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Dynamics of Trade Openness in Sri Lanka

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ABSTRACT

In Sri Lanka, even it was verbally confirmed that the trade openness occurs the wonder on the economy of Sri Lanka, which was not statistically proofed. This study was to test the trade openness dynamics of the economic growth in Sri Lanka using annual time series data over the period of 1975 to 2014. In this study the following variables were used as variables gross domestic product, which was the proxy variable of the economic growth, the trade openness and the money supply. Furthermore, in order to test the long run relationship between the variables, the Johansen cointegration technique was employed while, the VECM technique was employed to test the short run behaviour of the trade openness. In this study, both techniques confirmed that the trade openness negatively and significantly had the long run relationship with the economic growth. While, the lag values of the trade openness in short run period, jointly had not impacted on the economic growth over the sample period. Finally, this study recommended to the government of Sri Lanka that the export should be increased when they formulate the trade development policy.

Keywords: Trade openness, Money supply, Gross Domestic Product, Sri Lanka

1. INTRODUCTION

Indeed, among the Sri Lankan people, the trade openness provides a new experience from 1977 because the Sri Lankan government liberalized its economy in the later part of 1977. After the liberalization, the geographical border of Sri Lanka which had been opened to enter other countries into Sri Lanka for economical purposes. By this reason, Sri Lanka

continuously feels both positive and negative experiences. However, economically Sri Lanka has been gathered lot of positive experiences.

Development economists argue that the trade openness promotes the economic growth through supply and demand concepts. In order to support of their argument, they have taken the evidences from lot of trade liberalized countries after the 1960s. But in Sri Lanka, even though the government liberalized its economy, its impacts were not numerically confirmed. In the meantime, the governing authority verbally delivers that the trade openness positively effect on the economy but they haven't evidences. Therefore, it is time to test whether the trade openness positively or negatively effect on the economic growth in Sri Lanka.

In most of countries, the relationship between the trade openness and economic growth were well documented and got mixed results. Most of them found that the trade openness positively impact on the economic growth while others argued that the trade openness negatively impact on the economic growth. Positive viewers say that the trade openness calls the foreign direct investment, scholars, new technology, new durable and non- durable goods from other developed or developing countries. On the other hand, negative viewers light that the trade openness promotes the inflation, multi dimensions abuses, effect on the local industries, etc. However, most of the academics confirmed that the trade openness induces the economic growth. Therefore, in Sri Lanka the relationship between the trade openness and economic growth are wanted an econometric study reading the mentioned relationship. In this circumstance, this study covers the following subsections: introduction, objective, review of literature, methodology, results and discussion, and conclusion with recommendations.

Objective

The objective of this study is to analysis the dynamics of trade openness on the economic growth in Sri Lanka.

2. REVIEW OF LITERATURE

In order to extend the study in Sri Lankan context, the following literatures, which were conducted in several trade openness countries, were considered. In those studies, they got mixed conclusion that mean some of them summarized the trade openness positively effect on the economic growth. While, some of them concluded that the trade openness negatively impact on the economic growth. However, both scholars are utilized as reviews to extend this study.

In the positive sense, [4] in China conducted a study to test the impact of trade openness on the economic growth. They concluded that the trade openness positively and significantly effect on the economic growth in China. [5] emphasized in his study, the trade openness accelerates the economic growth in East Asian countries. In order to test the relationship he used the panel data which were collected from some sample countries. [3] conducted a study to investigate the connection between the trade liberalization and economic growth using Malaysian experience. In this study, the author concluded that the trade liberalization positively effect on economic growth. In the meantime, [6] concluded that the trade promotes the economic growth in the short run period, but in long run period it does not exit. So as to test the relationship, he used the Auto Regressive Distributed Lag technique. [2,9] summarized that the trade openness positively effect on the economic growth.

Meanwhile, [1] found that the trade openness negatively effect on the economic growth in Pakistan. [7] confirmed that the trade openness significantly and negatively impact on the economic growth, which confirmed by using the Johansen cointegration technique. Likewise, [8] found that the trade openness maintains an inverse relationship to the economic growth of Pakistan.

In the empirical analysis, among the trade openness and economic growth, they got both positive and negative results using different techniques, namely, Ordinary Least Square technique, Vector Autoregressive Lag model, Johansen cointegration and the Auto Regression Distributed Lag bound testing approaches. However, in their studies, they considered outdated data and did not touch the relationship between the trade openness and economic growth in Sri Lankan context. Thus, in Sri Lanka it is needed a study regarding the relationship between the trade openness and economic growth. Because, even though Sri Lanka opened the trade barriers in the later part of 1977 which was not econometrically studied, but the annual report of the Central Bank of Sri Lanka descriptively says that the trade openness in Sri Lanka factually impact on the economic growth. Accordingly, this is a gap of this topic in Sri Lanka. Therefore, this study goes to full fill the existing issues between the trade openness and economic growth.

3. METHODOLOGY

In this study, the annual time series data during the period of 1975 to 2015 for the following variables: gross domestic product, trade openness, broad money supply (M_2) were used to test the objective, which were gathered from the annual reports of relevant years. In this study the gross domestic product was considered as dependent. While, the trade openness was deemed as key independent variable and the broad money supply was measured variables. The literatures in this study clearly described the connection between the trade openness and gross domestic product. Thus, this study also delivers the connection between the variables as follows;

$$GDP_t = f(TOD_t, MS_t)$$

when the following relationship between the variables are extended into the econometric equation, which is written as follows;

$$GDP_t = \tau_0 + \tau_1 TOD_t + \tau_2 MS_t + \varepsilon_t$$

In order to make an easy calculation, the general econometric equation in this study is transformed into natural logarithm, which is written as;

$$\ln(GDP_t) = \tau_0 + \tau_1 \ln(TOD_t) + \tau_2 \ln(MS_t) + \varepsilon_t$$

where: GDP_t is gross domestic product, TOD_t is trade openness and MS_t is broad money supply

In order to achieve the objective of this study, the following analytical techniques such as unit root test, cointegration test and vector error correction techniques were employed.

In this study to test the stationarity of the variables the Augmented Dickey Fuller (ADF) test was applied because most of the literatures used the ADF test for knowing the stationary position of the variables. Therefore, this study also followed the ADF test for identifying the stationarity of the variables. The ADF test has three different forms with different types of null hypothesis, which are defined as follows;

1. X_t is random walk:

$$\Delta X_t = \partial X_{t-1} + \mu_t$$

2. X_t is random walk with drift:

$$\Delta X_t = \alpha_0 + \partial X_{t-1} + \mu_t$$

3. X_t is random walk with drift and trend:

$$\Delta X_t = \alpha_0 + \alpha_1 t + \partial X_{t-1} + \mu_t$$

In empirical research, if the variable has more than one lag the random walk with drift and trend model is written as follows;

$$\Delta X_t = \alpha_0 + \alpha_1 t + \partial_1 X_{t-1} \dots\dots\dots\dots \partial_k X_{t-k} + \mu_t$$

Thus, this model is reduced as;

$$\Delta X_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{k} \partial X_{t-i} + \mu_t$$

In order to select the optimum lag equation, this study used the Akaike Information Criterion (AIC) and Schwartz Bayesian Information Criterion (SBIC). The appropriate order of the model was determined by computing cointegration equation over a selected grid of values of the number of lags. Both AIC and SCBIC equation are written as;

AIC = T log (sum of square of residuals) + 2n

SBIC = T log (sum of square of residuals) + n log T

where: n is the number of estimated parameters and T is the number of usable variables

As stated earlier, to test the long run relationship between the variables the Johansen and Juselius cointegration test was employed, which is written in the matrix forms:

$$\begin{pmatrix} \Delta Y_t \\ \Delta X_t \\ \Delta W_t \end{pmatrix} = \Gamma_1 \begin{pmatrix} \Delta Y_{t-1} \\ \Delta X_{t-1} \\ \Delta W_{t-1} \end{pmatrix} + \pi \begin{pmatrix} Y_{t-1} \\ X_{t-1} \\ W_{t-1} \end{pmatrix} + e_t$$

Therefore, the long run relationship between the trade openness and economic growth in Sri Lanka was tested using above cointegration VAR model. This cointegrating vector was derived from two likelihood ratio tests, namely, Trace test and Maximum Eigen value test.

Both approaches are limited as;

1. Trace test

$$\lambda_{trace} = -2 \ln Q = -T_i \sum ln(1 - \lambda_t)$$

2. Maximum Eigen value test

$$\lambda_{Max} = -2 \ln(Q:r|r + 1) = -Tln(1 - \lambda_{t+1})$$

Trace statistics investigates the null hypothesis of "r" cointegrating relations against the alternative of "n" cointegrating relation , where n is the number of variables in the system for r = 0, 1,…… n-1.

Maximum Eigen value investigates the null hypothesis of "r" cointegrating vectors are tested against the alternative hypothesis of "r+1"cointegrating vectors.

After identifying the number of cointegration equation, the vector error correction model was employed to test the long run model among the dependent and independent variables and the short run disequilibrium. For this purpose, this study considers the following Vector Auto Regressive (VAR) model with different lags. The VAR model with different lags is written as follows;

$$Y_t = V + A_1 Y_{t-1} + A_2 Y_{t-2} \dots\dots\dots\dots A_i Y_{t-i} + \mu_t$$

where; Y_t is a (K x1) vector variable, V is a (Kx1) vector of parameters. A_1……. A_i are (KxK) matrices of parameters and μ_t is a (Kx1) vector of disturbances having zero mean and sum of covariance matrix is identically and independently distributed over a time. Any VAR model can be rewritten as vector error correction by using some algebra which can be expressed as;

$$\Delta Y_t = V + \Pi Y_{t-1} + \sum_{i-1}^{p-1} \Phi_i + \Delta Y_{t-i} + \mu_t$$

where; $\Pi = \sum_{j=1}^{p} A_j - I_k$ and $\Phi_i = -\sum_{j=i+1}^{p} A_j$

If cointegration between the independent and dependent variables has been identified, the Vector Error Correction Model (VECM) can be applied to test the short- run properties of

the identified cointegration equation. After evaluating the VECM, in order to test the autocorrelation effect between the variables using the vector error correction model the study used the Breusch – Godfrey Serial correlation LM test. While, the Breusch-Pagan-Godfrey was used to test the Heteroskedasticity among the variables of the estimated model. Furthermore, so as to test the normality test of the residuals of the estimated model Jarque – Brea test was employed. Thus, this study organized lots of techniques which discuss above paras.

4. RESULTS AND DISCUSSION

In order to confirm the visual pattern among the trade openness and gross domestic product, the confidential Ellipse is used, which show as follows;
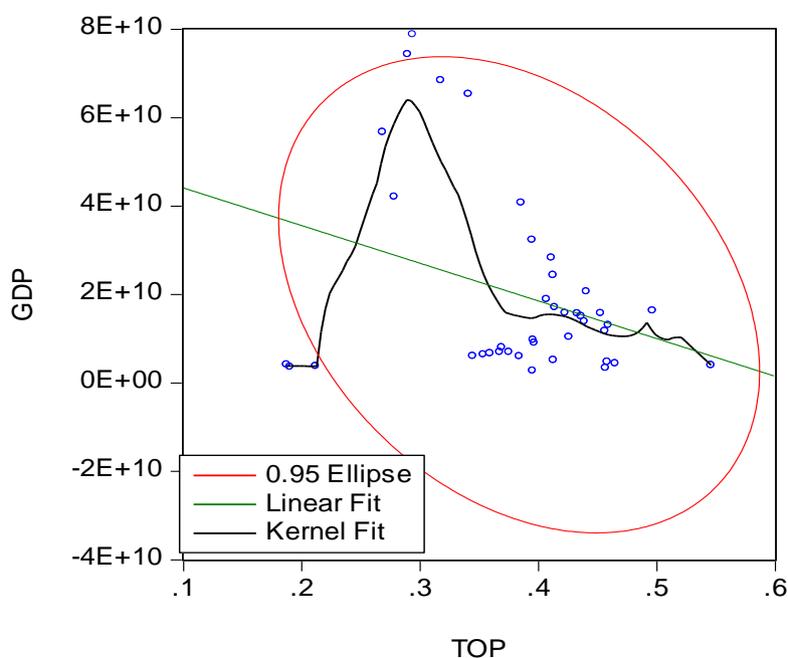

Figure 1. The confidential ellipse between the variables
Source: E-view software

Based on the Figure 1, it is confirmed that the trade openness and gross domestic product are negatively correlated among them at 95 percent confidential level over the sample periods, because the regression line between the trade openness and the gross domestic product shows an inverse relationship (see Figure 1). In the meantime, most of the literature in this study concluded that the trade openness and gross domestic product maintain the positive relationship among them. But in Sri Lankan case, it says that the trade openness negatively effect on the economic growth from 1975 to 2015. This situation would be happened with numbers of reasons which will be discussed in the conclusion part. Furthermore, in this study to know the hidden features of the variables, the descriptive statistics of the variables are employed. The following table shows the descriptive statistics of the variables.

Table 1. Descriptive statistics

Variables	Mean	Median	Max	Min	Std. Dev.	Observation
GDP MS TOP	10.0994 1.51805 0.38359	10.0918 1.51613 0.39621	10.8966 1.62034 0.54578	9.43666 1.25406 0.18730	0.4142 0.0774 0.0797	40

Source: Calculated from secondary data

In Sri Lanka the trade openness represents 0.38% of gross domestic product over the sample period. After liberalizing the economy in Sri Lanka, the trade openness is less volatile, which is confirmed by the standard deviation of the trade openness and others (see Table 1). Because, the trade openness has less standard deviation compared to GDP. For easy comparing the volatility, the standard deviation of variables are diagrammed in the following figure.
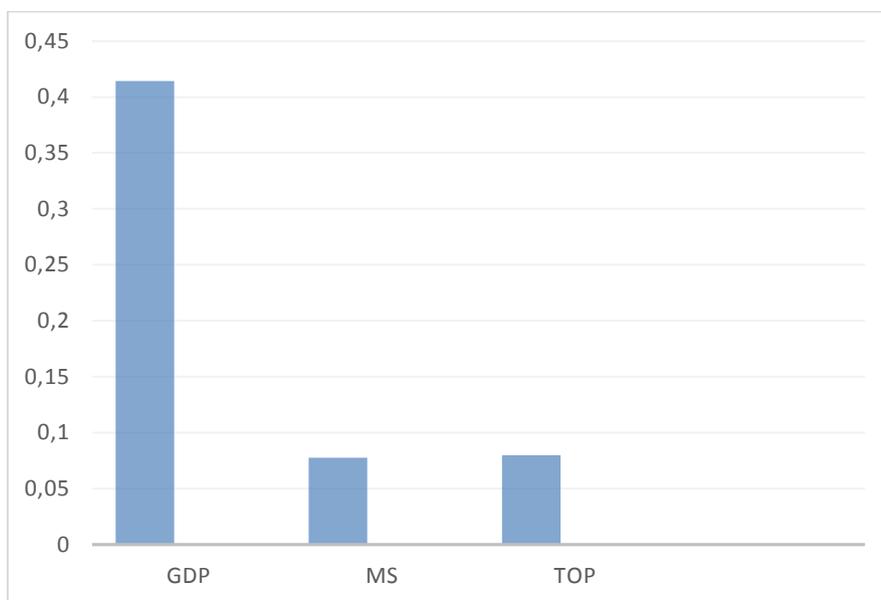

Figure 2. Volatility of the variables
Source: Calculated from secondary data

As mentioned in the research method, in order to test the integrated order of the variables, this study examines the stationarity of the variables by using Augmented Dickey Fuller unit root testing approach. The following table shows the cointegration position of the each variable.

Table 2. Integrated order of the variables

Variables	Level			1st difference		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
GDP	[5.462414] (-2.938987)	[1.860651] (-3.529758)	[7.683962] (-1.949609)	[-1.095266] (-2.945842)	[-5.137534] (-3.533083)	[-0.390969] (-1.950394)
MS	[-3.102833] (-2.938987)	[-2.909383] (-3.529758)	[0.936334] (-1.949609)	[-6.530530] (-2.941145)	[-6.724141] (-3.533083)	[-6.353238] (-1.949856)
TOP	[-2.628360] (-2.938987)	[-2.588676] (-3.529758)	[-0.240267] (-1.949606)	[-5.451354] (-2.941145)	[-5.752223] (-3.533038)	[5.512547] (-1.949856)

[ ] denotes the Augmented Dickey Fuller test statistic, ( ) denotes the test critical value in 5%
Source: Calculated from secondary data

Based on the Table 2, in order to test the stationarity of the variables the intercept and trend position of the Augmented Dickey Fuller formula is considered. In this sense, all the variables in this study integrated at fist difference. Thus, by the reasons of all variables are integrated in same order, this study uses the Johansen cointegration technique to test the long run relationship between the variables.

Table 3. Johansen Cointegration test statistics

Unrestricted Cointegration Rank Test (Trace)			
Hypothesized No. of CE (s)	Trace statistics	0.05 critical value	Probability value
H_0: r = 0*	36.28383	29.97707	0.0078
H_0: r ≤ 1	9.822343	15.49471	0.2946
H_0: r ≤ 2	0.582222	3.841466	0.4454
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)			
Hypothesized No. of CE(s)	Max -Eigen Statistics	0.05 critical value	Probability value
H_0: r = 0*	26.46149	21.13163	0.0081
H_0: r ≤ 1	9.240120	14.26460	0.2667
H_0: r ≤ 2	0.582222	3.841466	0.4454

Source: Calculated from secondary data
*Indicates cointegration vectors

In order to test the long run relationship between the trade openness and the gross domestic product, this study uses the Johansen cointegration technique. Based on this technique, Table 3 shows the Trace and Maximum Eigenvalues which has one cointegration equation. Because both tests indicate that the probability values of one equation has a lower value (P < 0.05). Therefore, the long run model is as:

Table 4. Long – run model and its outputs.

Variables	Coefficient	Standard errors	t- statistics
Log (MS)	6.590247	0.47385	13.9078
Log (TOP)	-4.431991	0.58342	-7.59657
$$\log(GDP) = -4.049 - 4.43\ln(TOP) + 6.590\log(MS)$$			

Source: Calculated from secondary data

The long run model indicates that the trade openness negatively maintains the relationship with the gross domestic product. Therefore, this study concludes that the trade openness have long run positive association with the gross domestic product in Sri Lanka.

Having found the long run model of cointegration equation, this study moves to find out the short run model or error correction model. By the reason of one vector cointegrated, this study uses the Vector Error Correction Model (VECM) to find the short run model. The following table indicates the details of the error correction model.

Table 5. Results of Vector Error Correction Model.

Variables	Coefficient	Standard Error	t- statistics
CointEq1	-0.102647	0.05414	-1.89603
D(GDP(-1))	0.341144	0.19332	1.76465
D(GDP(-2))	0.224104	0.15842	1.41462
D(GDP(-3))	0.161353	0.17830	0.90494
D(GDP(-4))	0.129899	0.17160	0.75697
D(MS(-1))	-0.090528	0.34423	-0.26299
D(MS(-2))	-0.254380	0.28985	-0.87761
D(MS(-3))	-0.343923	0.27811	-1.23663
D(MS(-4))	-0.149214	0.22155	-0.67349
D(TOP(-1))	0.115180	0.24982	0.46105
D(TOP(-2))	0.323981	0.17594	1.84145

D(TOP(-3))	0.148211	0.14225	1.04191
D(TOP(-4))	0.122360	0.12586	0.97217
Constant	0.019878	0.03318	0.55905

Source: Calculated from secondary data
(All Variables are in natural logarithm)

Having got the VECM model this study test that the explored model is suffering from Serial Correlation. In order to test the serial correlation effect, this study uses the Breusch – Godfrey Serial correlation LM test. The following table shows the serial correlation LM test of the explored model.

Table 6. Breusch – Godfrey Serial correlation LM test.

F – statistic	0.455331	Prob. F(4,17)	0.7673
Obs* R- Squared	3.386920	Prob. Chi- Square (4)	0.4953

Source: Calculated from secondary data

In the Table 4, the serial correlation LM test statistics are shown, here the observed R-squared probability value is 0. 4953 which is greater than 0.05 critical values. Therefore, this model is not suffering from the serial correlation effect.

After testing the serial correlation effect, this study confirms that the lag periods of the trade openness in the short run model using the Wald test. The following table shows the outcome of the Wald test.

Table 7. Outcome of Wald test.

Test Statistics	Value	df	Probability
F- statistic	1.127312	(4, 21)	0.3705
Chi – Square	4.509247	4	0.3415

Source: Calculated from secondary data

So as to test the short run behaviour of the trade openness, this study uses the Wald test and formulates the following null and alternative hypothesis. The null hypothesis is that all lag periods of trade openness jointly do not influence on the gross domestic product in the short run period. The alternative hypothesis is that the all lag periods of trade openness jointly influence on the gross domestic product in the short run period. In this study based on the outcome of Walt test, the null hypothesis is accepted because the probability value of the

Wald test is 0.34 which is less than 5% significant level. Thus, the lag periods of trade openness in short run model jointly do not influence on the gross domestic product in Sri Lanka (see Table -5 for knowing the lag period of trade openness in VECM).

In this study, the Breusch-Pagan-Godfrey is used to test the Heteroskedasticity of the estimated model. The following table shows the outcome of Breusch-Pagan-Godfrey Heteroskedasticity test.

Table 8. Heteroskedasticity Test: Breusch-Pagan-Godfrey.

F-statistic	0.450513	Prob. F(15,19)	0.9389
Obs*R-squared	9.182470	Prob. Chi-Square(15)	0.8678
Scaled explained SS	1.979208	Prob. Chi-Square(15)	1.0000

Source: Calculated from secondary data

Finally, so as to test the normality of the residual, the Jarque – Brea test is employed. The following diagram and schedule show the position of the normality of residuals of estimated model.
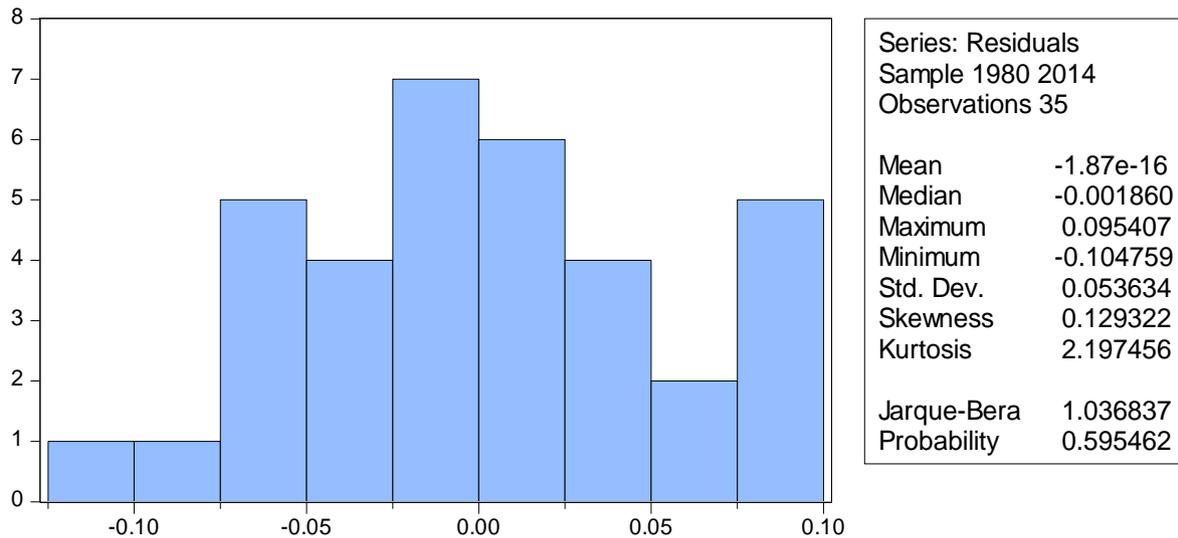
Figure 3. The residual normality test

Figure 3. The residual normality test
Source: Calculated from secondary data

Based on this test, this study formulates the following null and alternative hypotheses. The null hypothesis is that the residual does not normally distributed and alternative hypothesis is that the residual normally distributed. Thus, in this study the p- value is 0.595

which is greater than the 5% significance level. Therefore, this study concluded that the residual of the estimated model is normally distributed.

5. CONCLUSION AND RECOMMENDATION

In order to test the log nun relationship between the trade openness and economic growth, this study used the Johansen cointegration techniques of dealing time series data during the period of 1975 to 2014. In this study some pre- test for cointegration analysis were conducted and this study finally concluded that the trade openness negatively moves with the gross domestic product in the long- run period. In the meantime, the lag values of the trade openness in short run period were not jointly influence on the gross domestic product. Thus, this study summarized the reasons for taking the negative relationship between the trade openness and gross domestic product that the import costing are greater than the export earnings. Therefore, this study advice to the government of Sri Lanka that the exports have to be increased rather than increasing the imports.

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