

# An Empirical Analysis of the Twin Deficits Evidence from Sri Lanka

S. Sivarajasingham\*

N. Balamurali\*\*

## Abstract

*This paper explores the empirical relationship between budget and current account deficits in the case of a small developing country, Sri Lanka for the period of 1960-2010. The data are collected from annual reports, Central Bank, Sri Lanka. The econometric methods used in this study are co-integration technique, Error correction modeling and Granger causality analysis. The empirical results are consistent with conventional view. Our empirical results clearly suggest that there exist statistically significant long-run positive relationship between the trade deficit and the budget deficit in Sri Lanka. The Granger causality test shows that the direction of causality runs from the budget deficit to the trade deficit and the relationship is positive and statistically significant. The empirical analysis in this study partially supports the Keynesian view that there is a linkage between the trade deficit and the budget deficit and the direction of causality is correct but the Ricardian equivalence hypothesis is not valid for Sri Lankan economy during the study period.*

**Keywords:** Twin deficit, Ricardian equivalence, co-integration error correction models, Granger Causality test.

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\* S. Sivarajasingham is a Senior Lecturer at Department of Economics & Statistics, University of Peradeniya, Peradeniya, Sri Lanka.

\*\* N. Balamurali is a Visiting Lecturer at Vavuniya Study Centre, The Open University of Sri Lanka.

## Introduction

The current account deficits and the budget deficits have been an important feature of the Sri Lankan economy. Central bank reports provide that current account deficits and the budget deficits have been more than three decades in Sri Lanka. The budget deficit was growing exponentially along with a current account deficit since in the late 1950s. These deficits occurred concurrently with acute macroeconomic imbalances and indebtedness. Indeed, national income accounting identities guarantee that budget deficits must create either an excess of private saving over investment or an excess of imports over exports. These two deficits are closely and perhaps even causally related. The correlation coefficient between these two variables is about 0.6 and it is also statistically significant ( $p=0.00$ ) Twin-Deficit hypothesis—the hypothesis suggests that a larger fiscal deficits through its effect on national saving and consumption, leads to an expanded current account deficit. The identity will be a misnomer in many circumstances since there is no reason that "twin" deficits need always appear together on these two national accounts. In fact, some countries will, at times, experience a deficit on one account and a surplus on the other. (Japan in 2000). Also, at times, a country will experience a surplus on both accounts.

These continuous deficits in a country like Sri Lanka motivated the researchers to examine the relationship between these twin deficits.

These persistent deficits become a major cause of concern to researchers, policy makers in Sri Lanka. These twin deficits are related to the internal and external economic stability of the economy, interest rate, exchange rate.

The close correlation observed between these two deficits does not imply any causal relation between the two. Therefore, identifying the causal relation between these deficits is important and would have different policy implications. Theoretically, there are four possibilities about the relationship between budget deficit and trade deficit. The first one is called the Twin Deficit Hypothesis. According to this, budget deficit has positive and significant effect on trade deficit or the main cause of trade deficit is the excessive budget deficit. Even though theoretically not very well explained reverse of this relationship is also possible i.e trade deficits might also be mutually interdependent. Finally, the alternative to all these three possibilities is that there exists no relationship between the two deficits: They are independent. Issues relating to fiscal deficits, public debt and trade deficit have been an intense area of research among economists for the last five decades. The dramatic increases in both the budget and trade deficits, widely known as the "twin deficits phenomenon" have led many scholars to examine the possibility of a relation between the two (Feldstein 1992, Virmani 2001).

Like many other development countries, Sri Lanka has been experiencing both trade deficits and budget deficits since the fifties. Successive budget deficits and the accompanying trade deficits during the period 1957-1960 resulted in a rapid depletion of foreign exchange reserves causing a serious foreign exchange problem for the country, which lasted till the 1977 economic reforms. However, since then budget deficits have once again begun to exert pressure on the external payment position. It is worth noting here that a part of the trade deficits in the post-1977 period were also the outcomes of the country's attempt to absorb large doses of foreign capital. It is also worth noting that there have been few studies on the subject of budget deficits<sup>1</sup> and related issues in Sri Lanka (such as Colombage 1991; Premaratne 1983) and this issue has received some attention from IMF and the World Bank in their analysis of Sri Lanka's economic problems over much of the post-independence period. However, since most of the empirical studies on the twin deficits have focused on the developed countries there have been very few empirical studies on developing countries examining such an issue (such as Akbostanci and Tunc 2002; Alkswani 2000; Islam 1998). Akbostanci and Tunc (2002) used the error correction model and the co integration methodology to examine the linkages between budget deficit and trade deficit for Turkey during the period 1987-2001. The study concludes that

the twin deficits hypothesis holds, and the Ricardian equivalence hypothesis is not valid in the case of Turkey. Therefore, the objective of this study is to test the validity of the Keynesian proposition and the Ricardian equivalence in the case of Sri Lanka using time series data for the period 1977-2007. This study also attempts to determine the causal and long-run relationship between budget deficits and trade deficits as well as the direction of such a causality. Therefore, it is worth examining Sri Lanka's budget deficit and trade deficit. The empirical results from such a country enables us to better understand whether there is a long-run relationship and causal relationship between the two variables.

## Review of Literature

Empirical research has led to ambiguous results. Some empirical studies find that higher budget deficits lead to higher current account deficits, others show no significant impact at all. Although many studies examine the relationship between budget deficits and current account deficits, no consensus does now days exist about the exact nature of the link between the two deficits.

Darrat (1988) has shown the causality relationship between the trade deficit and budget deficit of the U.S. using the Granger causality test. Abell (1990), Alkswani (2000), Akbostanci and Tunc (2002), Bahmani-Oskooee (1995), Darrat (1988), Egwaikhide (1999), Piersanti (2000),

Akbostanci and Tunc(2002), Tallman and Rosensweig (1993),Khalid and Guan (1999) Hutchison and Pigott (1984), Piesanti(2000) among others support the Keynesian hypothesis that these twin deficits are positively linked and that budget deficit causes trade deficits .

In Contrast, other studies conducted by Evans(1998), Enders and Bong-Soo Lee (1900), Kim (1995) and Miller and Russek (1989) support the Ricardian equivalence that budget deficit does not affect trade deficit.

Most empirical studies mentioned above examined the relationship between the twin deficits for developed countries. However, there have been very few empirical studies on developing countries. Among them are Islam(1998), which examines the causal relationship between budget deficits and trade deficits empirically for Brazil from 1973 through 1991. Using the Granger - Causality test, the study shows a presences of bilateral causality between trade deficits and budget deficits.

In summary, there have been numerous empirical studies examining the twin deficits problems in developed countries. However, the number of empirical studies examining the long- run relationship between budget deficit and trade deficit in developing countries are scarce, in spite of the importance of such topic in the case of many developing countries. Our study is an

attempt to find further evidence of the relationship between the budget deficit and the trade deficit by applying the co integration and the Granger causality tests.

## **Research problem**

This study explores two empirical issues. (i) Are these two deficits (twin deficits) statistically persistent? (ii) Do the budget deficits affect the trade deficits in Sri Lanka? If so what extent, what direction? These issues have important policy implications.

## **Objectives**

The main objective of this study isto empirically investigate linkage between the trade deficit and the budget deficit for Sri Lankan economy during the period from 1960- 2010. In order to achieve the main objective the following sub objectives are investigated

## **The sub objectives**

- i. To investigate the time series properties of the data series
- ii. To study the long run and short run relationship between these two deficits
- iii. To estimate the speed of the adjustments
- iv. To examine the causality relationship between these two deficits

**Hypothesis:** Four alternative hypothesis are tested in this study. Namely, (i) Budget deficit cause trade deficits, (ii) Trade deficits cause budget deficits, (iii) Two deficits are independent, (iv) Two deficits are mutually causal

**Theoretical foundations of the “Twin deficits phenomenon”**

The “twin deficits phenomenon” has been one of the most controversial subject in modern macro economy since the Barro(1974). The conventional view is shown as follows. Twin deficits are defined as a long run (positive) relationship between the current account and fiscal balance. National accounts provide for a clear relationship between budget deficits and the current account trade deficits. To show the relationship between these two deficits, we can use national income accounting identities.

$$Y = C + I + G + (X - M) \text{-----(1)}$$

Y is Gross Nation Product, C is consumption, I is the private investment, G is government expenditure, X is exports, M is imports. Exports and imports are defined broadly, including merchandise, services, and investment income, factor services. T are the direct taxes collected from households and firms. Current account deficit, CA=X-M. One can easily rewrite this identity by using after tax, T, equals

$$Y = C + G + I + CA \text{-----(2)}$$

$$(Y - T - C) - (G - T) - I = CA, \text{ where } Y_d = Y - T \text{-----(3)}$$

Sp-Sg-I=CA, Sg= government saving, Sp=private saving, S-I=CA, this means that the current account balance has to equal the difference of national savings( S=Sp+Sg) and investment in the economy. National savings is defined as income less private and public consumption (S=Y-C-G) , We can write this equation in other form

$$Sp + Sg - I = CA$$

$$Sp - (G - T) - I = CA$$

$$(Sp - I) - (G - T) = CA \text{-----(4)}$$

Public savings, Sg, correspond to the fiscal budget position, defined as the difference between tax income, T, and expenditure similarly, private savings Sp, are defined as disposable income, that is , income less tax (Y-T) and private consumption. It is important to note that this relationship is an accounting identity. This identity rarely adds up, however, because the variables are not typically measured accurately. These two deficits are related to each other according to this accounting identity. If the difference between private saving and investment (Sp-I) is constant , an increase of budget deficit will influence positively the current account deficit. This equation indicates that a worsening budget deficit will lead to a fall in the current account balance while other variables are constant. If other variables change, they can also cause current account deficits as well.

In this case, the trade balance simply equals to the saving investment gap minus

the budget deficits. Thus assuming a stable saving investment gap, an increase in public sector deficit will directly increase the trade deficit, which is the conventional view of twin deficit relationship.

According to the Mundell-Fleming model, changes in the budget deficits trigger changes in the real interest rate, the real exchange rate, and the level of real income, which in turn alter the trade balance. An increase in the budget deficit will cause an increase in the aggregate demand and domestic real interest rates. High interest rates will cause net capital inflow from abroad and results in appreciation of the domestic currency. This in turn will adversely affect net exports due to higher value of the domestic currency and thus there will be deterioration in the current account.

### **The Ricardian Equivalence Proposition (REP)**

The Ricardian Equivalence Proposition stipulates that budget and current account deficits are independent. Under some restrictive assumptions, the budget deficit does not affect the current account. REP claims that there is no causal link between public sector deficit and external sector deficit; therefore the deficits are not twins. According to this hypothesis, the equilibrium levels of current account, interest rates, investment and consumption will not be affected by the changes in the level of budget deficit. The validity of the Equivalence

hypothesis depends on some powerful assumptions such as public purchases remain unchanged.

## **Data and Methodology**

### **Data and Variables**

This study used annual data from 1960 to 2010. The data were collected from 2010 Annual report of Central Bank of Sri Lanka. The variables used in this study are budget deficits (BD), Balance of payments current account deficits (TD), GDP deflator (GDPD).

Data were transformed into Absolute form then log transformation is done.

The empirical relationship between budget and current account deficits in Sri Lanka is investigated using the following three steps approach. Firstly, graphical methods and unit root test: line graphs, Correlogram, autocorrelation function, confidence ellipse, Histogram, Kernel density graphs, summary statistics are used to explore and describe the time series properties of the BD, TD series. The correlogram is a visual approach to check serial correlation at the empirical pattern of correlation between the series, TD, BD, and their own past values. Confidence ellipse helps us understand the joint distributions of BD and TD. The Newey-West method is used to correct the OLS standard errors for heteroscedasticity and autocorrelation. The Eviews software is used for the model estimation in this study.

*Unit root test:* In order to test the unit roots of concerned time series variable, two most popular techniques have been used: the Augmented Dickey-Fuller (ADF,1981) test and the Phillips-Perron (PP,1988) test. These tests have been performed in the levels as well as in the first differences. To determine the non-stationary property of these two time series variables both in the levels and in the first difference, at first, the relevant ADF test has been employed with time trend. The ADF test is a modification over the DF test and lagged values of the dependent variables are added in the estimation of equation (i) which is formed as follows :

$$\Delta Y_t = \alpha + (\rho - 1)Y_{t-1} + \gamma X + \delta \Delta Y_{t-1} + u_{1t} \quad (i)$$

Where  $\rho$  = autocorrelation coefficient. Since it is widely believed that ADF test does not consider the case of heteroscedasticity and non-normality frequently revealed in raw data of economic time series variables, the PP test for unit root has been used in the empirical analysis. Moreover, it has an advantage over the ADF test when the concerned time series has serial correlation and there is a structural break. Therefore, the PP test provides robust estimates over the ADF test and is based on the following form of equation:

$$\Delta Y_t = \alpha + (\rho - 1)Y_{t-1} + \gamma X + \delta \Delta Y_{t-1} + u_{1t} \quad (ii)$$

The appropriate critical values of the *t-Statistics* for the null hypothesis of non-stationary are given by Mackinnon (1991).

*Secondly*, cointegration technique and Error correction model are employed to study the long run and short run relationship between trade deficits and budget deficits. Engle and Granger (1987) and Phillips and Ouliaris (1990) single equation residual based test is performed to analyse the cointegration relationship.

### Residual-based Tests

Consider the following regression  $y_t = \beta_0 + \beta_1 x_t + u_t$ . For the estimated model, the sample regression function would be written  $\hat{y}_t = \hat{\beta}_0 + \hat{\beta}_1 x_t + \hat{u}_t$ . This can be rearranged as follows  $\hat{u}_t = \hat{y}_t - \hat{\beta}_0 - \hat{\beta}_1 x_t$ . This ( $\hat{u}$ ) is a linear combination of the variables  $y$  and  $x$ . Typically, the linear combination of  $I(1)$  variables will be itself be  $I(1)$ . But, if the  $x$  and  $Y$  are cointegrated,  $\hat{u}_t$ , the linear combination  $x$  and  $y$  would be stationary,  $I(0)$ .

The Engle-Granger(EG), and Phillips-Ouliaris residual-based tests for co-integration are simply unit root tests applied to the residuals obtained from OLS estimation of the regression equation,  $y_t = \beta_0 + \beta_1 x_t + u_t$ .

$$H_0 : \hat{u} \sim I(1)$$

$$H_1 : \hat{u} \sim I(0)$$

The null hypothesis of no co-integration against the alternative of co-integration corresponds to a unit root test of the null of non-stationarity against the alternative of stationarity. If this null hypothesis is not rejected, there is no co-integration. If the null of a unit root in the potentially co-integrating regression's residuals is rejected, the linear combination of the non-stationary variables,  $\hat{u}$  would be stationary which implies that  $x$  and  $y$  are co-integrated.

The Engle-Granger (1987) two stage co-integration procedure and the associated Error Correction Model (ECM) employed to examine the short-run and long-run relationship between trade deficit and budget deficit. Co-integration of two or more time series suggests that there is a long-run, or equilibrium relationship between them. If the two time series are integrated of the same order then the estimation of the following co-integration regression has been considered:

$$TD_t^* = \beta_1 + \beta_2 BD_t^* + U_t \text{ -----(i)}$$

Where,  $TD_t^*$  = log of trade deficit,  $BD_t^*$  = log of budget deficit, and  $U_t$  is a random error terms. The estimated residuals series is

$$\hat{U} = TD_t^* - \hat{\beta}_1 - \hat{\beta}_2 BD_t^* \text{ -----(ii)}$$

The ADF and PP unit root tests have been employed for residuals of equations (ii) i.e  $\hat{u}_t$ . When residuals are found to be integrated of order zero,  $I(0)$ , then it can be concluded that the two series,  $TD_t^*$  and  $BD_t^*$  are co-integrated. This implies the existence

of a stable long-run relationship between trade deficit and budget deficit. If  $\hat{U}_t \sim I(0)$  then the  $TD_t^*$  and  $BD_t^*$  variables are said to be co-integrated. The Granger representation theorem states that if two variables are  $X, Y$  are co-integrated, then the relationship between the two variables can be expressed as ECM. To examine the long run and short run linkage between trade deficit and budget deficit, we further employ error-correction model. The basic structure of an Error Correction Model (ECM) can be written as

$$\Delta TD_t^* = \alpha_0 + \alpha_1 \Delta BD_t^* + \alpha_2 (TD_{t-1}^* - \hat{\beta}_0 - \hat{\beta}_1 BD_{t-1}^*) + \varepsilon_t$$

$$\Delta TD_t^* = \alpha_0 + \alpha_1 \Delta BD_t^* + \alpha_2 (EC_{t-1}) + \varepsilon_t$$

where  $EC$  is the error correction component of the model and measures the speed at which prior deviations from long run equilibrium are corrected. This model can be used to estimate short term effects, long term effects (long run multiplier), and the speed at which  $TD_t^*$  returns to equilibrium after a change in  $BD_t^*$ . Therefore this method is used to search the relationship between the internal and external deficit both in the short-run and long-run. This model expresses error correction mechanism using combination of first differenced and lagged levels of co-integrated variables. The difference between  $BD_{t-1}^*$  and  $\hat{\beta}_2 BD_{t-1}^*$  in the ECM measures the extent disequilibrium. This error term is used study the short run behavior of the  $BD_t^*$  to its long run equilibrium value.  $\alpha_1$  is the short run multiplier, determining the immediate impact



of a change in  $BD^*_t$  on  $TD^*_t$ .  $\alpha_2$  describes the speed of adjustment back to equilibrium. ECM shows that there are two systematic effects on the changes  $\Delta TD^*_t$  of the dependent variable.  $\beta_1 TD^*_t$  is the instantaneous multiplier effects due to changes in the  $BD^*$ .  $\beta_2$  concerns deviations from the long run equilibrium relation  $TD^*_{t-1} = \beta_0 + \beta_2 BD^*_{t-1}$ .

Third, *Granger causality* test is employed. Granger causality test states that if TD and BD are two time series variables and if past values of a variable TD significantly contribute to forecast the value of another variable BD, then TD is said to Granger cause BD and vice versa. The test involves with the following :

$$TD_t = \gamma_0 + \sum_{i=1}^n \alpha_i BD_{t-i} + \sum_{j=1}^n \beta_j TD_{t-j} + u_{1t}$$

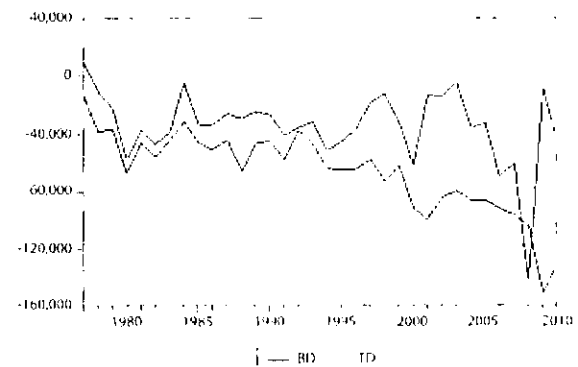
$$BD_t = \gamma_1 + \sum_{i=1}^n \lambda_i BD_{t-i} + \sum_{j=1}^n \delta_j TD_{t-j} + u_{2t}$$

Where TD and BD the trade deficit and budget deficit and  $U_{1t}$  and  $U_{2t}$  are mutually uncorrelated white noise errors, and t denote the time period. Equation(1) postulates that current TD is related to past values of TD as well as to past values of BD. Similarly, equation (2) postulates that BD is related to past values of BD as well as related to past values of TD. The null hypothesis for equation (1) is that there is no causation from BD to TD, thus the coefficient on the lagged BD not significant,  $\sum_{i=1}^n \alpha_i = 0$ . Similarly, the null hypothesis for equation (2) is that there is no

causation from TD to BD , thus the coefficients of lagged TD are not significant,  $\sum_{j=1}^n \delta_j = 0$ . Three possible conclusion that can be addressed from such an analysis include unidirectional causality, bi-directional causality, and are independent to each other.

### Empirical Analysis

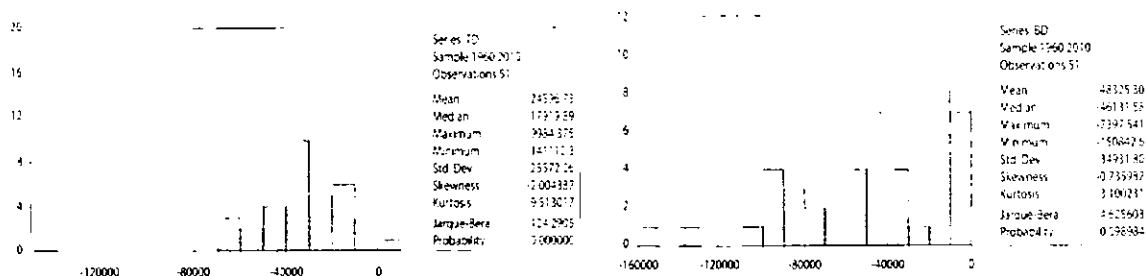
Looking at the raw data may tell us considerable things. Graphs reveal a large amount of information about the data series. Graphical analysis is used to get a preliminary and informal idea of the nature of the trend, seasonality, cycles, as well as the nature and location of any unusual observations. The basic Eviews tools are used to examine the data series in a variety of ways.



**Figure 1:** Time path of BD and TD behavior

Figure 1 shows that both deficits are increasing with downward trend. Budget deficits are higher than trade deficits along the all sample period except 2008. The difference is also increasing with time. The following histograms and summary statistics

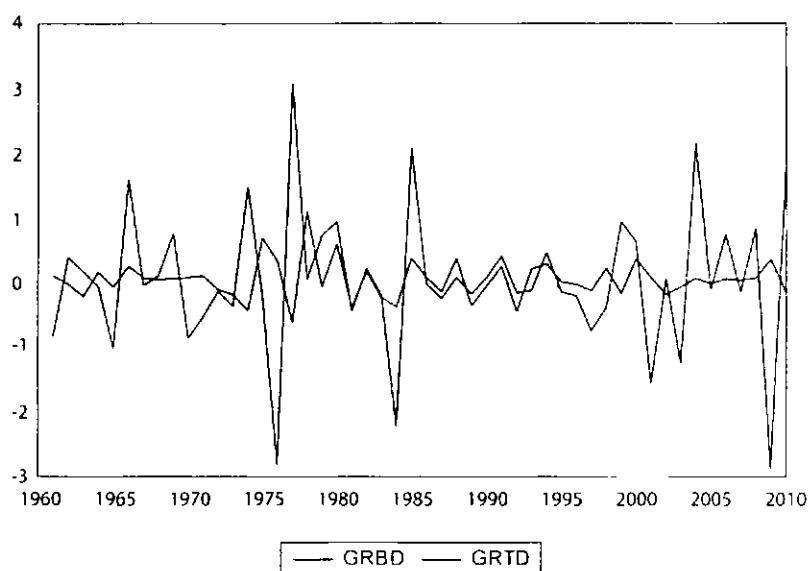
show the characteristics of the BD, TD series.



**Figure 2:** Histogram and summary statistics of BD and TD series-level form

The histograms of both series display the frequency distribution that are negatively skewed. Skewness statistics indicate the negative skewness of the series. Negative skewness implies that the distribution has a long left tail. TD series has higher negative skewness (-2.0) than that of the BD series

(-0.7). Variability is high in size and TD has relatively high variability than that of BD. Kurtosis statistic (k) shows the thickness and peakedness of the TD and BD distributions. The TD distribution has fat tail (k=9.5) than that of BD distribution (k=3.1).



**Figure 3:** Growth rate of BD and TD

There have been greater fluctuations in trade deficits growth rate than budget deficit growth rate. TD distribution volatility is more

(CV=23.8) than the volatility of BD distribution (CV=5.5). Both series tend to converge towards the balance position.

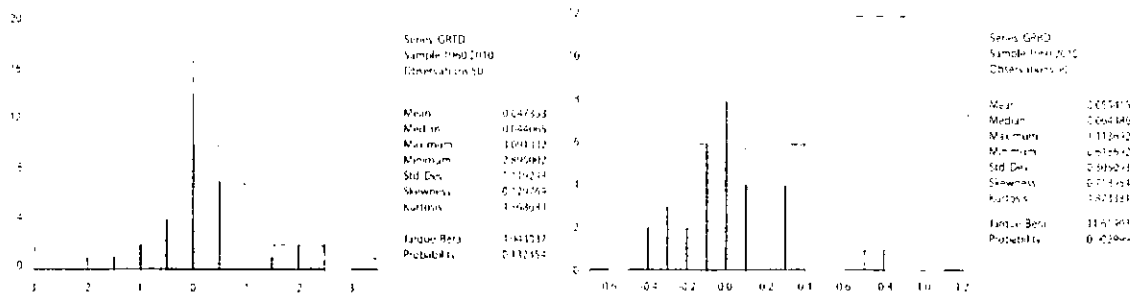


Figure 4: Histogram and summary statistics of TD and BD

The kernel density function is an alternative tool to the histogram. Density estimates can give valuable indication of such features as

skewness and multimodality in the data. Kernel density distributions for BD and TD series are given below.

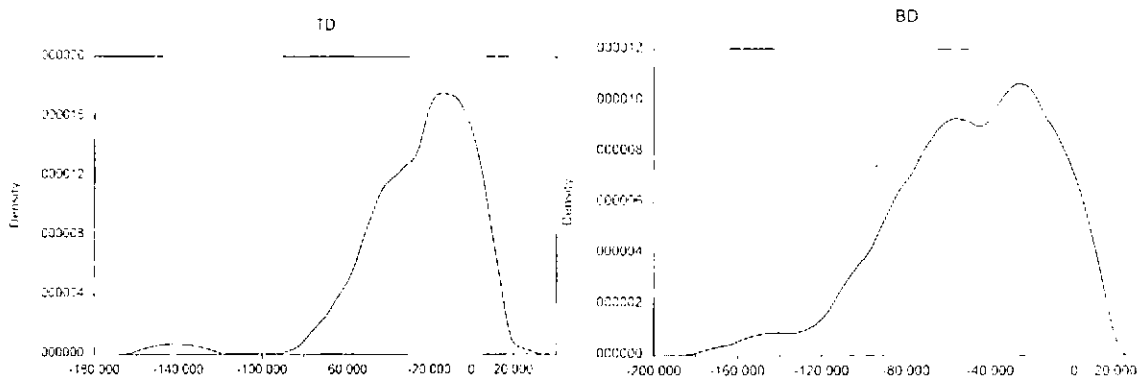
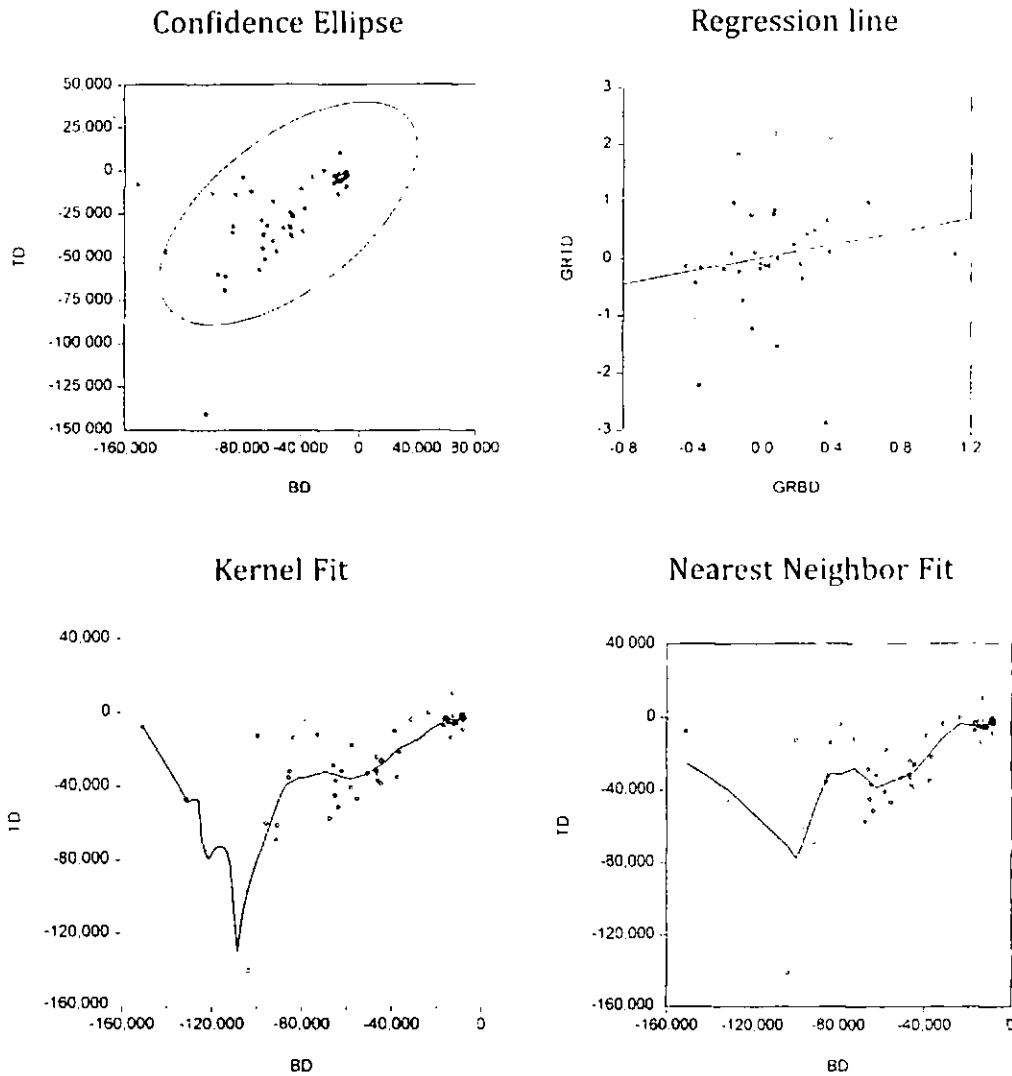


Figure 5: Kernel density of the distributions

The simple scatter diagram does not explicitly show the direction of relationship between these variables. Therefore, the relationship between TD and BD variables

was checked and identified by using confidence ellipse, Nearest Neighbour fit, kernel fit and ols regression fit.



**Figure 6:** the relationship between TD and BD

Kernel fit displays the local polynomial kernel regression fit of the TD series on the BD series. The nearest Neighbour fit displays local polynomial regressions for the series with bandwidth based nearest neighbours. The results show that kernel fit and nearest and

neighbor fit are broadly similar. Confidence ellipse displays the confidence region around the means. Except the first three points, these graphs clearly show that the relationship between BD and TD is positive and nonlinear.

**Unit root test:** the first step of the co-integration analysis is to examine the time series properties of the series. ADF and PP tests are done to examine the stationarity of the series. The results of ADF and PP tests are given in the following table.

**Results of Co-integration analysis**

ADF test and PP test from table 1 showed that these variables are non-stationary series in level form. Therefore we use Engle and Granger cointegration methodology. The coefficient covariance estimators were

**Table 1:** Results of unit roots for the variables

Series	ADF		PP		Order order
	Levels	1 <sup>st</sup> differences	Levels	1 <sup>st</sup> differences	
TD	-0.7831	-3.9565	-1.9288	-12.3797	I(1)
	(0.8130)	(0.0040)	(0.0521)	(0.000)	
BD	0.7537	-10.36352	-0.058237	-10.43433	I(1)
	(0.9922)	(0.000)	(0.9481)	(0.000)	

**Note** \* denotes 5% level of significance based on the MacKinnon critical values.

In the unit root test procedure, for both series lag length in the ADF test procedure was selected based on automatic based on AIC with maxlag=10. In the PP test procedure, lag length was selected based on spectral OLS-de-trended AR based on SIC, maxlag-10. Bandwidth is selected using BarlettKernel(Newey West automatic). Empirical results (Table 1) shows that all variables are stationary in first difference. It implies that BD and TD are stochastic non-stationary series and are distributed as  $\sim I(1)$ .

estimated using HAC(heteroscedasticity and autocorrelation consistent) when the model exists with both serial correlation and heteroscedasticity of unknown form. The cointegration regression was estimated with the following option:

HAC standard errors & covariance (Prewhitening with lags = 1 from AIC , maxlags = 3, Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Cointegration regression is estimated in two ways. One is TD is a dependent variable. Other one is BD as a dependent variable.

Then, the cointegrating regression residuals were tested using ADF and PP tests. The results are given in table 3.

The estimated cointegration regression of BD is as follows

$$L\hat{B}\hat{D} = 5.435015 + 0.525887LTD$$

p value (0.0000) (0.000)

**Table 2a:** Unit Root Test for the Residuals of the cointegrating regression model of BD

Error term	ADF	PP	Decision
$\hat{U}_t$	-4.794693 (0.0003)	-4.85999 (0.0002)	I(0)

**Note** \* denotes 5% level of significance based on the MacKinnon critical values.

The above results show that the estimated residuals are mean reverting and stationary, hence, TD and BD series are co-integrated. The estimated cointegrated behavior is shown below. The adequacy of the model is

assessed by plotting and examining the actual data, the fitted values and the residuals. The fitted values track the actual values fairly well except in the latter part (2008s). there is a pattern of heteroscedasticity.

$$L\hat{T}\hat{D} = -0.954659 + 1.004500LBD$$

p value (0.7667) (0.0018)

**Table 2b:** Unit Root Test for the Residuals of the cointegrating regression model of TD

Error term	ADF	PP	Decision
$\hat{U}_t$	-6.707016 (0.000)	-6.707016 (0.000)	I(0)

**Note** \* denotes 5% level of significance based on the MacKinnon critical values.

**Equilibrium correction model estimation.**

Granger representation theorem states that if two variables, BD,TD are cointegrated, then the relationship between the two can be expressed as error correction model. The model is estimated using OLS method and the standard errors for OLS estimators are corrected for autocorrelation and heteroscedasticity by Newey and West procedure. The corrected standard errors are heteroscedasticity and autocorrelation consistent. Lag selection was done by auto AIC method. Error correction model results are given below.

The coefficient of the error correction term, feedback effect,  $\hat{\gamma}$ , adjustment coefficient, shows how much of the disequilibrium is being corrected. The estimates,  $\hat{\gamma}$ , measures the proportion of last period's equilibrium error(disequilibrium) that is corrected for and also describes the speed of the adjustment back to equilibrium. The estimated adjustment coefficient is negative and statistically significant (-0. 9094) at 5 % level.It indicates that 91% adjustment take place in every year. That is 0.9094 of the deviation of the actual trade deficit from its long run equilibrium level is corrected each year. The negative value of  $\hat{\gamma}$  ( $\hat{\gamma} < 0$ ) indicates

**Table 3:** The estimates of Error Correction Model

ECM	Dependent variable	Adjustment Coefficient
FC term ( $\hat{\alpha}$ )	LBD	-0.2193(0.044)
EC term ( $\hat{\gamma}$ )	LTD	-0.9094(0.000)*

Short run dynamic relationship between budget deficit and trade deficit is explained by the error correction model. Estimated error correction model shows that changes in  $TD_t$  ( $\Delta TD$ ) depends on changes in  $BD$  ( $\Delta BD$ ) and also on the equilibrium error terms. Results shows that short run changes in  $BD$  have a statistically significant positive impact on short run changes in trade deficit. The impact multiplier, short run marginal impact of  $BD$  is 0.368078 which is the immediate impact of a change in  $BD$  on a change in  $TD_t$ .

that  $TD_{t-1} > \beta BD_{t-1}$ . This leads to a downward adjustment of  $TD_t$  in the direction of equilibrium. The error correction term works to push  $TD$  back towards equilibrium. The long run marginal impact is 0.2972 which is estimated from cointegration equation. In the error correction model of  $BD$ , short run marginal impact of  $\Delta TD$  is not statistically significant. However, Adjustment coefficient is -0.2193 (0,04) is statistically significant. 21 % adjustment take place in every year.

We used the Engel-Granger method as alternative techniques to see the direction of causality as the last step. Results of the causality test are reported in the table 4. These results suggest that the causality ran in both direction for lag 1. The estimated F value is significant the 5% percent level.

significant long-run positive relationship between the trade deficit and the budget deficit. The Granger causality test shows that causality runs from the budget deficit to the trade deficit as well as from trade deficits to budget deficits. This study supports the Keynesian view that there is a linkage

**Table 4:** Granger causality test

<b>Null Hypothesis:</b>	<b>Obs</b>	<b>F-Statistic</b>	<b>Prob.</b>
TD does not Granger Cause BD	50	8.76565	<b>0.0048</b>
BD does not Granger Cause TD		9.78034	<b>0.0030</b>

**Note:** these results suggest that the both variables are causal relationship in both direction.

### Conclusions

This study investigates the long run relationship between the budget deficit and trade deficit for Sri Lankan economy during the period of 1960-2010 by using the co-integration, error correction model, and Granger causality test. This enabled us to search the relationship between the internal and external deficits both in the short-run and in the long-run.

The empirical results from this study shows that the deficits could be twins as stated under Mundell-Fleming analysis: government budget deficits cause trade deficits as well as trade deficit cause budget deficits. Our analysis showed that there exist statistically

between the trade deficit and the budget deficit and the two way Granger causality between BD and TD is observed in Sri Lanka. Since the two deficits are co-integrated, the Ricardian equivalence hypothesis is not valid in Sri Lankan economy during the study period. Therefore, the results suggest that both deficits are important policy measures in Sri Lanka. Sri Lanka needs to implement policies to raise the level of domestic savings. These policies could include an efficient tax reforms in line with more efficient tax administration and tax collection. Further, Sri Lanka needs some policies including improving the terms of trade, a sustained effort to promote private saving and fiscal consolidation to raise public saving.



Measures focusing on productivity and efficiency improvement, exchange rate and monetary stance will complement the budget cut policy. Moreover, improving the government delivery system using new technology such as the information and communication technology (ICT) can improve the budget deficit problem. Policies to attract foreign direct investment in key sectors of the economy should be encouraged. Opening key sectors such as information and communication technology (ICT), education, healthcare, financial service, insurance and tourism sectors will reduce the burden on the government to develop these sectors.

The future study will investigate whether there is any linkage between the interest rates and exchange rates and how they are related to the "twin deficits".

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