Government Revenue and Government Expenditure Nexus in Sri Lanka

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ABSTRACT: This paper examines the relationship between both government expenditure and government revenue in Sri Lanka using time series data from 1950 to 2015. The data were gathered from annual report of Central Banka of Sri Lanka, 2015. The study mainly applied Engel Granger Co-integration, Error Correction Model and Granger Causality Test to find the relationship between these two variables. Engel Granger co integration results showed that there was a long-run equilibrium relationship between government expenditure and government revenue of Sri Lanka during the study period. Further, Granger Causality test concluded that there was bidirectional causality between government expenditure and government revenue of Sri Lanka.

Key Words: Co-integration, Government Revenue, Government Expenditure, Budget deficit

Introduction

The disparity between government revenue and government expenditure is growing in many countries. The government revenue of Sri Lanka exceeded its expenditure by Rs.0.1 billion in 1955. In 2015, government expenditure of Sri Lanka exceeded its revenue by Rs.830 billion. Hence, public debt was increased to Rs.8503 billion from Rs.1.1 billion between 1955 and 2015 (Annual Report of Central Bank of Sri Lanka, 2015).

The government committed sturdily towards implementing revenue based fiscal consolidation measures during 2016, recognizing the persistently low revenue mobilisation, which leads to high budget deficits, as the root cause of fiscal imbalances experienced for several decades in Sri Lanka Even though Sri Lanka's per capita income has increased steadily over the last two decades, revenue collection has been well below government expenditure, and has not been adequate even to cover recurrent expenditure of the government (Annual Report of Central Bank of Sri Lanka, 2016).

Weak tax revenue collection emanating from complex tax laws, various tax exemptions and tax holidays, narrow tax bases, tax evasion and weaknesses in tax administration has resulted in the government revenue to GDP ratio dropping to a level as low as 11.5 per cent in 2014 from over 20 per cent in the 1990s (Annual Report of Central Bank of Sri Lanka, 2016).

To rectify the structural weaknesses persistent in the government budget during the recent past, the government committed to revenue based fiscal consolidation process, rather than merely pursuing expenditure cuts.The government achieved the key fiscal targets for the year 2016, reducing the budget deficit to 5.4 per cent of GDP because of enhanced government revenue collection combined with the reduction in total government expenditure, particularly recurrent expenditure as a percentage of GDP(Annual Report of Central Bank of Sri Lanka, 2016). Therefore, the investigation on the relations between government revenue and government expenditure is important to make a policy regarding government revenue and expenditure in Sri Lanka.

Objective of the Study

The main objective of this study is to identify the relationship between government expenditure and government revenue in Sri Lanka by developing a robust econometric methodology. The result would help policy makers to develop the fiscal policy as well as monetary policy of Sri Lanka.

Review of Literature

Government expenditure is a function of government revenue. This can be written as follows:

$$GE = f(GR)$$

According to the above formula, GE is government expenditure and GR denotes government revenue. Keynesian economists say that government can control aggregate demand and the level of national income through spending and tax policies. Government current budget balance is the difference between its expenditure and revenues. It is given by the following formula.

$$BB_t = GE_t - GR_t$$

According to the above formula, BB_t denotes current budget balance of government at time t. If government expenditure exceeds the government revenue, there will be a budget dificit and if government revenues exceed the government expenditure, there will be budget surplus. In practically, most of the cases are budget dificit in many countries.

Al-Qudairt (2005) examined the long run equilibrium relationship between government expenditure and revenues in the Kingdom of Saudi Arabia using Co-integration technique and Granger causality test. The Cointegration test indicates the existence of long run equilibrium between government expenditure

and revenues. The causality tests indicate that there is a bi-directional causal relationship between government expenditure and revenues in both the long and the short run.

Narayan (2005) investigated evidence for cointegration and causality between government revenue and government expenditure for nine Asian countries. He found that for three out of the nine countries government revenue and government expenditure are cointegrated and the direction of causality are mixed.

Maynard and Guy (2009) investigated the interrelationship between total government expenditure and total tax revenue in Barbados using both bivariate and multivariate cointegrating models. This study found that government expenditure unidirectional Granger-causes changes in revenue.

Mehrara et al (2011) investigated the relationship between government revenue and government expenditure in 40 Asian countries for the period of 1995 to 2008. This study stated that there was a co-integration relationship between government expenditure and government revenue. It also found that there was a bidirectional causal relationship between government.

Ravinthirakumaran (2011) showed that bidirectional causality exists between government revenue and expenditure and there is a long-run equilibrium between these two variables in Sri Lanka. In India, there was also bidirectional Granger causality between expenditure and revenue over the period of 1980-2008 (Sikdar& Mukhopadhayay, 2011).

Subhani et al (2012) found that there was a uni-directional causality between government expenditure and revenue in Pakistan over the period 1979-2010.

Nwosu et al (2014) examined the relationship between expenditure and revenue in Nigeria using time series data from 1970 to 2011. This study found that there was a long-run equilibrium relationship between expenditure and revenue and also government expenditure had long run unidirectional relationship with total revenue in Nigeria.

Lojanica, (2015) revealed that there is a cointegration relationship between government expenditure and government revenue in Serbia. Also, the analysis has shown that, in the long run, there is a unidirectional causality moving from government expenditure towards government revenues.

There are many theoretical and empirical studies on the relationship between government expenditure and energy consumption. However, none of

the empirical studies in the existing literature have considered the relationship between government expenditure and government revenue in Sri Lanka by using cointegration and causality models.

Revenue and expenditure profiles in Sri Lanka

The characteristics of the total government revenues and expenditures in Sri Lanka are examined to support the econometric analysis in this work. For the purpose of this study, the author adopted total government revenue and total government expenditure.

Table.1 : Government Revenue and Government Expenditure in Sri Lanka (1955-2015)

Years	1955	1965	1975	1985	1995	2005	2015
Revenue (Rs.bn)	1.2	1.8	5.5	39.6	145.3	412.4	1460.9
Expenditure (Rs.bn)	1.1	2.2	7.2	55.2	203.5	584.8	2290.4
Revenue (As a % of GDP)	22.6	22.8	20.6	24.4	21.8	16.8	13.1
Expenditure (AS a % of GDP)	20.4	27.8	27.0	34.0	30.5	23.8	20.5

Source: Annual Report of Central Bank of Sri Lanka, 2015.

Table.1 shows some selected statistical data on government expenditure and government revenue of Sri Lanka between 1955 and 2015. The government revenue of Sri Lanka increased to Rs. 1461 billion from Rs. 1.2 billion between 1955 and 2015. The government expenditure of Sri Lanka increased to Rs. 2290 billion between 1955 and 2015. After 1955, government expenditure of Sri Lanka was greater than its revenue. In 1955, Government revenue as a percentage of GDP was 22.6% while government expenditure as a percentage of GDP was 20.4%. In 2015, government revenue as a percentage of GDP was 13.1% while government expenditure as a percentage of GDP was 20.5%.

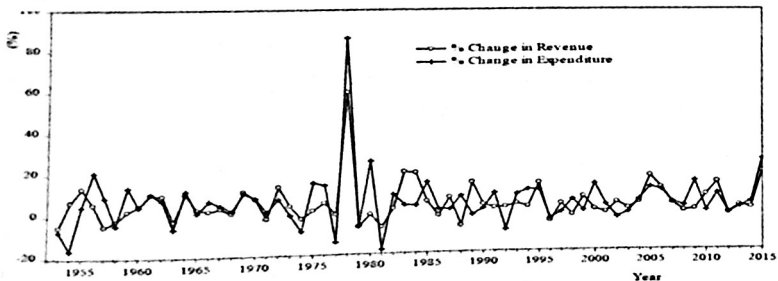Figure.1 Percentage Change in Revenue and Expenditure between (1955 - 2015)

Figure.1 shows the percentage changes in government expenditure and government revenue of Sri Lanka between 1955 and 2015. Both variables are adjusted according to GDP deflator (base year 1996). Growth rates of government revenue of Sri Lanka have fluctuated with the range between 8% and 18% after 1950 except the year 1978. Growth rates of government expenditure have fluctuated with the range between 17% and 26% after 1950 except the year. In 1978, the growth rates of both government expenditure and government revenue were 59% and 86% resepctively in Sri Lanka.

Data and Methodology

The study used data of two variables, government revenue and government expenditure which are in real terms. The study investigated the relationship between government expenditure and government revenue over the period from 1950 to 2015. The data were gathered from annual reports of Central Bank of Sri Lanka, 2015. The study applied time series econometric techniques. The following techniques were applied to find out the relationship between government expenditure and government revenue.

Augmented Dickey-Fuller Unit Root Test

Since the study deals with time series data, a test for stationary of data is a very important precondition before the analysis. A unit root test is performed to examine the stationarity of time series. An Augmented Dickey-Fuller (ADF) unit root test was employed to check the stationary of data. If there is a unit root, then that particular series is considered to be non-stationary. ADF test has three different specifications. Among these different specifications of ADF test, the study applied the trend with the constant term because both series are trended with time. The Akaike Information Criterion (AIC) was used to decide the optimal lag length.

Engel and Granger (1987) Cointegration

This study applied the Engel Grange (1987) co integration method to examine the short-run and long-run relationship between government revenue and government expenditure. If two or more series are integrated of order one, I(1), but a linear combination of them is integrated order zero, I (0), and thus stationary, then the series is said to be co-integrated. If both series are co-

integrated, there exists a long-run equilibrium relationship among the variables. Let us consider the following relationship,

$$EX_t = \beta_{10} + \beta_{11} RE_t + u_{1t} \qquad (1)$$

$$RE_t = \beta_{20} + \beta_{21} EX_t + u_{2t} \qquad (2)$$

Where EX_t denotes government expenditure at time t, RE_t denotes the revenue of government at time t, U_{1t} and U_{2t} are error terms of the models. In Equation 1, the dependent variable is government expenditure (EX). In Equation 2, the dependent variable is government revenue (RE). The equilibrium error terms of the models are given by the following equation.

$$\hat{u}_{1t} = EX_t - \hat{\beta}_{10} - \hat{\beta}_{11} RE_t \qquad (3)$$

$$\hat{u}_{2t} = RE_t - \hat{\beta}_{20} - \hat{\beta}_{21} EX_t \qquad (4)$$

Equilibrium errors, U_{1t} and U_{2t} should be stationary series for a long-run equilibrium relationship between variables government revenue and government expenditure to exist. If both variables, EX_t and RE_t, are co-integrated, then the study should apply the error-correction models.

Error Correction Model

For both cases, the error correction models (ECM) are given below.

$$\Delta EX_t = \mu + \sum_{i=1}^{n-1} a_i \Delta EX_{t-i} + \sum_{i=0}^{m-1} \gamma_i \Delta RE_{t-i} - \pi_1 \hat{u}_{1t-1} + \varepsilon_{1t} \qquad (5)$$

$$\Delta RE_t = \varphi + \sum_{i=1}^{n-1} \theta_i \Delta EX_{t-i} + \sum_{i=0}^{m-1} \sigma_i \Delta RE_{t-i} - \pi_2 \hat{u}_{2t-1} + \varepsilon_{2t} \qquad (6)$$

In model (5), the dependent variable is ΔEx_t. In model (6), the dependent variable is. Where ΔEx_t denotes change in government expenditure and ΔRe_t denotes the change in government revenue. In these models, π_1 and π_2 are error-correction coefficients, which are called the adjustment coefficient. In fact, π_1 tells how much of the adjustment to equilibrium takes place each period, or how much of the equilibrium error is corrected. If $\pi_1 = 1$, then 100% of the adjustment takes place within the period, or the adjustment is instantaneous and full. If, $\pi = 0.5$, then 50% of the adjustment takes place each period. If $\pi_1 = 0$, then there is no adjustment, the same interpretation applies for π_2 also.

Granger Causality Test

The study applied Granger causality test to find the causal relationship between government revenue and government expenditure. The Granger causality test states that if government revenue and government expenditure are two time series variables and if past values of a variable government revenue significantly contribute to forecast the value of another variable government expenditure, then government revenue is said to Granger cause government expenditure and vice versa. The test involves with the following:

$$Ex_t = \delta_1 + \sum_{i=1}^{n} \beta_i Ex_{t-i} + \sum_{i=0}^{n} \gamma_i Re_{t-i} + u_{1t} \qquad (7)$$

$$Re_t = \delta_2 + \sum_{i=1}^{n} \rho_i Ex_{t-i} + \sum_{i=0}^{n} \theta_i Re_{t-i} + u_{2t} \qquad (8)$$

Where U_{1t} and U_{2t} are mutually uncorrelated white noise errors. Equation (7) postulates that current government expenditure (Ex_t) is related to previous values of government expenditure as well as to previous values of government revenue. Similarly, Equation (8) postulates that current government revenue (Re_t) is related to previous values of government revenue as well as related to past values of government expenditure. The null hypothesis for equation (7) is that there is no causality from government revenue (Re_t) to government expenditure (Ex), thus the sum of the coefficients of lagged government revenue is equal to zero and it is shown in Equation (9).

$$\sum_{i=1}^{n} \rho_i = 0 \qquad (9)$$

$$\sum_{i=1}^{n} \gamma_i = 0 \qquad (10)$$

Similarly, the null hypothesis for equation (8) is that government expenditure does not cause government revenue, thus, the sum of the coefficients of lagged government expenditure is equal to zero and it can be shown at Equation (10)

The Empirical Results

(a) Unit root Results

Table.2 : Augmented Dickey-Fuller (ADF) Test

Variables	Level	First Difference	Decision
Revenue	1.3000	-7.1735	I(1)
Expenditure	0.7216	-8.2835	I(1)

The unit root test was carried out by using Augmented Dickey-Fuller (ADF) test. The null hypothesis of this test is that series follows a unit root. The ADF

test found that both government expenditure and government revenue are non-stationary at level but both variables turn to be a stationary at first differencing level and hence I (1).

(b) Co- integration Results

Table.2 : Engel Granger Co-integration results

Dependent Variable	tau-statistics	p-value	Z-statistics	p-value
Revenue (Model.1)	-5.3726	0.002	-41.6919	0.0001
Expenditure(Model.2)	-5.3473	0.002	-42.6224	0.0000

Table.2 shows the results of Engel Granger co integration test. Linear combinations of each model are stationary because tau-statistics and Z-statistics are greater than the critical value. This result shows that government revenue and government expenditure are co- integrated, therefore, there was long-run equilibrium relationship between government expenditure and government revenue of Sri Lanka during the study period.

(c) Error Correction Model

Table.3 : Results of Error Correction Model

Variable	Coefficients	t-statistics	p-value
ECM$_1$	-0.3034	-1.3893	0.1700
ECM$_2$	-0.3795	-1.5307	0.1313

Table.3 shows the results of error corrections of the models. These results show that there was disequilibrium in the short-run, even though there was equilibrium in the long-run between government revenue and government expenditure. However, short-run disequilibrium is not statistically significant in both cases.

(d) Granger Causality Test

Table.4 : Results of Granger Causality Test

Null Hypothesis	p-value at lag order one
Revenue does not cause Expenditure	0.0323
Expenditure does not cause Revenue	0.0510

Table.4 shows the results of Granger causality test. From this test, the study concluded that there was bidirectional causality between government

expenditure and government revenue of Sri Lanka during the study period from 1950 to 2015.

Conclusion

The study examined the relationship between government expenditure and revenue of Sri Lanka from 1950 to 2015. Engel Granger co integration results showed that there was a long-run equilibrium relationship between government expenditure and government revenue of Sri Lanka during the study period.

The literature reviewed earlier in this paper clearly showed co-integration relationship between government revenue and expenditure. In conformity with the studies reviewed this study also found co-integration relationship between these variables for Sri Lankan case. In the case of causal relationship, Al-Qudait (2005), Maynard and Guy (2009), Mehrara et al (2011), Ravinthirakumaran (2011), Sikdar & Mukhopadhay (2011) found bidirectional causality between government revenue and expenditure while Subhan et al (2012), Nwosu et al (2014) and Lojanica, (2015) found uni-directional causality between both variables. However, the Granger Causality test employed in this study divulged that there was bidirectional causality between government expenditure and government revenue of Sri Lanka. Our study revealed that bidirectional causality that was similar to first case between both variables.

The finding of this study would help policy makers to take policy action. That is policy makers should consider government expenditure while they make any policy dicision regarding government revenue since both variables have stable equilibrium and causal relationship between these in Sri Lanka.

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