87 in September of 2003 (Trading Economics, 2019).

On the contrary, Balance of payment deficit and budget deficit makes the foreign reserves to decline. Decreasing foreign reserve worsens the currency depreciation more and more. Currency depreciation leads to increase the value of interest rate than the real value. As a result, real value of debt servicing will be higher than value of debt. Due to this consequence, Sri Lanka facing a difficulties to growing an economy. Therefore there is a deep relationship between Exchange rate and aggregate output of a country. So, this study empirically examines the relationship between exchange rate regimes and economic growth in Sri Lanka as an objective.

2. Literature Review

Based on the theories, Exchange rate should be effect the long run economic growth may positive or negative. And past studies also reflected this results from various countries. The relationship between exchange rate volatility on economic growth analyzed using 1985 – 2015 data from 45 developing and emerging countries Findings suggest that the generalized autoregressive conditional heteroskedasticity-based measure of nominal and real exchange rate volatility has a negative impact on economic growth. Also, the effect of exchange rate volatility depends on the exchange rate regimes and financial openness, that is, volatility is more harmful when countries adopt flexible exchange rate regimes and financial openness (Achouak Barguellil, Ousama Ben-Salha, Mourad Zmami, 2018).

And Doğanlar (2002), Servén (2003), Demir (2010), Belke and Gros (2001) Studies were also found negative effects of exchange rate volatility on some macroeconomic aggregates that may affect economic growth such as international trade, investment, and employment. According to the Bosworth et al. (1995) the determinants of economic growth in 88 developed and industrial countries during the period of 1960~1992 and concluded that exchange rate negatively affects output growth. So above data strongly stated the adverse relationship between Exchange rate and Economic growth. The research done by Arslan Ahmad et al. (2013) using time series data for the period of 1975-2011in Pakistan said to be that there is a positive relationship between Exchange rate and Economic growth. The results of OLS show that significant affect economic growth of Pakistan. Exchange rate coefficient is -0.5504 that means one percent increase in exchange rate will reduce GDP by 0.55 percent. Nisthar & Mustafa (2019) analyzed the Impacts of Exchange Rates on Imports: An Empirical Study on Sri Lankan context used by using the time series data in this study periods from year 1950 to year 2017 and Granger Causality Test is used to find out the causal relationship among all the variables. The Johansen Co-Integration Test is used to find out long run equilibrium relationship among the variables.

Vice versa, Past studies said there is a positive relationship between Exchange rate and Economic growth. Studied of Ghana by Peter Yeltulme Mwinlaaru and Isaac Kwesi Ofori (2017) plotted the positive results. The study determine effect of real effective exchange rate on economic growth in Ghana using annual data from

1984 to 2014 using the ARDL co-integration estimation technique, found that real exchange rate and economic growth are co-integrated and real exchange rate exerts a positive and statistically significant effect on economic growth in both the long-run and short run. Thus, there is the need to ensure exchange rate stability in the

Ghanaian economy to help boost economic growth. Suna Korkmaz (2013) analyzed the effect of exchange rate on economic growth by using annual data of the 2002-2011 period from nine randomly selected European countries, by doing panel data analysis. As a result of the study, it has been found that there is causality from exchange rate towards economic growth for the nine European countries.

3. Methodology

This study is explained through secondary data which are collected from secondary sources. The data used in this study is annual time series data which covers the period from 1980 to 2017. The date were directly obtained from the annual report of Central Bank of Sri Lanka and a popular statistics database website called Knoema.

This study empirically examines the relationship between exchange rate and economic growth in Sri Lanka. In this study, GDP per capita (GDPPC) is dependent variable. Investment (INV), Trade openness (OPN), Consumer Price Index (INF), Human Development Index (HDI), trade balance (GTB), nominal exchange rate (EXR), Managed Floating Regime (D_1) and Independent Floating Regime (D_2) are independent variables. ADF test was used to test the unit root characteristics of the time series variables. To test the serial correlation effect of the selected model. This study used the Co-integration test analysis to test the long run equilibrium relationship between variables and Vector error correction method (VECM).

$$GDPPC_t = \beta_0 + \beta_1\,OPN_t + \beta_2\,EDUC_t + \beta_3\,INV_t + \beta_4\,INF_t + \beta_5\,HDI_t + \beta_6\,GTB_t + \beta_7\,EXR_t + \alpha_1\,D_1 + \alpha_2\,D_2 + U_t$$

Where:-

GDPPC: Gross Domestic Product Per Capita (Dependent Variable)

D_1: Managed Floating Regime

D_2: Independent Floating Regime

β_0 : Intercepte

β_1, β_2, β_3, β_4, β_5, β_6, β_7, α_1, α_2: Coefficients

4. Result and Discussion

Objective of the study is examines the relationship between Exchange rate and Economic growth in Sri Lanka. To achieve this, ADF unit root test method is applied to check out the stationary properties of the data. And Vector Autoregressive model has been used to select a lag length for the data. Johansen Co-integration test used to determine the long run relationship between variables. The results of ADF are reported in Table 1.

H_0 = There is Unit Root

H_1 = There is no Unit Root

Table 1: Stationary Test Result: Using Augmented Dickey- Fuller Test

Variables	ADF Test : P. Value (Intercept only)

	Levels (Log)	First Difference (Log)
GDPPC	1.0000	0.0000*
EXR	0.9013	0.0001*
GTB	0.1516	0.0000*
OPN	0.5405	0.0000*
INF	0.9887	0.0000*
HDI	0.3845	0.0000*
INV	0.4670	0.0000*

Source: Computed in E-Views Software

ADF test implies that all the variables are stationary at their first difference with intercept which suggesting that all variables considered under this study are integrated in order one in ADF test. Before estimating this relationship need to identify the optimal lag length of the model. Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Sequential modified LR tests statistics are adapted to determine the optimal lag length. All the lag length selection criteria proposed that to use one lag as an optimal lag length for this study. Hence, one lag included into the model. The lag length selection results are provided in the Table 2.

Table 2: Results of Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	379.78	NA	392E-18	-14.50	-14.2	-14.413
1	575.12	306.1	5.63-21	-17.83	-15.52*	-17.535*
2	660.1	112.97*	3.50E-20*	-19.18	-12.7	-16.7164
3	745.21	86.75	7.39-21	-19.74*	-10.191	-16.0860

Source: Computed in E-Views Software

The trace statistics and maximum eigenvalue statistics of Johansen co-integration technique are used to identify the co-integrating relations in the system of equation at 5% level of significance. The results of Johansen Co-integration test are presented in Table 3.

Johansen Co-integration Trace test statistics is identified two co-integrating relations in the system of equation at 5% level of significance since reject null hypothesis at rank 0 and 1 but failed to reject null hypothesis at rank 2. This indicates the existence of long-run correlation between the variables. Therefore, two co-integrating relations are adopted into the Vector Error Correction Model of this study.

Table 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**

None *	0.567231	145.5318	125.7757	0.0017
At most 1 *	0.432544	99.89211	95.76871	0.0252
At most 2	0.363456	69.79931	69.81434	0.0711
At most 3	0.307141	45.85601	29.73162	0.0871
At most 4	0.252798	10.97803	15.46460	0.1289
At most 5	0.010421	0.0726774	3.841466	0.7136

Source: Computed in E-Views Software
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

According to table 4 , the estimated model in long run can be written as follow:

$$LGDPPC_{t-1} = 9.8 - 0.31 LOPN_{t-1} - \mathbf{1.21 LEXR_{t-1}} + 0.014 GTB_t - \mathbf{1.2\ INF_{t-1}} + 0.117\ HDI_{t-1} + \mathbf{0.02\ D_1} + \mathbf{0.01\ D_2}$$

$$(-1.2545) \qquad \mathbf{(-4.28)} \qquad (0.629) \qquad \mathbf{(4.074)} \qquad (0.805) \qquad \mathbf{(3.1)} \qquad \mathbf{(3.10)}$$

First, the results of Johansen Co-integration in long run investigated two co-integrating relations which confirmed the long-run relationship among the regressions. It shows that the increase in exchange rate has a positive and significant long-run relationship with GDP per capita. When the exchange rate increases by 1 unit that should be increased the GDP per capita by 9.8 units while other variables are holding constant at 5% level of significance.

According to the findings, trade openness shows the negative relationship while trade balance and HDI show the positive relationship with GDP respectively. Even though, those variables have not significant impact on the GDP of Sri Lanka. At the same time, inflation has a negative and significant impact on GDP. It implies that other factors are remaining constant, while inflation rate of Sri Lanka increases by 1 percent, GDP will decrease the 1.2 percent in long run. Further, exchange rate has a negative and significant impact on GDP. Therefore, while other factors are constant, when exchange rate increases by 1 percent, GDP will decline by the 1.21. But, this finding is opposite to the economic theories. Because currency devaluation will increase the demand for export goods and leads to increase in export. Further, it decreases the import through decline the purchasing power of import goods. Consequently, increase in the net export will lead to an increase in GDP. Even though, research finding of this study shows the significant and negative impact on GDP. Because in Sri Lanka majority of export goods depends on the import raw materials. Export is higher than the import in Sri Lanka. Therefore, net export always shows a negative value. Hence, this leads to fall in GDP in Sri Lanka. This is the reason why exchange rate has a negative relation with GDP in Sri Lanka.

Moreover, managed floating regime (D1) and independent floating regime (D2) show the positive and significant relation on GDP in the long run. Hence, this finding implies that the exchange rate regime has a positive and significant relationship with GDP of Sri Lanka. Other factors are remaining constant, while government adopt the managed floating regime and independent floating regime, GDP will rise by the 0.01 percent and 0.03 percent in Sri Lanka. But, coefficient of managed floating regime is higher than the coefficient of independent floating regime [D1 (0.01) < D2 (0.03)]. Hence, this study concluded that independent floating regime has a positive impact on GDP of Sri Lanka than the managed floating regime.

Table 4: Result of Long Run Adjustment

Error Correction:	D(LGDPPC)	D(LOPN)	D(LEXR)	D(LGTB)	D(LINF)	D(LHDI)	D(LINV)
CointEq1	-0.037	0.230	0.152	-2.518	0.1850	-0.076	0.6914
	[-1.9145]	[1.91]	[1.04]	[-0.76371]	[2.524]	[-0.581]	[5.94945]

Source: Computed in E-Views Software

The table 4 denotes the coefficients of speed of adjustment which explain how the above model is adjusted towards long-run equilibrium. There is a negative and significant adjustment towards the long-run equilibrium between exchange rate and balance of payment of Sri Lanka. Error correction coefficient (-0.03) of exchange rate reveals that 0.3% (less than 1%) disequilibrium is corrected by each year one period after the shocks which implies that exchange rate moves downward towards the long run equilibrium path while error correction coefficient of GDP per capita. Further, HDI and Trade balance moves downward towards the long run equilibrium path while error correction coefficient of GDP per capita. And trade openness, inflation rate move upward towards with long run equilibrium path in each year one period after the shocks. Therefore, Johansen co-integration long run relationship, Long run equilibrium and short run relationship of the error correction model resulted there is a positive and statistically significant relationship between GDP per capita and exchange rate in Sri Lanka.

5. Conclusion

The purpose of present research is to examine the relationship between exchange rate regimes and economic growth of Sri Lanka. To review the short and long causal relationship among different variables, this study has used annual data started from 1980 to 2016 obtained from world development indicators of World Bank and the Annual Report of Central Bank of Sri Lanka.

ADF method have been used to check stationary. Vector Autoregressive model has been used to select a lag length for the data. Johansen Cointegration test used to determine the long run relationship between variables. For the dynamic stability of long-run equilibrium Vector Error Correction Model (VECM) has been used to find out whether the error term of long-run equations has adjusted to converge towards long-run equilibrium and its speed of adjustment.

Results demonstrate that all variables are non-stationary at the level, however, becomes stationary at first difference. Vector Autoregressive model suggested one lag that have been used throughout the econometric analysis. Johansen Cointegration results explain that there exists a long run relationship among variables under study. Based on the satisfactory preconditions, VECM model applied, and their results implies a long run dynamic stability. According to the long run VECM model, results has identified that exchange rate and inflation are negatively related with economic growth in Sri Lanka. Further, this study explain that there are positive relationship between the exchange rate regimes and economic growth in the long run.

6. Recommendation

As a developing country Sri Lanka, borrowed loans from China and Japan to finance the budget deficit in US dollar. Therefore, due to the currency depreciation against to the US dollar, Sri Lankan government has to pay back more interest rate. This leads to the debt burden. Hence, this study suggested that Sri Lankan government can use the exchange rate policies only for the short term. In the long term it seems impossible. Further, Sri Lankan government want to control the government intervention in determining the exchange rate, as well as they want to give the fully freedom to the market to determine the exchange rate.

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