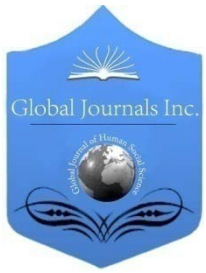
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Testing the Inter-Temporal Relationship between Government Spending and Revenue: Evidence from Sri Lanka

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Keywords: government expenditure, government revenue, vector error correction model, granger causality test. sri lanka.

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Testing the Inter-Temporal Relationship between Government Spending and Revenue: Evidence from Sri Lanka

Navoda Edirisinghe [α] & Selliah Sivarajasingham [σ]

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I. Introduction

An apposite fiscal policy is a vital ingredient for sustainable economic development. Maintaining sustainable fiscal policy has become one for the prominent problem in macroeconomic literature because, this is crucial for promoting price stability and sustainable growth in output, income and employment (Obioma & Ozughalu, 2010).Government and policy makers have the ability to achieve this vital objective by having a proper understanding about the budgetary movements and causal relationship between government revenue and government expenditure. Due to this reason many researchers have drawn their attention to comprehend the nexus between government revenue and government expenditure in political economic literature, public finance literature, etc. Furthermore, this issue has generated heated discussion around the world because, it is essential to address unsustainable fiscal deficit, evaluate government's role in the distribution of resources. Such evaluation clears the way for sound fiscal policy formulation and implementation to achieve rapid and sustainable socio-economic growth (Obioma & Ozughalu, 2010). Moreover, according to Kaya and Sen (2013), the three concepts, namely government revenue, government expenditure and fiscal balance are the key aggregates that necessary to achieve fiscal discipline.

In the context of Sri Lankan economy, the direction of causal relationship and its implication has gain major interest among economists and policy makers due to the fact that Sri Lanka is a South Asian developing country which is experiencing a chronic and persistent budget deficit throughout the time. The fiscal policy strategy of Sri Lanka was formulated in line with the Medium Term Macro Fiscal Framework (MTMFF) for 2013-2016 in order to reduce the budget deficit further (Central Bank, 2014). The recent budget deficit was maintained at 5.9 per cent of GDP which showing a slight deviation from the budgetary target of 5.8 per cent of GDP and this is a notable improvement from the deficit of 6.5 per cent recorded in 2012, (Central Bank, 2014). The main rationale for this is, though there is a reduction in 2013 government revenue to 13.1 per cent of GDP from 13.9 per cent in 2012 there also a reduction in recurrent expenditure to 13.9 per cent of GDP from 14.9 per cent in 2012 (Central Bank, 2014). But still Sri Lanka spends highly on recurrent expenditure comparative to capital expenditure because in 2013 capital expenditure was only 5.2 per cent of GDP (Central Bank, 2014). This is another puny point of Sri Lanka's fiscal policy. As a post war economy, though Sri Lanka's budget deficit fell substantially from 10% of GDP to 5.8%, this decline was not sharp enough for the government to meet its 2011 target of reducing the budget deficit to 5% (Verite Research, 2013).This explains the government's malfunction in tracking down the deficit and these kinds of failures can be overcome by having proper understanding about the nexus and the trends of government revenue and government expenditure.

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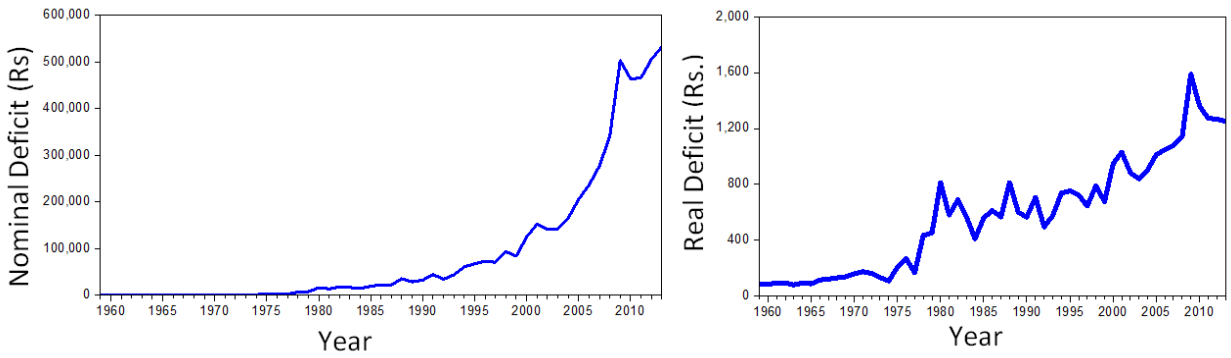


Figure 1 : Nominal deficit and Real deficit behavior in Sri Lanka

Figure 1 shows the high persistent budget deficit in Sri Lanka. And, this persistent behavior raise questions whether increases in the size of the government budget tend to be initiated by changes in expenditures followed by revenue adjustments or by the reverse sequence, or both.

As mentioned earlier, identification of the direction of causal relationship between government revenue and government expenditure is important to find solutions for the deficit problem and ultimately to have a sustainable macroeconomic environment. This can be done in several ways. For instance first, if government revenue causes government expenditure, then budget deficits can be eliminated by implementing policies that stimulate government revenue (Obioma and Ozughalu 2010; Ogujiuba and Abraham, 2012; and Mehrara and Rezaei, 2014). Second, if government expenditure causes government revenue, this situation can bring capital outflow as a result of the fear of consumers paying higher taxes in the future (Obioma and Ozughalu 2010). Third, if bilateral causality exists, the government should make its expenditures and revenues decision simultaneously (Elyasi and Rahimi, 2012; Hye and Jalil, 2010; and Takumah, 2014). Forth, if there is no bidirectional causality between government revenue and government expenditure, it explains that government expenditure decisions are made without any reference to government revenue decisions and vice versa (Obioma & Ozughalu, 2010). Likewise, by understanding the exact relationship and trends between government expenditure and government revenue, policy makers have the capability to implement the most appropriate policies to overcome the deficit problem within an economy. In the Sri Lankan context also determination of which hypothesis characterizes Sri Lankan economy is more than an intellectual exercise and has implications about solutions to the problem of persistent budget deficits

Due to these kinds of significances many scholars have conducted number of researches in this study area. When considering those literatures in both developed and developing countries, it is proving that those studies have used different econometric methodologies (Granger causality method, Vector Error Correction Method, VAR method, Bound testing approach and, Toda and Yamamato) and they have received mixed results. In the consideration of literatures related to Sri Lanka, we can see that there are only few studies exist and those studies have restricted their study only to identify the direction of causality between government expenditure and government revenue. In other words, none of the studies related to Sri Lanka have extended their analysis to identify the short run and long run dynamics and budgetary movement in the future.

By considering all the above research gaps, the research question is: what causes what? i.e. what is the direction of causality between government expenditure and government revenue in the case of Sri Lanka. To answer the above question the study focuses on the following objectives:

The main objective of this study is to examine the direction of causality between government expenditure and government revenue. Further, some specific objectives are formulated in order to achieve main objective systematically and comprehensively. First, to examine the tie series properties of the variables, second, to examine whether those variables are cointegrated, third, testing Granger causality test and finally, suggest policy implications. These objectives are expected to be achieved by using annual data for the period of 1960 to 2013 in Sri Lanka.

The paper is structured as follows. The Section 2, brief out the theoretical framework and review of literatures on study area. Section 3, illustrates the methodology and econometric models employed by the study. Empirical findings of this study are presented in Section 4. Finally, Section 5 consist the concluding remarks and policy recommendations.

a) Theoretical Framework and the Literature Review

The first part of this section will focus on the theoretical justification of the causal relationship between government revenue and government expenditure. Theoretically the existing literature explains

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the causal relationship by considering four schools of thoughts or four hypotheses, namely: i) Revenue-spend hypothesis; ii) Spend-revenue hypothesis; iii) Fiscal synchronization hypothesis; and iv) Fiscal independence or institutional separation hypothesis.

The first, the Revenue-spend school, proposed by Friedman (1978) explains that raising taxes will simply lead to more spending. According to Friedman (1982) an economy cannot reduce its deficit by raising taxes because, increasing taxes only results in more expenditure, leaving the deficit at the highest level. The most basic rule about the government's behavior, which is "government disburses what government receives plus as much more as it can get away with", also explains the above scenario (Mehrara & Rezaei, 2014). Moreover, Friedman (1982) suggests tax reduction as a solution to budget deficits, because, according to him, taxes have positive causal impact on government expenditure. In the meantime Buchanan and Wagner (1977, 1978) introduced an alternative version of the tax-and-spend hypothesis, which argue that reduction in taxes would lead to higher spending. Their viewpoint was, with the reduction in taxes the public will assume that the government intervention to welfare programs has fallen. As a result, they will demand more programs from the government which will lead to greater government spending and eventually for greater budget deficit. Therefore, their solution for budget deficit is an accretion in government taxes (Buchanan and Wagner,1977, 1978).

The second, the spend-revenue school, proposed by Peacock and Wiseman (1961, 1979) explains that government expenditure causes government revenue. According to this hypothesis, the government will first decide the level of spending and then they will adjust the tax policy to accommodate the level of spending. The spend-and-tax hypothesis is valid when spending hikes are created by temporary crisis situations (wars, natural disasters, or deep recessions) which will lead to temporary increase in expenditures and higher taxes to pay for them (Takumah, 2014). It also argues that this type of temporary tax hikes may become permanent and will change the citizens' attitude towards the proper level of government spending even after the crisis situation (Mehrara and Rezaei, 2014). This means ultimately, there will be permanent increase in the level of government expenditures and budget deficit. Therefore, this hypothesis suggests that reduction in government spending is the desired solution budget deficits (Mehrara and Rezaei, 2014; Takumah, 2014; and Elyasi and Rahimi, 2012).

The third school, fiscal synchronization hypothesis argues that governments may take revenue and expenditure decisions simultaneously, because the two variables interact independently (Meltzer and Richard, 1981; Musgrave, 1966). It also argue that, the revenue and expenditure decisions are made by analyzing costs and benefits of alternative government programs (Kaya and Sen, 2013).Therefore, this hypothesis is characterized by bidirectional causality and feedback relationship between government revenue and government expenditure (Obioma and Ozughalu, 2010).

Finally, fiscal neutrality school or institutional separation hypothesis which was introduced by Baghestani and McNown (1994) is the fourth school. This hypothesis is based on the perspective that government revenue and expenditure decisions are independent of one another. Therefore there is no causality between government revenue and government expenditure (Baghestani and McNown, 1994). According to the existing literature, government expenditure would be desired on the requirements expressed by the citizens and government revenue (tax policy) would be depended on the maximum tax burden that can be tolerated by the population (Mehrara and Rezaei, 2014; Takumah, 2014; and Elyasi and Rahimi, 2012).

In order to put a solid foundation for the study, the second part of this section will explore the most exclusive literatures about the causal relationship between government revenue and government expenditure. When considering Sri Lankan literatures in this area, only few researchers have drawn their attention to that (Ravinthirakumaran, 2011; Narayan, 2005). But, when it comes to other developed and developing countries vast number of studies have been done in the area of revenue-expenditure nexus (Mehrara and Rezaei, 2014; Takumah, 2014; Elyasi and Rahimi, 2012; Obioma and Ozughalu, 2010, etc).

In Sri Lankan context, the most recent study related to the area of revenue-spending nexus was done by Ravinthirakumaran (2011). Here, the author is investigating the causal relationship between government revenue and expenditure using Engle Granger Cointegration approach and Error Correction Model for the period of 1977-2009. According to this analysis, the two variables (government expenditure and revenue) are integrated in I(1) and has found existence of long term cointegrating relationship. But when it comes to causality analysis, the study has applied level data to the Granger causality test. But the series supposed to be stationary for conventional Granger causality test, which is the major weak point of this study. This could have led misleading result. However, the study found existence of bidirectional causality between the two variables and supported the fiscal synchronization hypothesis.

Narayan (2005) has done an empirical analysis under the same research question as the earlier study by considering nine Asian countries (including Sri Lanka). This study has employed bounds testing approach to cointegration and Granger causality method for the period of 1960-2000, and has obtained

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contrasting results for the Sri Lankan case. According to Narayan (2005) in Sri Lanka government revenue Granger cause government spending in the short run and government spending Granger cause government revenue in the long run.

Next, the paper will focus on the most recent empirical studies based on other countries. Mehrara and Rezaei (2014) have done a empirical examination to investigate the relationship between government revenue and government expenditure in Iran by using annual data for the period of 1978-2011. The study employed the Toda-Yamamoto Granger causality test for investigation and found unidirectional causality which runs from government revenue to government expenditure. Elyasi and Rahimi (2012) have examined the same research question based on Iran for the period of 1963-2007. But this study used bounds testing approach to cointegration and the results show that there is a bidirectional causal relationship between government expenditure and revenues in both long run and short run.

Takumah (2014) has evaluated the long run and short run causal relationship between government revenue and expenditure in Ghana for the period of 1986-2012. There the researcher utilized ARDL bounds testing procedure for cointegration and used real GDP as the control variable. The empirical findings revealed cointegrating and bidirectional causal relationship between government revenue and expenditure both in short run and long run.

Kaya and Sen (2013) have done an analysis on government revenue-expenditure nexus in Turkey for the period of 1975-2011 by employing cointegrated vector autoregression (VAR) method along with the Granger causality test. The findings of the analysis indicate that there is a unidirectional causality running from government spending to tax revenue and support the spend-and-tax hypothesis.

Likewise, many researchers (Hye and Jalil. 2010; Obioma and Ozughalu, 2010; Nanthakumar and Kogid, 2011; Ogujiuba and Abraham, 2012, etc) have investigated this issue (see appendix I). In the consideration of these exclusive literatures, it proves that these studies have used various econometric techniques (Granger causality method, bounds testing approach for cointegration, Toda-Yamamoto Granger causality test, etc) and have acquired diverse, contrasting results which led to inconclusive results.

Moreover, the most important fact is, only limited numbers of studies have concentrated on analyzing the nexus between government revenue and government expenditure in Sri Lanka. And those existing literature exhibits contradicting results and few weak points in application of analytical tools. Thus, this study intends to fill those gaps..

II. Methodology

Next section of this paper will introduce the analytical tools and econometrics models which will be employed to achieve the above mentioned objectives.

a) Data description

The study uses annual data of government revenue (GREV), Government expenditure (GEXP) and GDP deflator of Sri Lanka as main variables. Government revenue and government expenditure are in Sri Lankan rupee millions, and GDP deflator is an index value. Since the data are being collected in nominal values, GDP deflator is used to convert nominal values into real values of variables (RGEXP and RGREV). Here, the data are being collected from the Central Bank annual reports for the period of 1960-2013.

In order to stabilize variability of the series, to linearise the series, and to make economic interpretations in elasticity, the study uses natural logarithmic transformation of all variables (LRGEXP=log of real government expenditure and LRGREV=log of real government revenue). Moving further, the study also focuses on the growth dynamics of the two variables. In that case the variables are again transformed in to growth form as follows:

$$GRGEXP=LRGEXP-LRGEXP(-1)$$

$$GRGREV=LRGREV-LRGREV(-1)$$

Here, GRGEXP= growth of real government expenditure and GRGREV= growth of real government revenue.

b) Preliminary Analysis

The study uses descriptive statistics in the preliminary stage of the analysis to have a better understanding of the variables. And, cross correlation matrix to confirm the association between government expenditure and government revenue.

The line graphs, error bar graph and confidence ellipses are used to understand the trend behavior and underlying relationship between GREV and GEXP respectively. More importantly, confidence ellipses will confirm the results of cross correlation matrix.

c) Unit root test

In the primary stage of the analysis unit root tests are applied to investigate the order of the series. Almost all economic and financial time series manifest trending behavior or non-stationarity in the mean. Therefore it is essential to test for stationarity, in order to avoid spurious regression in standard OLS approaches. Here, three standard unit-root test techniques are employed. Namely, Augmented Dickey Fuller (ADF) test, Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test and Elliot, Rothenberg, and Stock Point Optimal (ERS)test.

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i. *Augmented Dickey-Fuller Test (ADF Test)*

This paper employs the Augmented Dickey-Fuller (ADF) procedure to test for stationarity and the order of integration of RGEXP, RGREV, LRGEXP and LRGREV. This test requires both the data generating process of the series under study as well as the appropriate lag length be chosen (Gujarati, 2003). Three different data generating processes can be chosen within the Augmented Dickey-Fuller test to examine the stationarity and the order of integration, but in this study we employ only one process, which is:

A random walk with drift and stochastic trend

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \qquad (1)$$

Where;

Y_t represent government expenditure and government revenue

Δ = the difference operator

β_1 = the drift term

t = the time trend

ε = the white noise error term

In this procedure, acceptance of null hypothesis indicates that the time series is non-stationary or the series exhibits some trending behavior.

ii. *Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Test*

This study also will utilize KPSS test to verify the results of ADF test. This procedure was introduce by Kwiatkowski, Phillips, Schmidt and Shin in 1992. Here, series of observations is represented as a sum of three components: deterministic trend, a random walk, and a stationary error term. The model has the following form:

$$y_t = \xi t + r_t + \varepsilon_t \qquad (2)$$

$$r_t = r_{t-1} + u_t \qquad (3)$$

Where, $y_t, t = 1,2,3, \ldots$ indicates variable of interest (in this cae government expenditure and government revenue), *t*- deterministic trend, r_t– random walk process, ε_t - error term of equation (2), by assumption is stationary, u_t denotes an error term of equation (3), and by assumption is a series of identically distributed independent random variables of expected value equal to zero and constant variation . By assumption, an initial value of the second equation is a constant; and it corresponds to an intercept (Syczewska, 2010). The main difference of KPSS test from ADF test is, in KPSS test the null hypothesis state that the time series is stationary.

iii. *Elliot, Rothenberg, and Stock Point Optimal (ERS) Test*

In order to verify the consistency of the unit root results, the study employs another unit root test which is the ERS test. Elliot, Rothenberg and Stock (1996) proposed this test with improved power when trend components are present. This test is based on the following model:

$$y_t = \beta' D_t + u_t \qquad (4)$$

$$u_t = \phi u_{t-1} + v_t \qquad (5)$$

Here, D_t represents a vector of deterministic terms, $E[u_0] < \infty$, and v_t is a 1-summable linear process with long-run variance λ^2. Typically D_t= 1 or D_t = [1, t]. And this procedure test the null hypothesis $\varphi = 1$ versus $|\varphi| < 1$.

iv. *Vector Error Correction Model (VECM)*

One of the objectives of this study is to identify the short run and long run dynamics of government expenditure and government revenue. In order to accomplish this objective the study employs VECM. Another importance of VECM is, there two possible sources of causality with the VECM. One, the significance of the error correction term (ECT) reveals the long run causality and the second one is lag explanatory variables that show short run causality. Though that that the prime objective of the study can be achieved which is investigating the short run and long run causal relationship between government revenue and government expenditure. The study use two VECMs considering each variable (LRGEXP and LRGREV) as the dependent variable at each time and the structure of the VECMs are as follow:

$$\Delta LRGEXP_t = \alpha_0 + \alpha_1 \Delta LRGREV_t + \lambda \hat{u}_{t-1} + \varepsilon_t \qquad (6)$$

$$\Delta LRGREV_t = \beta_0 + \beta_1 \Delta LRGEXP_t + \gamma \hat{v}_{t-1} + \eta_t \qquad (7)$$

Expenditure function: where, α_1 represents the short term reaction of government expenditure to changes in government revenue, λ shows the speed of adjustment in case of a shock and ε_t is the error term. Here, $\hat{u}_{t-1} = LRGEXP_{t-1} - \hat{\alpha}_0 - \hat{\alpha}_1 LRGREV_{t-1}$ and it is known as the error correction component of the model.

Revenue function: β_1 represents the reaction of government revenue to changes in government expenditure in short run, γ shows the long run speed of adjustment in case of a shock and η_t is the white noise error term. Here, $\hat{v}_{t-1} = LRGREV_{t-1} - \hat{\beta}_0 - \hat{\beta}_1 LRGEXP_{t-1}$ and it is known as the error correction component of the model.

v. *Granger Causality Test*

Next the study moves to the analysis of short run causality. Even though VECM is capable of doing this, it is necessary to undertake a formal short run causal analysis. In that case the study employs three types of Granger causality tests to check the consistency of the results, which are: i) Pairwise Granger causality test (F test) from single equation method, ii) VAR Granger causality/Block Exogeneity Wald Tests (Chi-Square) and iii) VEC Granger causality/Block

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Exogeneity Wald Tests (Chi Square).. Here, the most important fact is, existence of Granger causality reveals the predictive ability of one variable in forecasting the other. The general form of Granger causality model is:

$$\Delta Y_t = \sum_{i=1}^{n} \alpha_i \Delta X_{t-i} + \sum_{j=1}^{n} \beta_j \Delta Y_{t-j} + u_t$$

$$\Delta X_t = \sum_{i=1}^{n} \lambda_i \Delta X_{t-i} + \sum_{j=1}^{n} \delta_j \Delta Y_{t-j} + v_t \quad (9)$$

From the above equations, if α_i's are significant and δ_j's are not significant, then it concludes that there is a unidirectional causality between Y variable and X variable (X causes Y). If α_i's are not significant and δ_j's are significant, then it concludes that there is a unidirectional causality between Y and X (Y causes X). If α_i's and δ_j's are not significant, then it indicates that the variables are independent, which means there is no causal relationship between X and Y. And finally, if α_i's and δ_j's are significant, then we conclude that there is a bilateral causality between X and Y. The study uses the above two models to examine the causal relationship between two variables in level and log forms separately, RGEXP-RGREV and LRGEXP-LRGREV.

III. Results and Discussion

This part of the paper will exhibit the results which were obtained by the analytical tools and will discuss the interpretations of those results.

a) Preliminary analysis

As mentioned earlier the whole study is based on two variables which are government expenditure and government revenue. Table 1 presents the results of those variables. According to this table it is clear that both variables are positively skewed with relatively similar mean values. In the consideration of standard deviation real government expenditure shows high values comparative to real government revenue. Another significant feature exhibits by this table is, averagely throughout the sample period the country is experiencing budget deficit.

Table 1: Descriptive statistics of the variables

	Real GovExpenditure	Real Gov Revenue
Mean	1701.702	1121.496
Std. Dev.	1091.424	703.2840
Skewness	0.538059	0.636607
Kurtosis	2.269349	2.370022
Jarque-Bera	3.877224	4.624457
Probability	0.143904	0.099040

Figure 2, shows the line graph and error bar graph of real government expenditure (RGEXP) and real government revenue (RGREV) for the period of 1959-2013. This figure clearly illustrates that; prior to 1977 Sri Lanka's RGEXP and RGREV are considerably at low level and exhibits low volatility. Moreover, prior to 1977 the gap between RGEXP and RGREV is relatively small, which indicates low level of budget deficit. After 1977, there is a huge jump in RGEXP and RGREV, and this jump of RGEXP is relatively large than RGREV. Main reason for this behavior can be the trade liberalization in 1977. By opening the market to external trade Sri Lankan government had to spend lot of money on imports, export industries and infrastructure. Due to this reason government expenditure of Sri Lanka has increased substantially. Another significant feature after 1977 period is the wider gap between RGEXP and RGREV and this gap is increasing over time, which is contrasting from prior to 1977 period. This implies that after 1977 Sri Lanka has experiences chronic budget deficit. The error bar graph of figure 1, clearly display the behavior of budget deficit, how it is increasing over time and the contrasting behavior of the two time periods (before 1977 and after 1977). In the consideration of overall behavior of RGEXP and RGREV, throughout the sample period both variables show positive trend and RGEXP is increasing at a faster rate comparative to RGREV.

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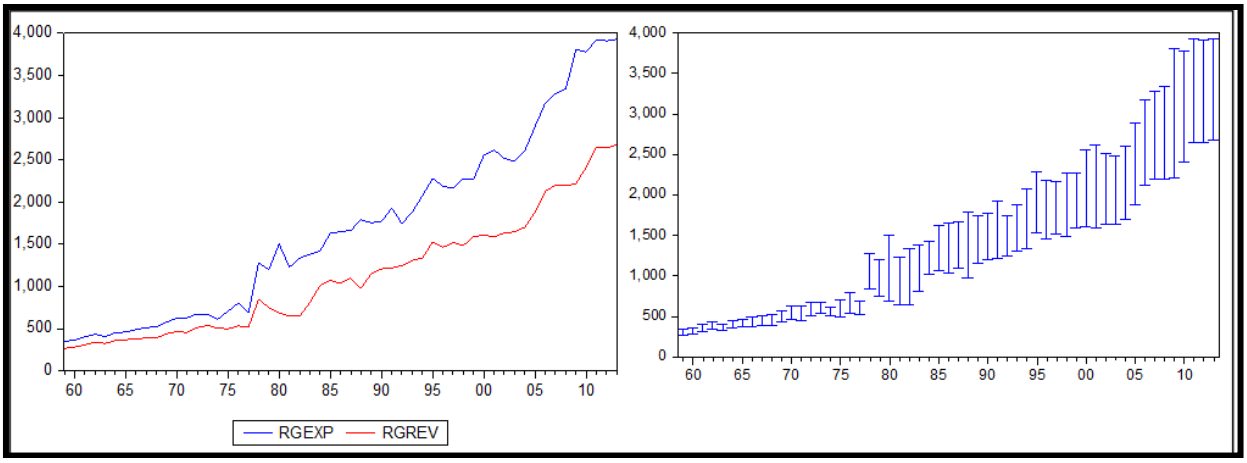


Figure 2 : Line graph and Error Bar graph of RGEXP and RGREV

When considering the growth dynamics of figure 3, we can identify the above mentioned notable change during the period of 1977- 1979. Figure 3, clearly shows that soon after 1977, there were sharp increase in GRGEXP and GRGREV, and GRGEXP was greater than GRGREV. Furthermore, when considering the latter part of the sample period growth of the two variables has become more or less similar.

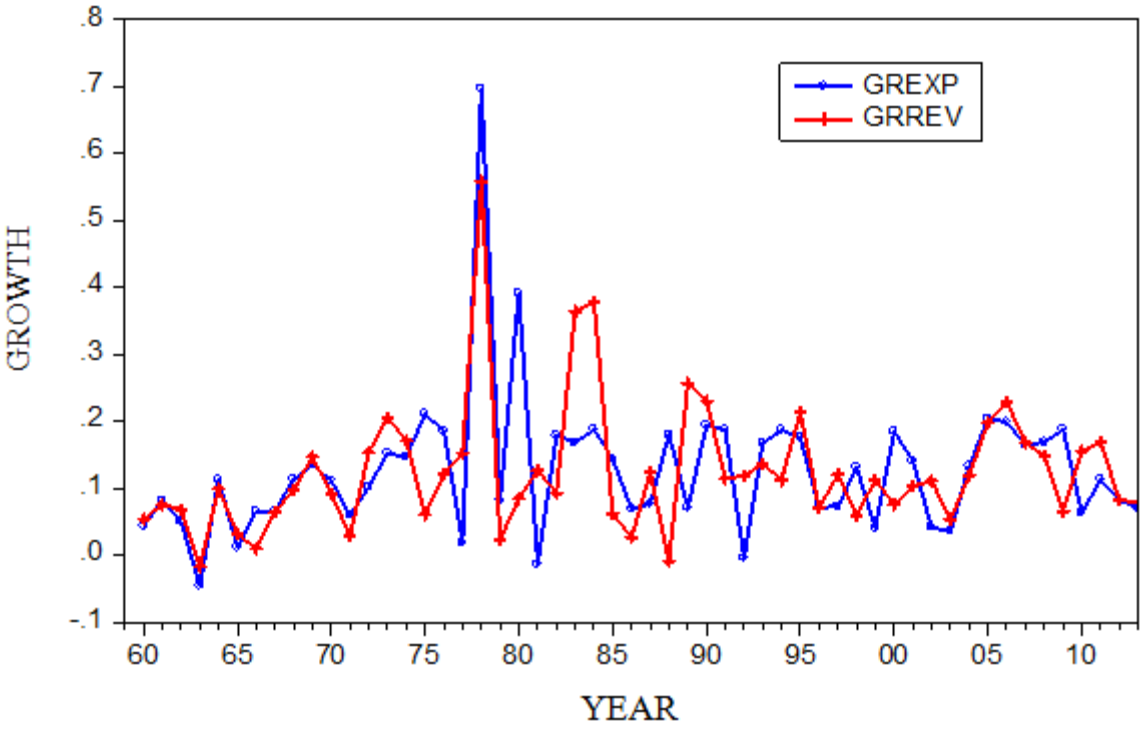


Figure 3 : Dynamics of Real growth series of GRGEXP, GRGREV

Under the graphical analysis, the study uses a tool to graphically illustate the correlation between the two main variables which is Confidence Ellipse. Figure 4 shows the 95% confidenc ellipse of RGEXP vs RGREV and GRGEXP vs GRGREV. The confidential ellipses clearly shows that the RGEXP and RGREV are highly positively correlated and GRGEXP and GRGREV are weakly positively correlated. In order to confirm the strong positive correlation between RGEXP and RGREV, the study employs correlation matrix, which shows in table 2. According to correlation matrix, there is a 99% correlation between RGEXP and RGREV and unanimously confirms the output of confidence ellipse.

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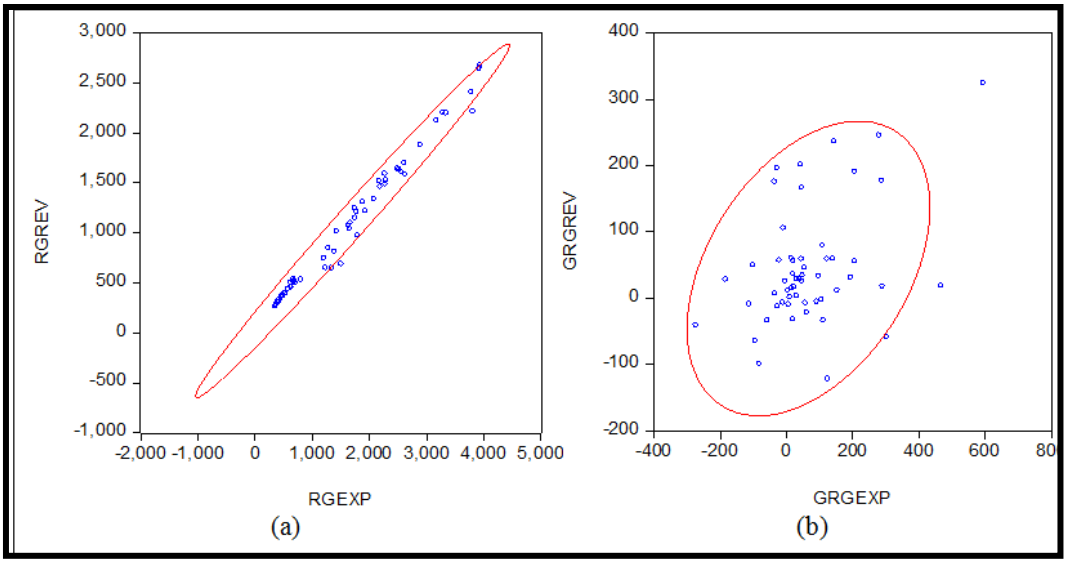


Figure 4 : Confidence Ellips of REXP vs RREV and RGREXP vs RGRREV

Table 2 : Cross correlation RGEXP vs RGREV

	RGEXP	RGREV
RGEXP	1 .00	
RGREV	0.99(0.000)	1.0

b) Unit root analysis

As mentioned in the methodology section, unit root test is an obligatory requirement in the time series analysis to identity the trending behavior and the order of integration. Even though, the study concluded trending behavior of the two variables in the visual inspection part, it is necessary to do a formal unit root test. In that case this study uses three types of unit root tests (ADF test, KPSS test and ERS test) to verify the consistency of the results. In ADF test Mackinnon (1996) critical values are used, in KPSS test Kwiatkowski-Phillips-Schmidt-Shin (1992) critical values are used and in ERS test Elliott-Rothenberg-Stock (1996) critical values are used.

Table 3 displays the unit root test results of LRGEXP, LRGREV, RGEXP and RGREV for all three tests under level form and first difference. According to that only ADF test result indicates, LRGREV is stationary at level, because it reject the null hypothesis. On the other hand KPSS test reject the null hypothesis (H_0: series is stationary) and ERS test accept the null hypothesis (H_0: series has unit root) which indicate that LRGREV is non stationary at level form. In order to solve this contradiction the study suggests to accept the test results of KPSS test and ERS test, because those test are newly developed, the power of those tests are greater than ADF test and visually also the study concluded trending behavior of LRGREV.

Next the study follows the same procedure for LRGEXP, RGEXP and RGREV. In this case the study did not find any contradictory results. All three tests show that LRGEXP, RGEXP and RGREV are non stationary under level form.

Subsequently, in order to determine the order of integration of non-stationary time series, the same tests were employed for all variables under first difference. Those results are also shown in table 3. Here, the three tests indicate that all four variables are stationary at 5% level. Because ADF test and ERS test reject the null hypothesis and KPSS test accept the null hypothesis under first difference. This implies that LRGEXP, LRGREV, RGEXP and RGREV are integrated at same order I(1).

Table 3 : Unit root test results of LRGEXP and LRGREV

Variables	Level (intercept with trend)			First Difference (intercept and trend)		
	ADF	KPSS	ERS	ADF	KPSS	ERS
RGEXP	-2.123	0.193	3.820	-10.007	0.125	18.167
RGREV	-1.364	0.225	3.385	-7.607	0.029	25.662
LRGEXP	-1.809	0.151	0.369	-11.693	0.059	43.128
LRGREV	-4.063	0.189	5.019	-7.577	0.023	12.276
Critical Values (5%)	-3.497	0.146	5.712	-3.497	0.146	5.714

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c) Vector error correction model

Next the analysis focuses on identifying the short run and long run dynamics of LRGEXP and LRGREV by using vector error correction model. When applying VECM it is necessary to use non-stationary data which are known to be cointegrated. Therefore the study has undertaken cointegration analysis by using Engle-Granger cointegration test and found that the two variables are cointegrating. This gives the opportunity for the study to apply VECM to identify short run and long run dynamics of the two variables. The study employs two VECM, one with LRGEXP as the dependent variable (results are in table 4) and one with LRGREV as the dependent variable (results are in table 5). First part of the tables (4A and 5A) reports the long run parameter estimates, second part of the tables (4B and 5B) reports the short run impact multiplier estimates and third part of the tables (4C and 5C) reports the speed of adjustment after the equilibrium in the long run. According to the results in table 4A and 5A long run relationship exist for both cases. But, when considering the coefficient of the ECTs in table 4C and 5C, only the adjustment coefficient of LRGREV is significant at 10 percent level. Therefore, we can say the there is a long run causal relationship between LRGEXP and LRGREV and one percent increase in LRGEXP will increase LRGREV by 0.91 percent in the long run. Moreover, the negative sign of the adjustment coefficient indicates that LRGREV movers downward towards the long run equilibrium and at each year the disequilibrium error is corrected in the speed of 24.4 percent.

In short run one lag period LRGEXP is having negative and significant impact on both LRGEXP and LRGREV which means, when one lag period LRGEXP increase by one percent LRGEXP and LRGREV will decrease by 0.53 percent and 0.48 percent respectively. This confirms that inshort run also LRGEXP is the influencing variable. Based on this empirical results what we can say is, due temporary crisis situations Sri Lankan government will increase spending. But in short run there will be a time constrains to adjust the revenue policy to accommodate expenditure. Therefore, there will be a negative relationship between government expenditure and revenue.

Table 4: VECM of LRGEXP

A: Long Run Dynamic of LRGEXP & LRGREV		
	LRGEXP	
LRGREV(-1)	-1.0966**	
	[-20.5001]	
C	0.267416	
B: Short Run Dynamic of LRGEXP & LRGREV		
	D(LRGEXP)	D(LRGREV)
D(LRGEXP(-1))	-0.5344**	-0.483678
	[-2.75296]	[-2.75191]
D(LRGEXP(-2))	-0.097065	-0.268284
	[-0.52473]	[-1.60168]
D(LRGREV(-1))	0.159996	0.162744
	[0.76473]	[0.85903]
D(LRGREV(-2))	0.256019	0.059888
	[1.25062]	[0.32307]
C	0.0553**	0.066651
	[3.00874]	[4.00717]
C: Adjustment speed		
ECT	-0.088218	0.22232
	[-0.56731]	[1.57889]

Table 5: VECM of LRGREV

A: Long Run Dynamic of LRGREV & LRGEXP		
	LRGREV	
LRGEXP(-1)	-0.9119**	
	[-20.5504]	
C	-0.243852	
B: Short Run Dynamic of LRGREV & LRGEXP		
	D(LRGREV)	D(LRGEXP)
D(LRGREV(-1))	0.162744	0.159996
	[0.85903]	[0.76473]
D(LRGREV(-2))	0.059888	0.256019
	[0.32307]	[1.25062]
D(LRGEXP(-1))	-0.4837**	-0.534354
	[-2.75191]	[-2.75296]
D(LRGEXP(-2))	-0.268284	-0.097065
	[-1.60168]	[-0.52473]
C	0.0667**	0.055266
	[4.00717]	[3.00874]
C: Adjustment speed		
ECT	-0.2438*	0.096742
	[-1.57889]	[0.56731]

*Note: ECT refers error correction term, ** significant at 1 percent level, * Significant at 10 percent level and "t" statistic values in [ ]*

d) Granger causality test

Finally the study moves to the crucial analysis which is the identification of causal relationship between variables. In order to ensure the consistency of the results the study employs three types of granger causality test which are; Pairwise Granger causality (F-test) from single equation, VAR Granger causality/Block Exogeneity Wald Tests and VEC Granger causality/Block

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Exogeneity Wald tests to test the causal relationship between LRGEXP-LRGREV and RGEXP-RGREV. Under the unit root analysis the study found that all variables are I(1) and stationary at first difference. Therefore, the study uses first difference data for all three granger causality tests and the results are demonstrated in table 6. The probability values in table 6 indicate the rejection decision of the null hypothesis of no causality at 5 percent level or 10 percent level. According to that, except VEC granger causality test, other two tests reject the null hypothesis of RGEXP does not granger cause RGREV at 5 percent level. Moreover, the null hypothesis of LRGEXP does not granger cause LRGREV is rejected by pairwise and VAR granger causality test at 10 percent level and by VEC granger causality test at 5 percent level. Since we have more evidence towards causality run from government expenditure to government revenue, we can conclude the in the short run government makes expenditure decisions first and government revenue depends on the expenditure decisions made by the government in prior periods.

Table 6 : Granger Causality Test Results

Null hypothesis	Probability values		
	Pairwise Granger causality	VAR Granger causality	VEC Granger causality
DRGREV $\xrightarrow{no}$ DRGEXP	0.2237	0.2130	0.6321
DRGEXP $\xrightarrow{no}$ DRGREV	0.0357**	0.0278**	0.4773
DLRGREV $\xrightarrow{no}$ DLRGEXP	0.1676	0.1563	0.4107
DLRGEXP $\xrightarrow{no}$ DLRGREV	0.0907*	0.0799*	0.0215**

*Note: ** significant at 5 percent level, * Significant at 10 percent level and lags=2*

When considering the results of table 5 and table 6, both in short run and long run the direction of causality runs from government expenditure to government revenue. Therefore the study concludes the existence of spending-revenue hypothesis in Sri Lanka. This means that government will decide the level of spending first and then they will adjust the tax policy to accommodate the level of spending. Moreover, the evidence highlights government expenditure as the most important variable in Sri Lankan government's Fiscal policy decisions. As said by Mehrara and Rezaei (2014) with the existence of this type of causal relationship, a temporary increase in expenditure may lead to permanent government expenditure hikes and ultimately greater budget deficit. To facilitate this high budget deficit the government will start to raise revenue. Then the there will be a negative impact on investors and human capital due to high taxes.

IV. Conclusion and Policy Recommendation

This paper mainly focuses on investigating the causal and dynamic relationship between government expenditure and government revenue in Sri Lanka for the period of 1960-2013. In the process of achieving the primary objective the study uses annual data of government revenue, government expenditure and GDP deflator, and utilizes them mainly on Vector Error Correction Model and Granger causality tests. There the results supports spending-revenue hypothesis both in short run and long run, which means government expenditure is the influencing factor in Sri Lanka's fiscal policy. Moreover, when it comes to the dynamic relationship, the study finds that in long run there is a positive association between government expenditure and government revenue, but in short run there is a negative association.

Based on the empirical findings the study suggests that in order to achieve and sustain fiscal discipline or to reduce budget deficit, Sri Lankan government should adopt spending restrictions. This does not mean that government should cut down government expenditure and impose high taxes. What this paper recommends is Sri Lanka should try to reduce recurrent expenditure and increase development and investment expenditure (capital expenditure0 which will generate income in the future. When the government spends on development projects, they should conduct proper cost benefit analysis and then determine whether to undertake the project or not. In addition, implementing high taxes might not be the most intellectual contrivance because, it can discourage the whole development process and can move people away from economic activities. Therefore government's tax policy should focus the right group of people and try to improve non-tax revenue such as profits and dividends, interest income and etc since, Sri Lanka's non- tax revenue is far below than tax revenue.

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Appendix I

Study	Period	Country	variables	Analytical technique	Results
Ogujiuba and Abraham (2012)	1970-2010	Nigeria	Federally collected public expenditure (EXPN), federally collected revenue (REV), revenue from crude oil (OREV), non-oil revenue (NOREV) and crude oil price in USD (COP)	Correlation analysis, Granger causality test, Vector Error Correction Model and Impulse response function	Revenue and expenditure of Nigeria are highly correlated, causality runs from government revenue to expenditure and vector error correction model also confirms that there is a significant long run relationship between revenue and expenditure.
Subhani et al (2012)	1979-2010	Pakistan	Government revenue and government spending	*Granger causality method*	*Unidirectional causality runs from government revenue to government expenditure*
Nanthakumar and Kogid (2011)	1970-2009	Malaysia	Tax revenue and government spending	Auto-regressive distributed lag model (ADLM) and Toda-Yamamoto MWALD Granger causality analysis	Unidirectional causality runs from tax revenue to government spending in Malaysia
Sikdar and Mukhopadhyay (2011)	1971-2008	India	Central government revenue and central government spending	*Granger causality test*	*Bidirectional causality between government revenue and government spending*
Hye and Jalil (2010)	1998Q1-2008Q3	Romania	Government revenue and government expenditure	ARDL approach to cointegration, variance decomposition and rolling regression method.	Bilateral long run causal relationship between government revenue and expenditure.
Obioma and Ozughalu (2010)	1970-2007	Nigeria	Government expenditure and government revenue	*Engel-Granger two-step cointegration technique, the Johansen cointegration method and the Granger causality test*	Long run cointegrating relationship between government revenue and government expenditure. Unidirectional causality that runs from government revenue to government expenditure
Saunoris and payne (2010)	1955Q1-2009Q1	UK	Government revenue, government spendingnand GDP	*Asymetric error correction model*	*Government respond to government spending in short run a well as asymmetrically to budgetary dis equilibrium*
Asian and Tasdemir (2009)	1950-2007	Turkey	Government revenue and government spending	*Engle Granger test and Gregory-Hensen method*	*Bbidirectional causality between government revenue and government spending*

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