Sustainability of Government Debt in Sri Lanka

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ARTICLE INFO

Available Online July 2014

Key words:
Government Debt;
Debt Ratios;
Augmented Dicky-Fuller and Phillips-Perron Tests;
Chow Test.

ABSTRACT

This paperexamines the impact of government budget deficit on debt sustainability in Sri Lanka by using a novel methodological approach. The study used annual time series data from 1960 to 2012 in Sri Lanka for empirical testing. Sustainability of government debtis tested by using face value, market value and discounted market value of government debt as a proportion of GDP. Discounted market value of debt to GDP ratio was calculated using weighted average interest rate. Results of Augmented Dickey Fuller and Phillips-Perron tests indicate that debt ratios are non-stationary implying the existence of an unsustainable debt outlook. Results of the Chow test, employed to test if a structural break can be observed in 1978 as a result of moving away from the command economy to a market-oriented economy, indicate that the policy change has not led to have any fixed change in the mean of debt serials. The results compel us to conclude that public debt in Sri Lankan is not sustainable, so that a switch is required from foreign debt to other sources of financing of fiscal deficit or deficit reduction.

Introduction

Deficits in government budget and stock of debt are important factors of economic performance of a country. Most aggregate economic variables tend to fluctuate at different levels with effects on various interrelated factors. At present, a long term budget deficit is observed in Sri Lanka. For example, average budget deficit as a percentage of Gross Domestic Product (GDP) was -6.01 during 1960-69, -7.13 in 1970-79, -11.28 in 1980-89, and -7.1 during 2000-2012 (Central Bank of Sri Lanka2012). Further, the stock of debt in Sri Lanka has also been gradually increasing. Though from these trends, one might conjecture that the public debt in Sri Lanka is not sustainable, a formal analysis by applying appropriate methods are required to understand whether public debt in Sri Lanka is unsustainable. As unsustainable public debt tends to negatively cause future economic development, the results of these empirical tests would generate important insights for effective implementation of fiscal policy.

This study aims to analyze the effects caused bythe Sri Lankan budget deficit on total debt sustainability and its relationship. There are many sourcesforfinancing government budget deficit such as printing money, borrowing from local institutes, adjusting foreign reserves,and obtaining foreign loans.Each financing method would entail different macroeconomic repercussions; money printing would be linked to inflation, use of reserves might propagate exchange rate movements and possible balance of payments crises, borrowing from foreign sources might provoke external debtcrises, and internal borrowing with higher interest burden and potentially explosive debt dynamics would cause inflation (Akcay*et al* 2005). Unsustainable external debt tends to create macroeconomic instability, loss of international competitiveness leading to long term economic downturn.

Every country is legally bound to settle theirforeign debt.For debt settlement to be sustainable, the present value of the resources transferred to foreign countries should be equal to thestarting debt stock of a country. A country which is borrowing should create a budget surplus for the possible repayment of loans in the future. If the discounted value of the future budget surplus is less than the present debt stock to be settled, the debt is not sustainable at that time. As a result, the debt services (interest and the principle repayment) tend to be unsettled. When the debt services are on operation, welfare of the country is

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decreased. Some countries attempt to increase welfare by not paying the debt services. As a result, the willingness to settle debt will be decreased.

When there is continues primary surplus, likelihood of the sustainability of debt tend to increase due to a few reasons. First likelihood of the debt sustainability will increase by decreasing the crowding out effects through decreasing of the accrued interest. It would also increase by increasing the efficiency of resource distribution and increasing income through reduction of accumulated of interest payments. Finally debt sustainability would be enhanced by increasing the demand of money base as a result of decreasing inflationary expectation.

Review of Literature

The sustainability of debt is normally evaluated by calculating the government gross or net debt as a percentage of Gross Domestic Product (GDP). If the debt of the government is to be sustainable, the debt to GDP ratio should be stable or decreasing over time. There are two conceptual approaches of calculating the sustainability of debt. These are accounting&Present Value Constraint (PVC) approaches. The ratio of debt to GDP is used mainly in accounting. Pasinetti(1998) and Goldstein (2003) have expressed that if a stable debt ratio can be managed over time then fiscal policy would be sustainable. For debt to be sustainable according to Cuttingnton(1997), a stable ratio of primary deficit to GDP (or surplus has selected the growth targets of gross domestic product and when the real interest rate is stable) and debt to GDP should be generated.According to the PVC approach,the no Ponzi Game (NPG) conditionthe fact that there is no way of new borrowings to settle debt is used to analyze debt sustainable.

The debt to GDP ratio calculated at a particular time to be sustainable, the discounted present value of expected future surplus should be equal to unsettled debt stock. This approach expects to generate a budget surplus in future if there is not enough net income to settle cumulative debt and interest at current. As long as government pays interest by obtaining moredebt, the fiscal policy is not sustainable. This approach is pointing out that the present deficit should be covered by future surplus. Hamilton and Flavin(1986) were pioneers of introducing inter-temporal budget constraint (IBC). Kremers(1998) further developed this theory by pointing out that if the IBC to be saturated, the debt should grow at a lower rate than the interest rate, and the budget deficit and stock of debt should be stationary. Wilcox (1989)further showed that it is better to test the stability of discounted debt. Based on these approaches, the main determinant factor of sustainability of the debtstock of the government is the budget deficit of a country. Growth rate of GDP is also an important factor of measuring sustainability.

The literature has extensively used stationary approaches and prediction methods to empirically examine the debt sustainability. Several studies related to the case of Sri Lanka have focused on sustainability of fiscal policy (Gupta 1992, Siriwardana1997, Jayawickrama2004).Sustainability of foreign debt in relation to fiscal policy has not been formally studies with reference to Sri Lanka. This paper focuses on filling this void.

Materials and Methods

The objective of this research is to study the sustainability of Sri Lankan debt.We employ a novel method to empirically estimate the sustainability of public debt in Sri Lanka. The approach developed byJayawickrama(2004), Jayawickrama&Abeysinghe(2006), and Akcay et al (2005) were used to build the analytical framework for the empirical study. It is assumed by this study that the primary deficit is financed by printing money and by financingthrough domestic and foreign bonds.

The nominal value of budget deficit for one year can be written as follows.

$$G_t - T_t + i_t B_{t-1} = \Delta M_t + \Delta B_t \quad (1)$$

Here, $G_t, T_t, B_t, i, i_t B_{t-1}, M_t$ are total expenditure of thegovernment without interest paying, tax Income of the government, stock of domestic and foreign debt of the government at the end of year t, nominal

interest rate on government debt, interests which is to be paid for the year of t-1, and base money, respectively.

$$B_t = G_t - T_t + (1+i_t)B_{t-1} - (M_t - M_{t-1}) \quad (2)$$

The following proportions were obtained dividing this equation by nominal gross domestic product (Y_t).

$$\frac{B_t}{Y_t} = \frac{G_t}{Y_t} - \frac{T_t}{Y_t} + (1+i_t)\frac{B_{t-1}}{Y_t} - \left(\frac{M_t}{Y_t} - \frac{M_{t-1}}{Y_t}\right) \quad (3)$$

By substituting the economic growth rate to the solution obtained through above equation $\left[\lambda = \frac{Y_t - Y_{t-1}}{Y_{t-1}}\right]$, the following solution was obtained:

$$b_t = g_t - t_t + \frac{(1+i_t)}{(1+\lambda)}b_{t-1} - \left[m_t - \frac{1}{(1+\lambda)}m_{t-1}\right] \quad (4)$$

From above equation,

$$d_t = g_t - t_t - \left[m_t - \frac{1}{(1+\lambda)}m_{t-1}\right] \quad (5)$$

The value which is obtained by the seignorage (the income generated by government through printing of money) is subtracted from the primary budget deficit has been equated to d_t of equation (5). $\frac{(1+\lambda)}{(1+i_t)} = \rho_t$ is the discount factor.

$$b_{t-1} = \rho_t b_t - \rho_t d_t \quad (6)$$

$$b_t = \lim_{N\to\infty} E_t(\rho b)_{t+N} - \sum_{j=1}^{\infty}(\rho d)_{t+j} \quad (7)$$

From here, it is considered that no new debt are withdrawn when settling the existing debt or No Ponzi Game.This requires the future limits of debt stock to be not positive (or negative).

$$\lim_{N\to\infty} E_t(\rho b)_{t+N} \le 0 \quad (8)$$

The idea of this condition is the present value of government stock of debt should converge to zero in the infinite future. According to that, the present value of expected future budget surplus should be equal to the stock of debt of the government in any year where there exists the above condition.

$$b_{t-1} = \sum_{j=1}^{\infty} (\rho d)_{t+j} \quad (9)$$

According to this approach, the discounted ratio of debt as a share of gross domestic product should be stable for debtto be sustainable. The expected ratio of debt should be equal to zero at limit analysis.

$$\lim_{N\to\infty} E_t(\rho b)_{t+N} = 0 \quad (10)$$

It proves that the debtis no longer sustainable if it is being a positive factor without being equal to zero.

The sustainability of government debt is testedby using face value debt as a share of GDP, market valueof debt as a share of GDP and discounted market valueof debt as a share of GDP. The nominal value of total debt stock was divided by nominal gross domestic product related to that year to calculate the face value of government debt to GDP ratio (b_{ft}). The market value of government debt to GDP ratio (b_{mt}) was obtained by dividing market value of total debt stock of the government by nominal GDP. To get the market value of government debt, the face value of government debt was discounted with one plus the yield on government debt. It was a challenge to get the yield on government debt because the time taken for the debt to be matured is different. Accordingly, the yield on government debt was derived by dividing the government total interests payments of the considered year by total outstanding stock of debt of the previous year. The discounted market value of governmentdebt to GDP ratio (b_{dmt}) was derived based on the above calculated face and market values using the following equation (equation 11).

$$b_{dmt} = b_{mt} \prod_{k=1}^{t} (1+\rho_k)^{-1} \quad (11)$$

$\rho_k = \left(\frac{1+\lambda}{1+r^t}\right)$ is discount factor

Here, λ and r^t are real GDP growth rate and interest rate respectively. Weighted averageinterest rate (WAIR) for 52 years from 1960 to 2012 was calculated by using equation (12) and the interest rate (r^t) was calculated by dividing the sum of WAIR by 52. The WAIR was calculated as follows.

$$WAIR = ai^d + bi^f \quad (12)$$

Where, a, b, i^d, i^f is the domestic debt stock as a proportionate of total stock of debt, the foreign stock of debt as a proportionate of total stock of debt, interest rate for domesticdebt and interest rate for foreign debt,respectively.

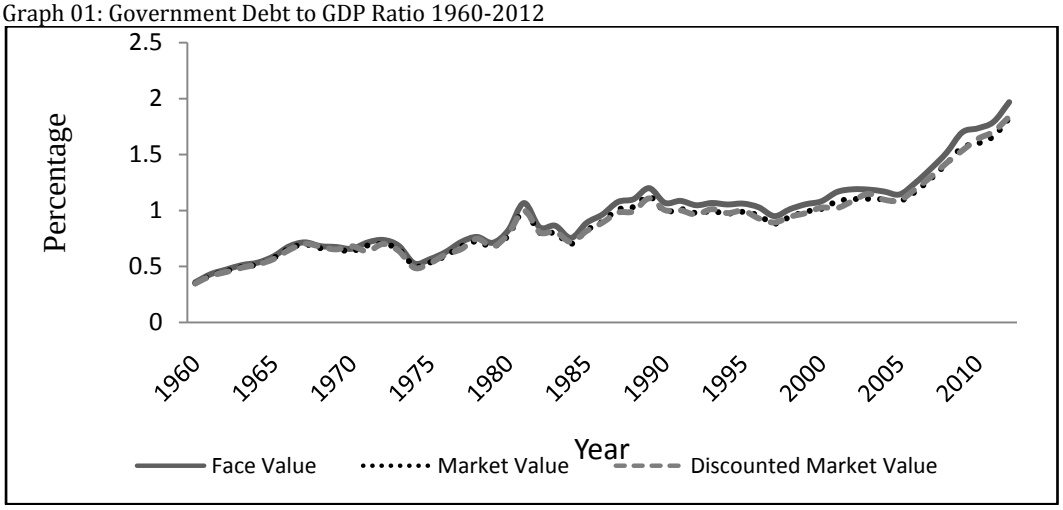
Results and Discussion

Augmented Dicky-Fuller (ADF) and Phillips-Perron (PP) tests were used to test the stationary and non-stationary of the face value of debt to GDP ratio, market value of debt to GDP ratio and discounted market

value of debt to GDP ratio. The calculated triple debt serials were tested for unit root only with constant term and with constant term and deterministic trend.Results are summarized in table 1.

According to the results, the null hypothesis ofunit root of face value of debt to GDP ratio including constant term and no trend cannot be rejected. That is, when it is tested by reducing triple lags to one lag the ADF test statistics was smaller than 5% Mackinnon Critical Value at all the three times. Similarly, the constant term was positive at all the times.Accordingly, the debt of Sri Lankan government is not seemingly sustainable.

Graph 01: Government Debt to GDP Ratio 1960-2012



Source: Authors calculation based on CBSL's data

However, the results obtained about government debt sustainability by further studies by conducting above tests related tothe market value of government debt to GDP ratio (b_{mt}) and the discounted market value of government debt to GDP ratio (b_{dmt})in addition to the face value of government debt to GDP ratio are presented in table 1 for further verifying the empirical results. According to those results, the market value of government debt to GDP ratio with the constant term and with the constant term and trend were not stationary at both times. Even though the unit root test was done by reducing the number of lags from three to one, the ADF test statistics failed to reject the null hypothesis of which unit roots were present.

The most appropriate debt serial was to measure the sustainability of Sri Lankan government's debt was the market value of discounted government debt to GDP ratio. It was concluded that, the serial was non stationary due to the test statistics being failed of rejecting the null hypothesis. That is the present value of government stock of debt was not convergent to zero in infinite future. Accordingly, the stock of debt of the government related to any year is not equal to the present value of expected future budget surplus. Lastly, according to that, both the market value and discounted market value of the government debt to GDP ratio were found to be non-stationary. Also, the constant term of all those times has shown a positive value. According to those results, the government debtin Sri Lanka was proven to be unsustainable.

Table 01: Augmented Dicky – Fuller Test

Variable	Constant with no Trend			Constant with Trend		
	First Lag	Second Lag	Third Lag	First Lag	Second Lag	Third Lag
b_{ft}	-0.908443 (-2.9190)	-0.851952 (-2.9202)	-1.262295 (-2.9215)	-o.831588 (-3.4987)	-1.079412 (-3.5005)	-0.461603 (-3.5025)
b_{mt}	-0.867439 (-2.9190)	-0.831139 (-2.9202)	-1.265868 (-2.9215)	-0.862102 (-3.4987)	-1.074299 (-3.5005)	-0.413220 (-3.5025)
b_{dmt}	-1.053300 (-2.9190)	-0.986204 (-2.9202)	-1.110088 (-2.9215)	-0.576843 (-3.4987)	-0.793915 (-3.5005)	-0.706154 (-3.5025)

Source: Authors calculation based on CBSL's data.

To further verify this, we employed Phillips-Perron tests. The triple data serials were re-tested by taking maximum lags as three and reducing to one for testing the stationarity. Those results are presented in table 02. Any debt serials failed to get enough test statistics to reject the null hypothesis that the debt serial consist of unit root at any time. Accordingly, those results further prove that the government debt in Sri Lankan is not sustainable.

Table 02: Phillips-PerronTest

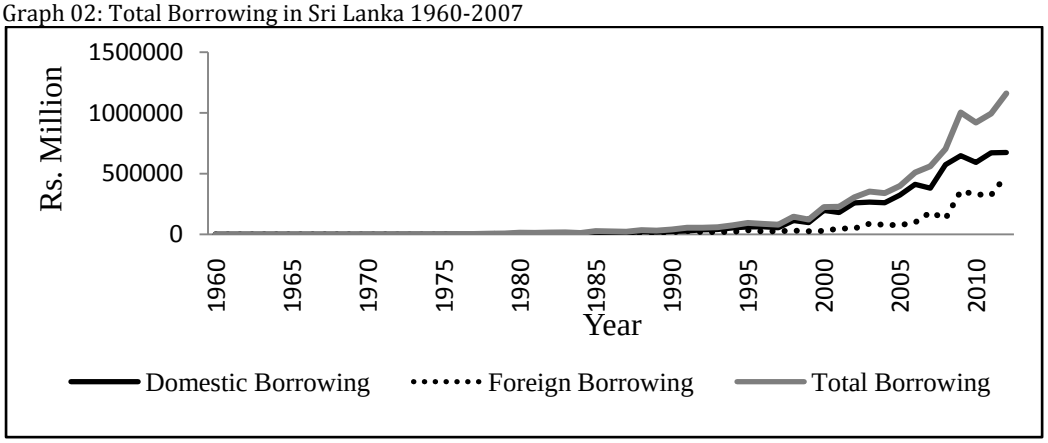
	Constant with no Trend			Constant wit Trend		
Variable	First Lag	Second Lag	Third Lag	First Lag	Second Lag	Third Lag
b_{ft}	-0.807711 (-2.9178)	-0.769443 (-2.9178)	-0.865856 (-2.9178)	-0.863170 (-3.4969)	-0.999747 (-3.4969)	-0.963766 (-3.4969)
b_{mt}	-0.770378 (-2.9178)	-0.727069 (-2.9178)	-0.824637 (-2.9178)	-0.860147 (-3.4969)	-0.996691 (-3.4969)	-0.951907 (-3.4969)
b_{dmt}	-0.930559 (-2.9178)	-0.906407 (-2.9178)	-0.929122 (-2.9178)	-0.655289 (-3.4969)	-0.769111 (-3.4969)	-0.814113 (-3.4969)

Source: Authors calculation based on CBSL's data.

When there is a structural change in the data serials, the results are being challenged. That is according to (Perron 1989), when there is a structural change in data serials, the null hypothesis of the presence of unit roots explained by ADF test can be bias. Therefore,possible structural breaks were tested by using Chow Test to see if there is a structural change in the triple variables of the face value, market value and discounted market value of government debt to GDP ratio. It was tested that if there is any break in government GDP in 1978 due to the open economic policy introduced in the latter part of 1970s. However, no significant break in any of the variables - face value of debt of government debt to GDP ratio, market value of government debt to GDP ratio, and discounted market value of government debt to GDP ratio – were observed.The results indicate that the F statistics related to those variables and log likelihood ratios were not significant. Even though all of those above tests were done related to the year 1979 any of F statistics or log likelihood ratios were not numerically significant.

The gap between income and expenditure of the government or the budget deficit is determined by the fiscal policy. From 1960 to 2012in Sri Lanka, many political parties with different economic policies have been ruling the country. The fiscal policy implemented based on various economic policies which has not remained sound according to above results. However, it is needed to broadly study the reasons for the unsustainability of government debt.

Graph 02: Total Borrowing in Sri Lanka 1960-2007

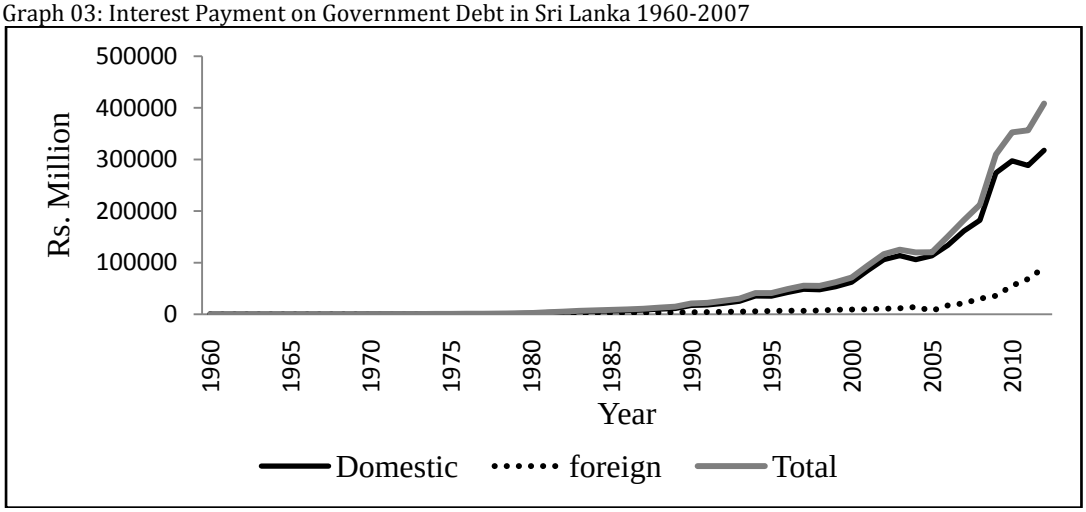


Source: Authors calculation based on CBSL's data.

First, it is important to discusshow borrowings, interest payments, and structure of the total stock of debt are structured and how it has affected the sustainability of debt.According to the 2nd graph, Sri Lanka's borrowings gradually grew after the year 1978. But it shows a growth of borrowing from local sources from the beginning of 1990 decade. The unsustainable debt leads the tax and non-tax income of the economy to decline and increase the current expenditure. Then, to generate the money needed to cover expense and pay

debt services, government has to get new loans. The local withdrawal of loans could have lead for the total debtto be unsustainable. There is also a big risk of local interest rate to increase, when the local withdrawal of loans is higher. This would result in crowding private investment out.

Graph 03: Interest Payment on Government Debt in Sri Lanka 1960-2007

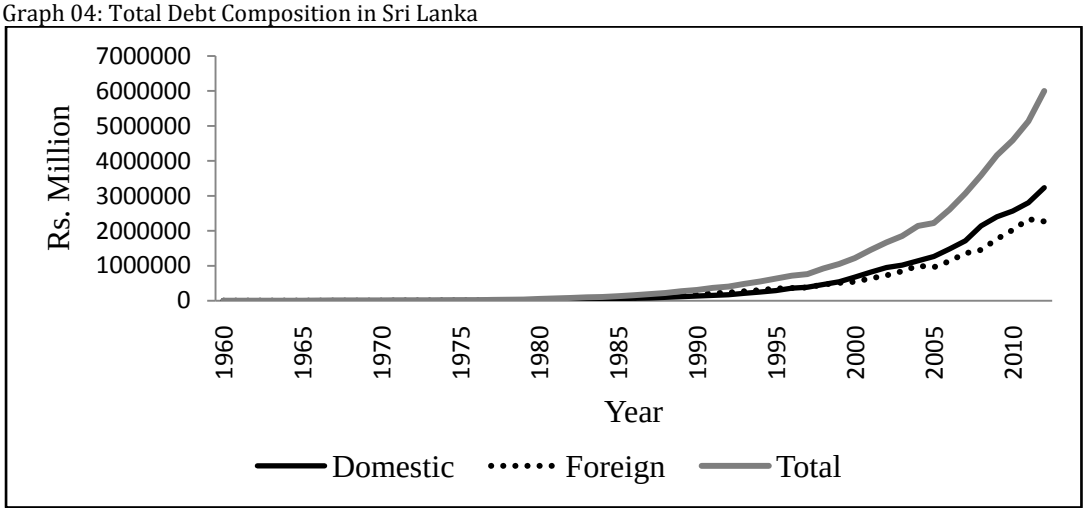


Source: Authors calculation based on CBSL's data.

Graph 3 explains how the government debt interest payments structured as locally and internationally.A larger portion of total interest payments is domestic interest payments. Even though the domestic withdrawal of loans is comparatively higher, the domestic interest payments have contributed to total interest payments at a higher rate than that. The foreign interest payment is comparatively lower, and a considerable decrease can be seen in 2005. This has adversely affected the total stock of debt of Sri Lanka to increase, that it has obtained more debt from domestic sources at higher interest rates. With the higher interest payments and the higher the debt service payments, it further leads to increase the budget deficit. This has significantly contributed for government debt in Sri Lankan to be unsustainable.

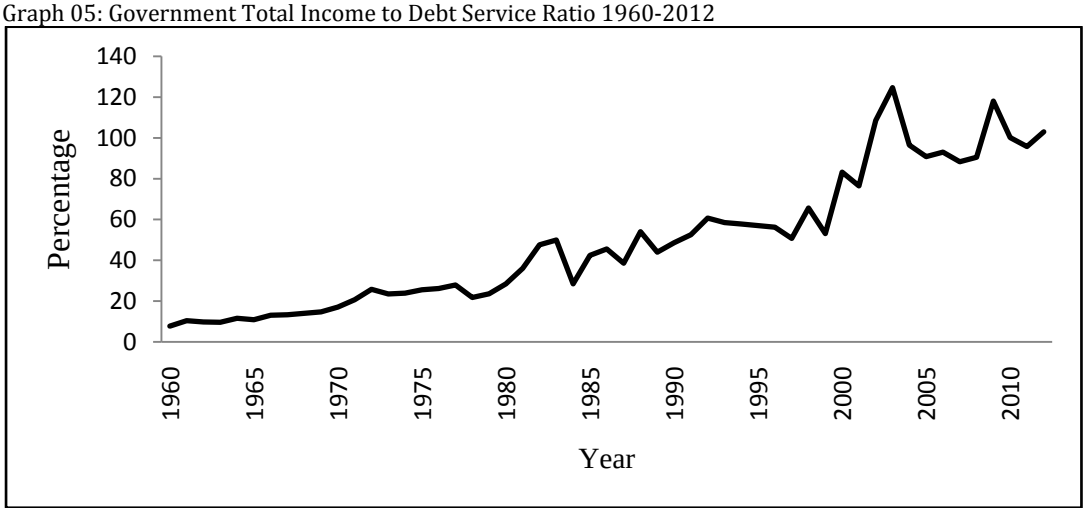
According to graph 4, the domestic debt stock from the total debt stock of the Sri Lankan government has increased after 1995. Even though the withdrawing of loans from domestic sources is comparatively higher than that of the foreign sources, there is no big gap between domestic and foreignsources on the cumulative debt.However, the total debt stock is shown a large increase after 1978. Meanwhile, when the total stock of debt goes up, the government has to allocate more for expenditure to coverdebt, which appears to have contributed for government debt to be sustainable.

Graph 04: Total Debt Composition in Sri Lanka



Source: Authors calculation based on CBSL's data.

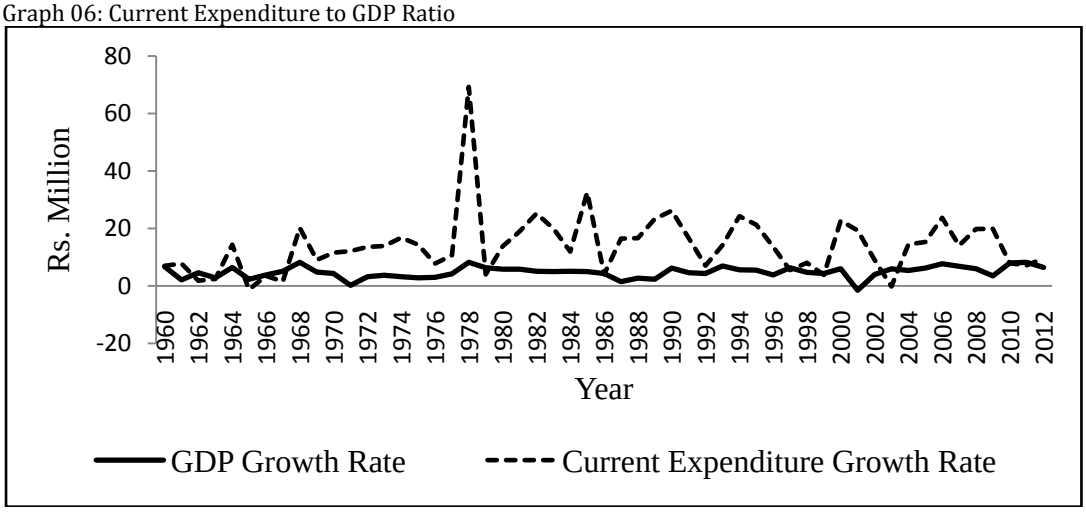
Graph 05: Government Total Income to Debt Service Ratio 1960-2012



Graph 5 shows that the total income of government to debt service ratiohas slowly grown until 1978 and gradually grown at a higher rate after 1978. The government obtained new loans to large infrastructure projects including education, and health projects.This resulted in increasing the debt services. This contributes to accumulate debt resulting in unsustainable stock of debt.

The current expenditure has grown faster than the growth of government gross domestic product in many years according to the graph 6. The growth of current expenditure in 1978 was 69% and economic growth rate was 8.2%. When the gap between economic growth and growth of current expenditure increases, debt also tends to go up. This leads to further borrowing making the public debt to be unsustainable.

Graph 06: Current Expenditure to GDP Ratio



Source: Authors' calculation based on CBSL's data

The revenue to the gross national product ratioof Sri Lanka is lower than that of the recent industrialized countries in the North Asia and developed countries. The tax income was 14.2% as a percentage of gross national product in 2007 in Sri Lanka, which has decreased to 13.3% in 2008. However, the tax income was approximately 20% from 1960 to the first half of 1990. Inefficiency in tax administration and differences in wage structure have led to decrease the attitudes of people about tax authority. Though tax income was expected to increaserecently, it has actually decreased.

Conclusion

The results of the empirical tests clearly indicate that the government debt in Sri Lanka is not sustainable. These results may be future verified if one uses the methods such as Vector Autoregressive method and impulse response functions, which are not the subject of focus in this paper. A number of factors were identified as responsible for the government debt to be unsustainable over the years in Sri Lanka. Over-reliance on various sources of debt to finance the budget deficit has resulted in this predicament. A large number of public works programmes were implemented during the past few decades mainly through foreign commercial borrowing. The output generated by these investments was basically non-tradable goods and services making it extremely difficult for the government to find means for financing debt services. Export growth was not facilitated mainly by these investments.

References

Akcay, O. C., C. E. Alper, and S. Ozmucur.(2005).Budget Deficit, Inflation and Debt Sustainability: Evidence from Turkey (1970-2000). *Bogazici University Research Papers*,No. 200112

Central Bank of Sri Lanka.(1960-2008). *Annual Reports*. Colombo: Central Bank of Sri Lanka.

Cuttington, John T.(1997). Analyzing the Sustainability of Fiscal Deficits in Developing Countries.Department of Economics, Georgetown University, Washington D.C.

Goldstein, M.(2003).Debt Sustainability, Brazil and the IMF.*Working Paper*, Institute of International economics.

Gupta, K.L. (1992). *Budget Deficits and Economic Activity in Asia*. London: Rutledge.

Hamilton, J. D. and M. Flavin.(1986). On the Limitation of Government Borrowing: A Framework for Empirical Testing.*AmericanEconomic Review* 76: 808-819.

Jayawickama, Ananda. (2004). Fiscal Policy Sustainability: Evidence from Sri Lanka.*Sri Lanka Economic Journal* 5(1): 51-69.

Jayawickrama, Ananda and TilakAdeysinghe.(2006). Sustainability of Fiscal Deficits: The U. S. Experience 1929-2004. *SCAPE Working Paper Series*, Paper No. 2007/01, Department of Economics, National University of Singapore: 1-28

Kremers, J. M.(1988). Long Run Limits on the US Federal Debt.*Economics Letters* 28:259-62.

Pasinetti, L.L.(1998). The Myth (or folly) of the 3% Deficit/GDP Maastricht Parameter.*Cambridge Journal of Economics* 22:117-136.

Perron, P. (1989). The Great Crash, the Oil Price Shock and the Unit Root Hypothesis.*Econometrica* 57: 1361-1401.

Siriwardana, K.K.M.(1997). An Analysis of Fiscal Sustainability in Sri Lanka.*Staff Studies.* Central Bank of Sri Lanka: 80-108.

Wilcox, David W.(1989). The Sustainability of Government Deficits: Implications of the Present Value Borrowing Constraint. *Journalof Money, Credit and Banking* 21: 291-306.