THE BUDGET DEFICIT AND FINANCIAL CROWDING OUT: EVIDENCE FROM SRI LANKA

Sri Lanka Journal of Economic Research
Volume 1(1)
December 2013:3-28
Sri Lanka Forum of University Economists

A A S Priyadarshanee
O G Dayaratna-Banda

Abstract

Fiscal policy is an important factor that influences the effectiveness of private investment. An expansionary fiscal policy might lead to growth in total income of a country, while such may also raise interest rates and thereby reduce private investment. The present study examined whether there is such a financial crowding out with reference to Sri Lanka, amidst a dearth of studies examining the impact of the budget deficit on private investment. Time series data from 1960 to 2007 were used for empirical tests based on Neoclassical Flexible Accelerator and Mundell-Fleming models. The bounds testing co-integration procedure was adopted to test the long-run relationships and dynamic interactions among variables. The results show that there is a long run co-integration relationship between real interest rate and budget deficit, money supply, exchange rate, and the expected inflation. The study found evidence for the absence of a financial crowding out effect as a result of fiscal expansions in Sri Lanka, where private investment appears to have increased as a result of fiscal expansions. The Central Bank of Sri Lanka appears to have mitigated any crowding out effect of fiscal expansions by an accommodative monetary policy which has been financed through capital inflows, foreign aid, foreign debt, and worker remittances.

Key Words: *Budget Deficit, Private Investment, Interest Rate, Financial Crowding-out, ARDL*

JEL Codes :*C01, C82, E62, E43, E52*

A A S Priyadarshanee
The Open University of Sri Lanka, Colombo, Sri Lanka
Telephone: +940773650253, email: imaliwimalasiri@yahoo.com

O G Dayaratna-Banda
Department of Economics & Statistics, University of Peradeniya, Sri Lanka
Telephone: +940812382622, email: ogdayab@gmail.com

INTRODUCTION

The relationship between budget deficits, interest rates, and private investment has long been discussed in literature on macroeconomics. Government activity related to fiscal policy seemingly affects economic outcomes. Expansionary fiscal policy, by positively affecting private investment (crowding-in), may lead to growth in total income of a country, while it may also raise interest rates, thereby reducing private investment (crowding-out). The net effect is determined by these two opposing tendencies. Since effects of fiscal policy on other macroeconomic variables tend to depend on monetary policy, balance of payments and exchange rates, whether fiscal policy would result in 'crowding-out' or 'crowding-in' effects cannot be determined, a priori, without empirically testing possible relationships with respect to a particular economy.

There are different theoretical positions taken by different schools of thought on the effects of fiscal policy. While the neoclassical school asserts crowding out effects, the Keynesian school emphasises crowding in effects, arguing that an increase in Government spending stimulates domestic economic activity. According to the Ricardian Equivalence Theorem, increases in budget deficit financed through Government borrowing will be matched with a future increase in taxes, leaving interest rates and private investment unchanged (Bahmani-Oskooee, 1999). It is therefore important to investigate empirically as to how the budget deficit in Sri Lanka impacted private investment through its effects on interest rates during the post-colonial period.

Sri Lanka endured persistent budget deficits for several decades. As the largest expenditure unit and employer, the scope and participation of Government has expanded since the 1950s. By 1955, the export boom collapsed, while economic conditions showed a consistent downward trend. In the 1960s, the Sri Lankan Government resorted to socialist inclined economic policies with heavy interventions into the economy, curtailing private economic activity. In 1970, the new Government adopted an inward-looking policy of import substitution and established Government enterprises, nationalized private enterprises and expanded welfare programs, which seriously reduced private economic activity to negligible levels. After 1977, the Government adopted open economic policies as its development strategy, though Government expenditure continued to remain at high levels. Sri Lanka, therefore, has witnessed the implementation of a series of contrasting development strategies since independence.

In spite of the different policy thrusts adopted, Sri Lanka experienced high budget deficits since 1960. According to Central Bank of Sri Lanka, the overall budget deficit as a percentage of GDP was 5.8 in 1958-67, 6.1 in 1968-77, 11.5 in 1978-87 and 8.4 in 1988-96 (CBSL 1998). It was 8.1 in 2006 (CBSL 2007).

Examining the macroeconomic implications therefore is of great significance to the policy making process in Sri Lanka, particularly because of the dearth of studies directly focusing on the impact of budget deficit on private investment. In this respect, the present study attempted to empirically investigate whether there has effectively been a financial crowding out in Sri Lanka.

REVIEW OF LITERATURE

In macroeconomic theory, there exist two variants of crowding out in an economy–real and financial. The real (direct) crowding out occurs when an increase in public investment displaces private capital formation broadly on a one-to-one basis, irrespective of the mode of financing fiscal deficit (Blinder and Solow 1973).

On the other hand, the financial crowding-out is the phenomenon of partial loss of private capital formation, due to the increase in interest rates emanating from the pre-emption of real and financial resources by the Government through bond-financing of fiscal deficit (Buiter 1990).

According to Barro (1974), budget deficits are irrelevant for financial decisions. An increase in budget deficit is expected to be accompanied by an increase in taxes in the future, if not today. Therefore, individuals considering their future income do not change their consumption and/or savings, leaving interest rates and private investment also unchanged, which translates into no crowding-out or crowding-in effect of fiscal spending (Barro 1978 and 1989, Darrat and Suliman 1991, Ghatak and Ghatak 1996).

The Keynesian school, on the other hand, assumes that there is unemployment in the economy and that the interest rate sensitivity of investment is low. In that case, expansionary fiscal policy will lead to little or no increase in the interest rate. This also assumes that Government spending tends to increase private investment because of the positive effect of Government spending on the expectations of investors. Therefore, there is a crowding-in rather than a crowding-out effect of public spending (Aschauer 1989, Baldacci, Hillman and Kojo 2004).

The Neoclassical Loanable Funds Theory explains that the balancing of savings and investment will be resolved by the interest rate mechanism (Grieve 2004). In case of an increase in Government spending, interest rates have to increase to bring the capital market into equilibrium, dampening private investment (Beck 1993, Heijdra and Ligthard 1997, Voss 2002, Amirkhakhali 2003, Ganelli 2003). Chakraborty (2006) pointed out that sale of bonds by the Government to finance budget deficits, regardless of its use of proceeds, raises supply of bonds and thereby lowers bond price. This results in increasing interest rates and reducing private investment (crowding-out).

Empirical findings on the effects of budget deficit on interest rate and private investment are ambiguous. Evans (1995) and Kormendi (1983) found that there is a relationship between budget deficit and interest rate. Alani (2006) found empirical support for the absence of a crowding-out effect arising as a result of financing budget deficit. Esiner (1989) concluded that budget deficit affects capital inflows, and not capital outflows. Cebula (1978), Cebula and Scott (1991), Cebula and Belton (1992), Cebula, Hung and Manage (1996) identified a positive relationship between budget deficit and interest rate with reference to USA and Canada. Investment appears to be affected by the net change in the debt, and hence crowding out effects (Ostroky 1979), while increase in the debt financed proportion of Government deficit appears to crowd out private investment (Feldstein 1986).

In an empirical study covering 10 Asian countries, Gupta (1992) has found that the Ricardian Equivalence Theorem is rejected vis-a-vis Sri Lanka, India, Indonesia and Philippines. He identified evidence of crowding out in all Asian countries excluding India. Chowdhary (2004) tested possible effects of fiscal actions enumerated earlier on five least developed countries (LDCs) in South Asia. In the case of Sri Lanka, the price effect seems negative but statistically insignificant and therefore does not indicate any perceptible influence on the interest rate.

However, none of these studies appears to have had their focus on empirically testing the financial crowding out hypothesis.

THEORETICAL FRAMEWORK

The Neoclassical Flexible Accelerator Model appears to provide a basis for analysing financial crowding out effects in advanced countries. The neoclassical theory does not adequately recognise Government investment as its philosophy encompasses assumptions which are not amenable to developing countries. However, Governments in developing countries appear to be carrying out significant functions pertaining to investment in their economies. Therefore, this study developed a theoretical model to establish a relationship between budget deficits and interest rates following the Mundell-Fleming Model, and also a model to establish a relationship between interest rate and private investment using the variant of the Neoclassical Flexible Accelerator Model adopted by Chakraborty (2006).

Firstly, with regard to the link between interest rate and private investment, Gross investment in private sector can be expressed as its net investment plus the depreciation of previous capital stock, as depicted in the equation (1).

$$I_{pvt} = \Delta KP_t + \delta KP_{t-1} \quad (1)$$

where, I_{pvt} = Gross Private Investment

$\Delta KP_t = N_{pvt}$ = Net Private Investment

δ = Depreciation Ratio

The Net Private Investment, on the other hand, can be expressed as a combination of the desired capital stock and the brought-forward capital stock (equation 2).

$$N_{pvt} = \Delta KP_t = \beta\left(KP_t^* - KP_{t-1}\right) \quad (2)$$

where, KP_t^* = desired stock of capital in private sector

KP_{t-1} = actual stock of private investment in previous year

β = coefficient of adjustment, $0 \le \beta \le 1$

Substituting equation (2) into (1);

$$I_{pvt} = \beta\left(KP_t^* - KP_{t-1}\right) + \delta KP_{t-1} \quad (3)$$

$$I_{pvt} = \beta KP_t - \beta KP_{t-1} + \delta KP_{t-1} \quad (4)$$

By rewriting equation (4) using Standard Lag Operator (L),

$$I_{pvt} = \left[1 - (1-\delta)L\right]KP_t \quad (5)$$

where $LKP_t = KP_{t-1}$

Partial adjustments function for gross investment is,

$$\Delta I_{pvt(t)} = \beta\left(I^*_{pvt(t)} - I_{pvt(t-1)}\right) \quad (6)$$

where $I^*_{pvt(t)}$ = desired level of private investment

Private investment in the steady state should be,

$$KP^*_{t-1} = KP_{t-1}$$

$$I^*_{pvt} = \left[1 - (1-\delta)L\right]KP_t^* \quad (7)$$

Combining equation (6) and (7), and solving for I_{pvt};

$$\Delta I_{pvt(t)} = \beta\left[1 - (1-\delta)L\right]KP_t^* - \beta I_{pvt(t-1)} \quad (8)$$

$$I_{pvt(t)} - I_{pvt(t-1)} = \beta\left[1 - (1-\delta)L\right]KP_t^* - \beta I_{pvt(t-1)} \quad (9)$$

$$I_{pvt(t)} = \beta[1-(1-\delta)L]KP_t^* + I_{pvt(t-1)} - \beta I_{pvt(t-1)} \quad (10)$$

$$I_{pvt(t)} = \beta[1-(1-\delta)L]KP_t^* + (1-\beta)I_{pvt(t-1)} \quad (11)$$

According to accelerator models, desired stock of capital can be assumed to be proportional to the output expectations in the economy.

$$KP_t^* = \alpha Y_t^* \quad (12)$$

where, Y^*_t = expected output in the economy

Substituting equation (12) into (10);

$$I_{pvt(t)} = \beta[1-(1-\delta)L]\alpha Y_t^* + (1-\beta)I_{pvt(t-1)} \quad (13)$$

$$I_{pvt(t)} = \beta\alpha[1-(1-\delta)L]Y_t^* + (1-\beta)I_{pvt(t-1)} \quad (14)$$

where (β) is the response of private investment to the gap between desired and actual level of investment. This response is determined by the economic factors that influence private investor's ability to reach the desired level of investment.

We assume that level of private investment depend on private consumption (C_{pvt}), real interest rate (i_r), and Government investment (I_{pub}).

$$\beta = \int \{C_{pvt}, i_r, I_{pub}\} \quad (15)$$

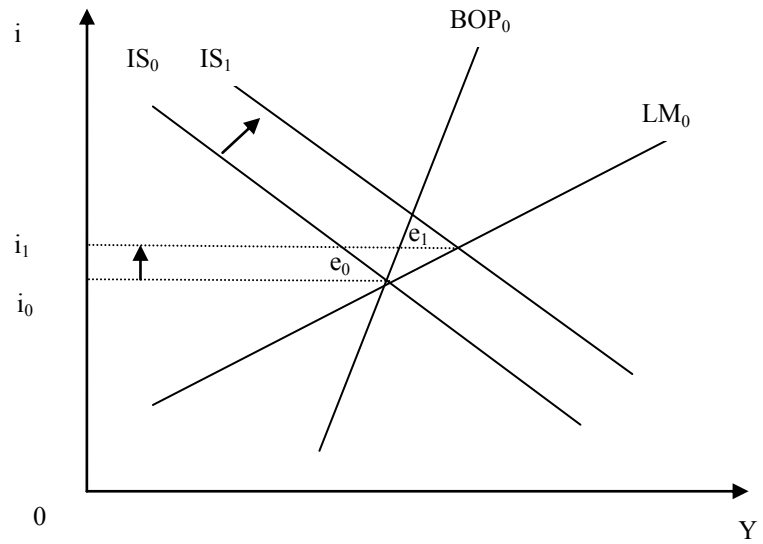
Secondly, though the study conducted by Chakraborty (2006) was able to show that private investment is sensitive to interest rate, it has been unable to build a relationship between interest rate and budget deficit.

To fill this gap, the present study modified the Mundell-Fleming Model to establish a relationship between budget deficit and interest rate. So this study used the IS-LM-BP model, developed by Robert Mundell based on J. Marcus Fleming in the 1960s including capital mobility and differentiated goods, equilibrium of goods and money market, also concerns the differences like fixed and flexible exchange rates, large and small countries and the effect of fiscal and monetary policies on these macro variables in an open economy. According to them, capital mobility is faster than international trade and it depends on interest rate. Long run capital inflow depends on marginal productivity of capital. Foreign Direct Investment (FDI) depends on capital gains, and not on interest rate. However Mundell-Fleming model discusses the short term capital mobility, that is "hot money".

According to Figure 1, increase in Government expenditure leads to shifting IS curve to the right (to the new position identified as IS_1) and then, interest rate increases to i_2. As

interest rate increases, the crowding-out effect begins to affect private investment. Higher the investment cost, lesser would be the tendency of private investors to invest. This implies a relationship between budget deficit and interest rate. This study therefore hypothesises that investment would decrease when budget deficit increases.

Figure 1: Fiscal and Monetary Policies in Sri Lanka



Source: Mundell (1963)

In the Mundell-Fleming model, interest rate is mainly influenced by fiscal policy, monetary policy and external factors. Thus, this study models real interest rate as a function of budget deficit (BD), money supply (MS), exchange rate (ER) and expected inflation (π^e).

$$RI = f(BD, MS, ER, \pi^e) \qquad (16)$$

Therefore the empirical equation for financial crowding-out would be as follows:

$$RI_t = C_0 + \delta_1 RI_{t-i} + \delta_2 BD_t + \delta_3 \pi_t^e + \delta_4 MS_{2t} + \delta_5 ER_t + \varepsilon_t \qquad (17)$$

where, RI_t = Real Interest Rate

BD_t = Budget Deficit Growth Rate

π_t^e = Expected Inflation Rate

ER_t= Exchange Rate

MS_{2t} = Money Supply Growth Rate

Estimation Methods

In order to test the stationarity of data, Augmented Dicky-Fuller (ADF) and Phillips-Perron tests were used in the presence of structural breaks. The liberalisation of the Sri Lankan economy in 1977 had a significant impact on the mean of most of the country's macroeconomic variables, because of the structural breaks that would have been caused by the economic policy shift from a controlled economy to a market-oriented economy. The Chow test was adopted to ascertain the significance of the break in the trends. The optimal lag length was selected using Schwartz-Bayesian Criteria (SBC) and Akaike Information Criteria (AIC). The study used a relatively longer lag length in the beginning, and then pared down the model through the usual AIC and SBC tests.

To empirically analyse the long-run relationships and dynamic interactions among the variables of interest, a model was estimated by using the bounds testing co-integration procedure [or autoregressive distributed lag (ARDL)] developed by Pesaran *et al* (2001). Unlike other techniques such as the Johansen approach, the ARDL approach to co-integration does not require the pre-testing of the variables included in the model for unit root (Pesaran *et al.*, 2001). It is applicable irrespective of whether the regressors in the model are purely I(0), purely I(1) or mutually co-integrated. However, as remarked by Ouattara (2004), if the order of integration of any of the variables is greater than one [for example, an I(2) variable], then the critical bounds provided by Pesaran et al. (2001) are not be valid. They are computed on the basis that the variables are I(0) or I(1). It is necessary to test for unit root to ensure that all the variables satisfy the underlying assumptions of the ARDL methodology before proceeding to the estimation stage.

The long run relationship as General Vector Autoregressive (VAR) model of order *p* is given below,

$$Z_t = C_0 + \beta t + \sum_{i=1}^{\rho} \phi_i Z_{t-i} + \varepsilon_t \qquad \text{t=1, 2,3,...j} \tag{18}$$

where $C_0 = \mathrm{K} + 1$ Vector of intercepts (drift)

$\beta = \mathrm{K} + 1$ Vector of trend coefficients

Vector Error Correction Model (VECM) below was derived using the above equation:

$$\Delta Z_t = C_0 + \beta t + \Pi Z_{t-1} + \sum_{i=1}^{\mathrm{P}} \Gamma_i \Delta Z_{t-j} + \varepsilon_t \qquad \text{t=1, 2,3,...j} \tag{19}$$

where the $(\mathrm{K} \times 1) \times (\mathrm{K} \times 1)$ matrixes $\Pi = l_{\mathrm{K}+1}$ and $\Gamma = -\sum_{j=i+1}^{p} \Psi_j$ represent the long run multipliers and short run dynamic coefficients of VECM. Z is the vector of variables Y_t and X_t respectively. Y_t is dependent variable and X_t is vector of I(0) and I(1) regressors.

Thus, the Conditional Vector Error Correction Model would be as follows:

$$\Delta y_t = C_{y0} + \beta t + \delta_{yy} y_{t-1} + \delta_{xx} X_{t-1} + \sum_{i=1}^{P-1} \lambda_i \Delta y_{t-i} + \sum_{i=1}^{P-1} \phi_i \Delta X_{t-i} + \varepsilon_{yt} \quad (20)$$

The first step in the ARDL bounds testing approach is to estimate equation (20) by Ordinary Least Squares (OLS) in order to test for the existence of a long-run relationship among the variables. Two asymptotic critical value bounds provide a test for co-integration when the independent variables are I(d) (where d is either 0 or 1): a lower value assuming the regressors are I(0) and an upper value assuming purely I(1) regressors. If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected, irrespective of the orders of integration in the time series. Conversely, if the test statistic falls below the lower critical value, the null hypothesis cannot be rejected. If the statistic falls between the lower and upper critical values, the result would be inconclusive.

$$\Delta RI_t = C_0 + \delta_1 RI_{t-1} + \delta_2 BD_{t-1} + \delta_3 \pi^e_{t-1} + \delta_4 MS_{2t-1} + \delta_5 ER_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta RI_{t-i}$$
$$+ \sum_{j=1}^{q} \varpi_j \Delta BD_{t-j} + \sum_{l=1}^{q} \eta_l \Delta \pi^e_{t-l} + \sum_{m-1}^{q} \varphi_m \Delta MS_{2t-m} + \sum_{n-1}^{q} \gamma_n \Delta ER_{t-n} + \varepsilon_t \quad (21)$$

Once the co-integration is established, the ARDL long-run model for dependent variable can be estimated as:

$$RI_t = C_0 + \sum_{i=1}^{p} \delta_1 RI_{t-i} + \sum_{i=1}^{q} \delta_2 BD_{t-i} + \sum_{i=1}^{q} \delta_3 \pi^e_{t-i} + \sum_{i=1}^{q} \delta_4 MS_{2t-i} + \sum_{i=1}^{q} \delta_5 ER_{t-i} + \varepsilon_t \quad (22)$$

The error correction model associated with the long-run for estimate the short-run dynamic parameters could then be obtained as follows:

$$\Delta RI_t = C_0 + \sum_{i=1}^{p} \alpha_i \Delta RI_{t-i} + \sum_{j=1}^{q} \varpi_j \Delta BD_{t-j} + \sum_{l=1}^{q} \eta_l \Delta \pi^e_{t-l} + \sum_{m-1}^{q} \varphi_m \Delta MS_{2t-m} + \sum_{n-1}^{q} \gamma_n \Delta ER_{t-n} + \vartheta ecm_{t-1} + \varepsilon_t \quad (23)$$

The equation (22) will be the basic focus of our estimations to test the financial crowding out effects of fiscal expansion in Sri Lanka.

Description of Variables and Data

Interest rates on commercial bank loans were used for the purposes of this study. Average interest rate of loans and overdrafts (stock in trade, immovable property and other) was taken as nominal interest rate. Fisher hypothesis was used to convert nominal interest rate into real interest rate.

Ex-ante and ex-post equations are as follows:

$$\gamma^n = \gamma^r + \pi^e$$

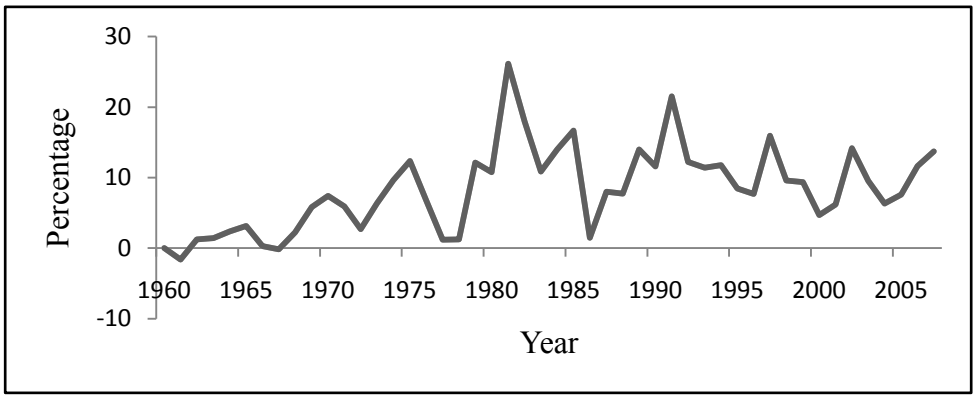
$$\gamma^n = \gamma^r + \pi$$

where, γ^n = nominal interest rate, γ^r = real interest rate,

π^e = expected inflation, π = actual inflation.

Real interest rate was calculated by applying ex-post equation.

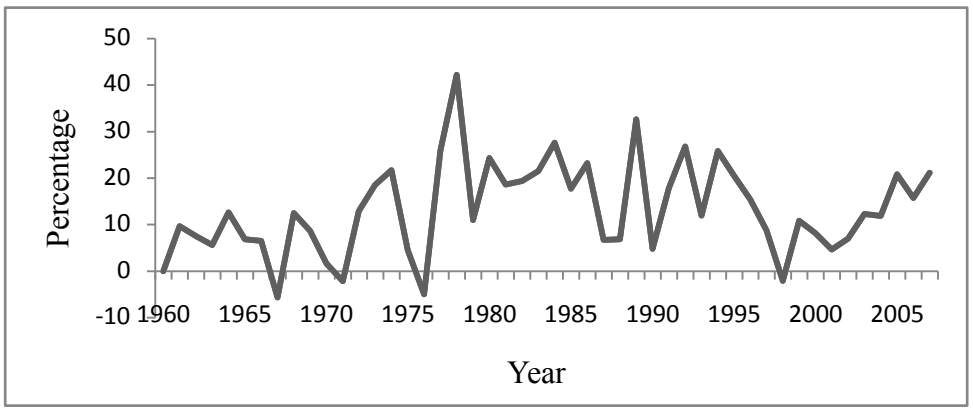
Figure 2: Real Interest Rate 1960 – 2007



Source: Authors' calculation based on CBSL data.

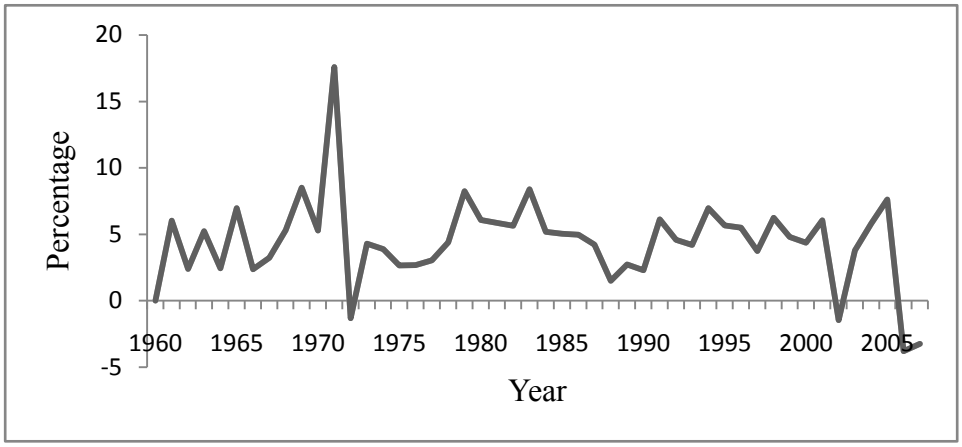
The overall budget deficit being equal to primary budget deficit plus interest, the growth rate of the budget deficit was calculated to test the relationship between budget deficit and interest rate.

Figure 3: Overall Budget Deficit Growth Rate : 1960 - 2007



Source: Authors' calculation based on CBSL data.

Figure 4: Money Supply Growth Rate : 1960 -2007



Source: Author's calculation based on CBSL data.

For the purpose of the analysis, broad money supply consisting of currency plus rupee denominated demand, and savings and time deposits held by the public was used.

The Rational Expectation Theory was adopted in calculating the expected inflation for Sri Lanka, which uses all available information, unlike the Adaptive Expectation theory (which considers previous year's inflation as the expected inflation).

Thus, it was assumed that the inflation expectation could be represented as follows :

$$\log \pi_t = f(MS_{2t}, BD_t, OG_t, \pi_{t-1}) \quad (24)$$

where, π_t =inflation rate in time t

MS_{2t} = money supply growth rate ; π_{t-1} = inflation rate in time t-1

BD_t = overall budget deficit growth rate; OG_t = output gap

Output gap index was estimated using the following model:

Output Gap = [(Actual GDP – Potential GDP)/Potential GDP]*100

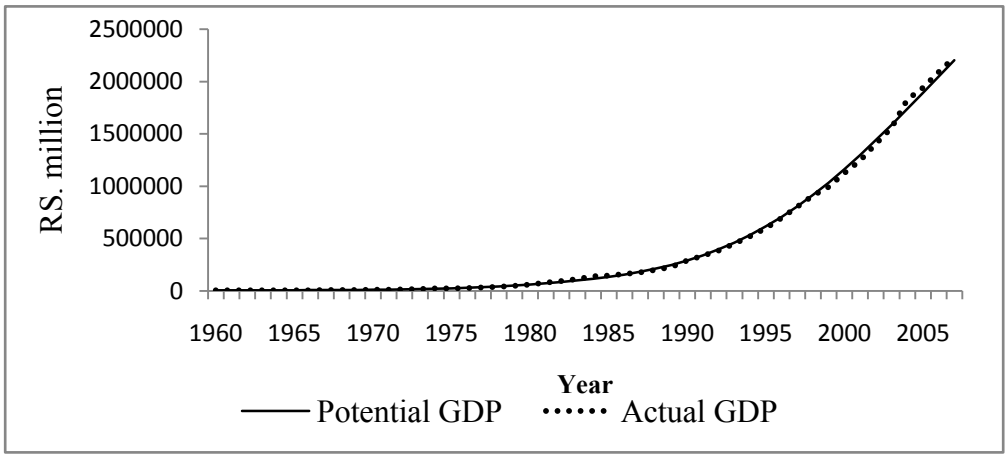
This is also known as the economic activity index. Potential GDP is higher than the actual output level, as the resource utilisation becomes maximised at the potential level. However, cyclical factors, such as recessions or booms, could cause the actual to be below or above the potential output, respectively (Tanzi 1985). The Hodrick-Prescott filter method was used to calculate the potential GDP. This method decomposes a non-stationary time series (such as actual output level) into a stationary cyclical component

and a smooth trend component by minimising variance of cyclical component, subject to the trend component.

$$Min \sum_{t=1}^{T} (Y_t - Y_t^*)^2 + \lambda \sum_{t=2}^{T-1} \left[\left(Y_{t+1}^* - Y_t^* \right) - \left(Y_t^* - Y_{t-1}^* \right) \right]^2 \qquad (25)$$

where, Y_t=logarithms of actual output, and Y_t^*= logarithms of potential output

Figure 5: Actual and Potential GDP: 1960 -2007

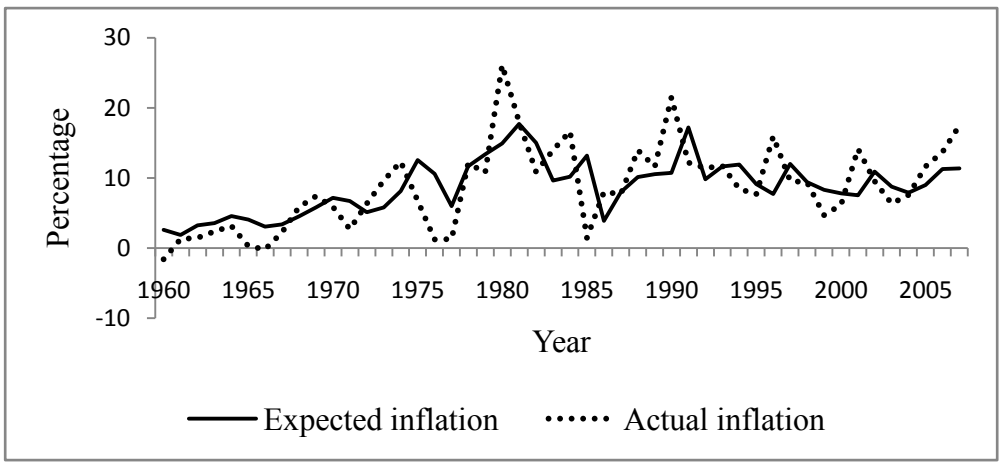


Source: Authors' calculation based on CBSL data.

An equation was thereafter built to estimate the expected inflation, as given below :

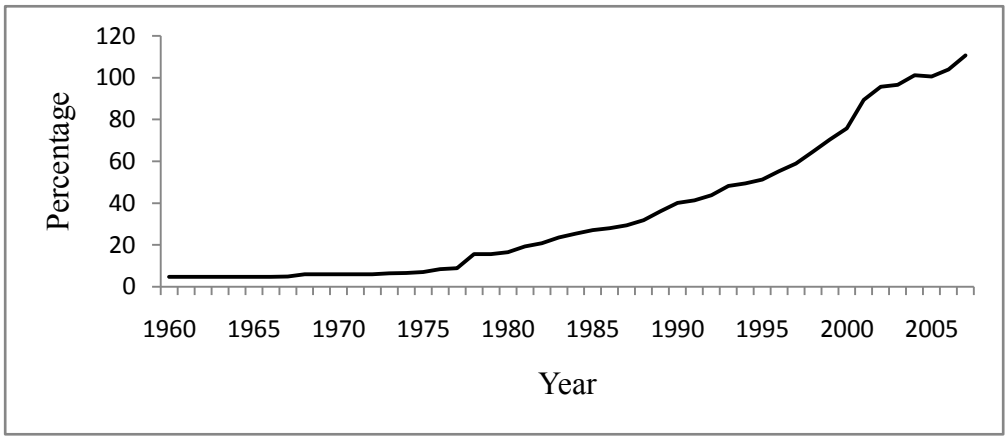
$$\log \pi_t = \beta_0 + \beta_1 MS_{2t} + \beta_2 BD_t + \beta_3 OG_t + \beta_4 \pi_{t-1} + U_t \qquad (26)$$

Figure 6: Expected and Actual Inflation 1960 - 2007



Source: Authors' calculation based on CBSL data.

Figure 7: Exchange Rate 1960 -2007



Source: Author's calculation based on CBSL data.

The quantity of rupees exchange for one USA dollar was taken as the exchange rate, which indicated an increasing trend since 1977 upon the introduction of the crawling peg system in 1977. Time series data obtained from the Central Bank of Sri Lanka for the period 1960 to 2007 were used in the analysis.

RESULTS AND DISCUSSION

Only the exchange rate variable displayed a structural break as a result of Sri Lanka's policy changes that took place after 1977. The significance of the break in the trend was ascertained through the Chow test. The results obtained are presented in the Table 1.

Table 1: Testing Exchange Rate for Structural Break

Break point	Estimated Chow Test F-statistic	Probability	Estimated Chow Test log likelihood statistic	Probability
1978	0.885007	0.420	1.893101	0.388077
1981	4.620362**	0.015	9.150433**	0.010304

Notes: ** indicate the 5% significance level

Source: Authors' calculations based on CBSL data

The results of Chow test in terms of F-Statistic and Log Likelihood statistic revealed that the exchange rate variable exhibited a break in trend in 1981. The statistics of both these were statistically significant at 5% level.

As expected, the F-statistic in the Chow test and the Log Likelihood statistic exhibited that there was no significant break in 1978, indicating that the economic liberalisation policy had not induced a break in the Exchange Rate evolution.

ADF and Phillips-Perron (PP) unit root tests were performed at level, including constant without deterministic trend, and constant with deterministic trend. Wherever the tests failed to reject the null hypothesis of unit root at level, the tests were carried out using first differences. Results of these tests indicated that all variables were either I(0) or I(1), and are presented in the Tables 2 and 3.

Table 2: ADF and PP Unit Root Tests at Level

Level	ADF		PP		Order of Integration I(d)
	Constant with no Trend	Constant with Trend	Constant with no Trend	Constant with Trend	
RI_t	-3.350115** (-2.9256)	-3.692485** (-3.5088)	-4.249307** (-2.9241)	-4.626756** (-3.5066)	I(0)
BD_t	-2.903361 (-2.9256)	-2.873762 (-3.5088)	-8.286219** (-2.9241)	-8.283176** (-3.5066)	H_0 not rejected
π_t^e	-2.137324 (-2.9271)	-2.076348 (-3.5112)	-2.895478 (-2.9241)	-3.313194 (3.5066)	H_0 not rejected
ER_t	-4.681407** (-3.5973)	-4.620479** (-4.41958)	-7.430387** (-3.5930)	-7.339235** (-4.1896)	I(0)
MS_{2t}	-2.556708 (-2.9256)	-2.507204 (-3.5088)	-3.022407** (-2.9241)	-3.044762 (-3.5066)	H_0 not rejected

Notes: ** represent 5% significance level.
Values in parenthesis are 5% McKinnon critical values.

Source: Authors' calculations based on CBSL data.

Table 3: ADF and PP Unit Root Tests in First Difference

First Difference	ADF		PP		Order of Integration I(d)
	Constant with no Trend	Constant with Trend	Constant with no Trend	Constant with Trend	
BD_t	-6.000449** (-2.9286)	-5.951330** (-3.5136)	-20.61688** (-2.9256)	-20.39708** (-4.1678)	I(1)
π_t^e	-4.791424** (-2.9286)	-4.707757** (-3.5136)	-9.700610** (-2.9256)	-9.662645** (3.5088)	I(1)
MS_{2t}	-6.044581** (-2.9271)	-5.999239** (-3.5112)	-8.925267** (-2.9256)	-8.849402** (-3.5088)	I(1)

Notes: ** represent 5% significance level.
Values in parenthesis are 5% McKinnon critical values.

Source: Authors' calculations based on CBSL data.

For the variables BD_t and MS_{2t}, however, the ADF results could not reject H_0 whilst the Phillips-Perron test indicated that it was I(0). A plot of the variable and its correlogram suggested that the order of integration was one. RI_t and ER_t were tested stationary at level, whilst other three variables were not stationary at level at 5% significant level. The critical values were based on finite sample values computed by McKinnon (1991).

When the variables were found not stationary at level, the ADF and PP unit root test statistics were calculated for the first differences including constant without trend and constant with trend. As reported in the Table 3, all three variables BD_t, π_t^e and MS_{2t} , in their first difference form, were found stationary of the order one or I(1) at 5 percent level of significance[1]. Thus, the study considered them stationary of I(1), even though both tests indicated mixed results with regard to BD_t and MS_{2t}, in their level form. These results indicate that the conditions for applying the ARDL bounds test approach have been satisfied with regard to both cases. In other words, none of the variables included in the model was I(2) or of greater order.

[1]This finding was also supported by the graphical representation (not shown here) of the data

In the first step of the ARDL analysis, the presence of long-run relationships was examined using conditional Vector Error Correction Model (VECM). AIC and SBC criteria was used to select the optimal lag order for the conditional ARDLVECM. The study adopted Pesaran and Pesaran (1997) procedure to estimate an OLS regression firstly for the first differences part of the conditional ARDLVECM, and then for the joint significance of the parameters of the lagged level variables added to the first regression. According to Pesaran and Pesaran (1997), "this OLS regression in first differences are of no direct interest" to the bounds co-integration test. The F-statistic indicated that the coefficients of the lagged level variables were zero (i.e. no long-run relationship exists between them).

Table 4 reports the results of the calculated F-statistics when each variable was considered a dependent variable (normalised) in the ARDL-OLS regressions. The calculated F-statistic $F_{RIt}(RI_t\backslash BD_t, MS_{2t}, ER_t, \pi_t^e)$ =5.210717 was found greater than the upper bound critical value of 4.85 at the 5% significance level. Hence, the presence of a long run co-integration between the Real Interest Rate and its determinants was confirmed based on the result of *bounds testing*. As suggested by AIC, SBC and Durbin Watson statistics, lag order 2 was selected.

Table 4: The Result of the F-test for Co-integration

Dependent Variable	AIC & SBC lags	F-statistic	Probability	Outcome
$F_{RIt}(RI_t\backslash BD_t, MS_{2t}, ER_t, \pi_t^e)$	2	5.21072**	0.000110	Co-integration
F_{BDt} $(BD_t\backslash RI_t, MS_{2t}, ER_t, \pi_t^e)$	2	4.98715**	0.000107	Co-integration
$F_{MS2t}(MS_{2t}\backslash BD_t, RI_t, ER_t, \pi_t^e)$	2	2.66379	0.011255	No Co-integration
$F_{ERt}(ER_t\backslash RI_t, BD_t, MS_{2t}, \pi_t^e)$	2	2.14389	0.037451	No Co-integration
$F\pi_t^e(\pi_t^e\backslash RI_t, BDt, MS_{2t}, ER_t,)$	2	7.25740**	0.000003	Co-integration

Notes: The critical value of F-statistics for lower bound and upper bound are 3.79 and 4.85 respectively, at 5% significance level Sources from Pesaran et al. (2001, p. 300), Table CI(iii) Case III unrestricted intercept and no trend.

** indicates the 5% significant level.

Source: Authors' calculations based on CBSL data.

Further, F_{BDt} (BD_t \ RI_t, MS_{2t}, ER_t, π_t^e) and $F_{\pi_t^e}$ (π_t^e \RI_t, BDt, MS_{2t}, ER_t,) were also found to be greater than the upper-bound critical value of 4.85 at the 5% level. Thus, the null hypotheses of no co-integration was rejected, implying the presence of long-run co-integration relationships amongst the variables with regressions normalised on both BD_t and π_t^e.

The calculated F-statistics for F_{ERt} (ER_t\ RI_t, BD_t, MS_{2t}, π_t^e) and F_{MS2t}(MS_{2t}\BD_t, RI_t, ER_t, π_t^e) were lower than the lower bound critical value of 3.79 at the 5% significant level& it implied that there was no long run co-integration between the Exchange Rate and the other four variables and also between the Money Supply and the four determinants considered.

Having established the existence of a long-run relationship, the ARDL co-integration method was used to estimate the long run parameters with maximum order of lag set to 4. Lag selection was based on the AIC and SBC criteria in view of searching the optimal lag length of the level variables of the long-run coefficients. The model was estimated using the ARDL (2, 0, 0, 0, 0) specification, and the results obtained by normalising on real Interest Rate, in the long run, are reported in the Table 5.

Table 5: The Result of the ARDL(2, 0, 0, 0, 0) Long Run Model
Dependent Variable: Real Interest Rate (RI_t)

Variable	Coefficient	Standard error	t-statistics	Probability
RI_t(-1)	0.696083***	0.167684	4.151151	0.0002
RI_t(-**2**)	-0.139204	0.133444	-1.043162	0.3036
BDt	-0.043906**	0.019397	-2.263578	0.0296
MS_{2t}	-0.033272	0.089349	-0.372384	0.7117
π_t^e	0.714369**	0.272016	2.626198	0.0125
ER_t	-0.014465	0.022866	-0.632617	0.5309
Dummy80	-12.83956***	4.362787	-2.942973	0.0056
Dummy90	-11.98072***	3.949614	-3.033391	0.0044
C	0.893632	2.243855	0.398257	0.6927

Notes: **, *** represent 5% and 1% significance levels respectively.

Source: Authors' calculations based on CBSL data.

The estimated coefficients of the long-run relationship indicated that the sign of the coefficient of Budget Deficit variable (BD_t) was negative and significant at 5% level. This would mean that, all things being equal, a 1% increase in Budget Deficit would leads to approximately 4% decrease in real interest rate. In other words, Budget Deficit, in the long term, has a negative significant impact on Real Interest Rate. Thus, this result brings evidence to conclude the absence of financial crowding out in Sri Lanka, and quite unexpectedly, to indicate the presence of financial crowding in.

The relationship between Real Interest Rate and Expected Inflation was positive and significant at 5% level. According to the Table 5, a 1% increase in expected inflation would increase the Real Interest Rate by approximately 71%. Thus, Expected Inflation would lead to crowd out private investment in Sri Lanka.

Money Supply Growth Rate and the Exchange Rate showed negative elasticity with Real Interest Rate, though not statistically significant. The first lag of Real Interest Rate appeared to have a positive effect on its current value and significant at 1% level, though the second lag of Real Interest Rate showed a negative effect on its current value and statistically not significant. Also observed that the dummy variables for 1980 and 1990 were highly significant and the Dummy80 carried a positive sign whilst the Dummy90 indicated a negative impact.

The regression for the underlying ARDL equation (22) fits well at R^2=53%. Overall regression model was significant at 1% level and F-statistic was 5.327. No serial correlation in the residual term was indicative with the Durbin-Watson statistic being 2.06>2.

Table 6: Diagnostic and Specification Tests for co integration

Test Objective	Test	Test Statistic	Probability
Normality	Histogram - Normality test - (Jarque-Bera)	1.21987	0.543386
Heteroskedasticity	White Heteroskedasticity Test-No Cross	15.1799	0.36597
Serial Correlation	Breusch-Godfry Serial Correlation LM Test	0.60773	0.737959
Stability	Ramsey RESET Test	1.02151	0.318907

Source: Author's calculation based on CBSL data.

This study applied a number of diagnostic and specification tests to the error correction model, the results of which tests are summarised in the Table 6. These tests did not produce any evidence of serial correlation in the disturbance of the error term. The White Heteroskedasticity test suggested that the errors were independent of the repressors. The model also passed the Jarque–Bera normality tests, suggesting that the errors were normally distributed. The RESET test indicated that the model was correctly specified.

The results of short-run dynamic coefficients associated with the long run relationships obtained from ECM equation are given in Table 7.

Table 7: ARDL (2, 0, 0, 0, 0) Model ECM Results
Dependent Variable: First Difference of Real Interest Rate (ΔRI_t)

Variable	Coefficient	Standard error	t-statistic	Probability
$\Delta RI_t(-1)$	0.767129	0.542898	1.413025	0.1665
$\Delta RI_t(-2)$	-0.174139	0.142174	-1.224830	0.2288
ΔBD_t	-0.065379*	0.036508	-1.790832	0.0820
ΔMS_{2t}	-0.008719	0.128507	-0.067850	0.9463
$\Delta \pi_t^e$	1.443751	0.948135	1.522726	0.3628
ΔER_t	-0.194086	0.260707	-0.744460	0.4616
DUMMY80	-12.47230**	4.877026	-2.557358	0.0150
DUMMY90	-12.26748**	4.801099	-2.555141	0.0151
ECM(-1)	-0.728690**	0.269623	-2.702629	0.0105
C	0.774226	0.924168	0.837754	0.4079

Notes: * represent 10% significance level, ** represent 5% significance level

Source: Authors' calculations based on CBSL data.

The equilibrium correction coefficient (ECM) estimated to be -0.729 was highly significant, carried the correct sign, and implied a fairly high speed of adjustment to equilibrium after a shock.

Approximately 72% of disequilibria from the previous year's shock appeared to be converging back to the long-run equilibrium in the current year, demonstrating the presence of a long run relationship between the variables. The results also suggest that the immediate impact of changes in the Budget Deficit growth rate on Real Interest Rate would be negative and significant at the 10% level. Money Supply Growth Rate, Exchange Rate and Expected Inflation did not indicate a significant impact on Real Interest Rate, in the short run. The coefficients of Money Supply Growth Rate and Exchange Rate were positive whilst the variable representing the Expected Inflation appeared to have a positive impact on it.

The two lagged changes in real Interest Rate were statistically insignificant. The two dummy variables also were statistically significant at 5% level and indicated having a negative impact on the Real Interest Rate in the short term. The ECM model also passed the diagnostic tests against serial correlation, heteroskedasticity, non-stability and non-normal errors (Table 8).

Table 8: Diagnostic and Specification Tests for Error Correction Model

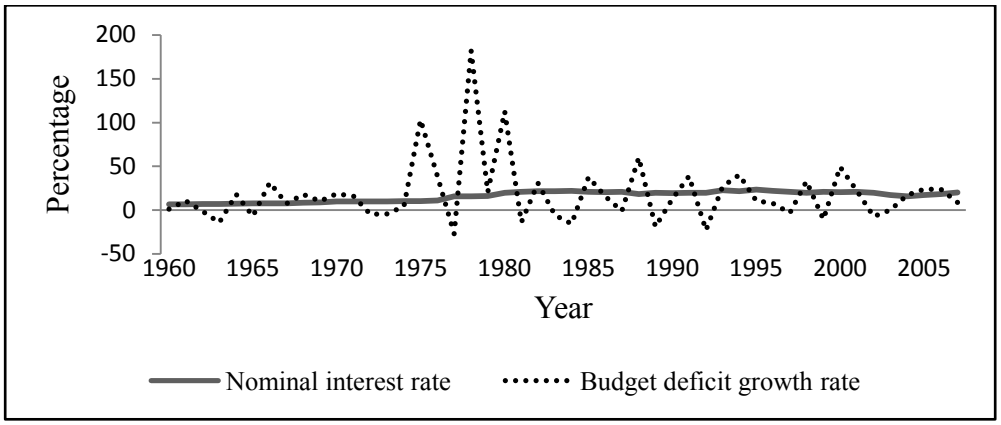
Test Objective	Test	Test statistic	Probability
Normality	Histogram- Normality Test - (Jarque-Bera)	1.78453	0.40972
Heteroskedasticity	White Heteroskedasticity Test-No Cross	10.1197	0.860301
Serial Correlation	Breusch-Godfry Serial Correlation LM Test	1.78453	0.409726
Stability	Ramsey RESET Test	0.51230	0.479034

Source: Authors' calculation based on CBSL data.

This study found that there could be a negative relationship between the budget deficit and the interest rates in Sri Lanka. The budget deficit would not lead to reduce private investment in Sri Lanka. Decrease in real interest rates would increase the possibility of getting loanable funds for investment. It is worth noting that the interest rates in Sri Lanka are directed by the Central Bank rather than automatically adjusted through the influences of the budget deficit.

This study assumed that the private investors, when making their investment decisions, would consider the real interest rate. However, the nominal values also could influence the investment decision. According to the Figure 8, nominal interest rates were not fluctuating as rapidly as the budget deficit growth rate changes.

Figure 8: Nominal Interest Rates and Budget Deficit Interest Rate 1960 – 2007

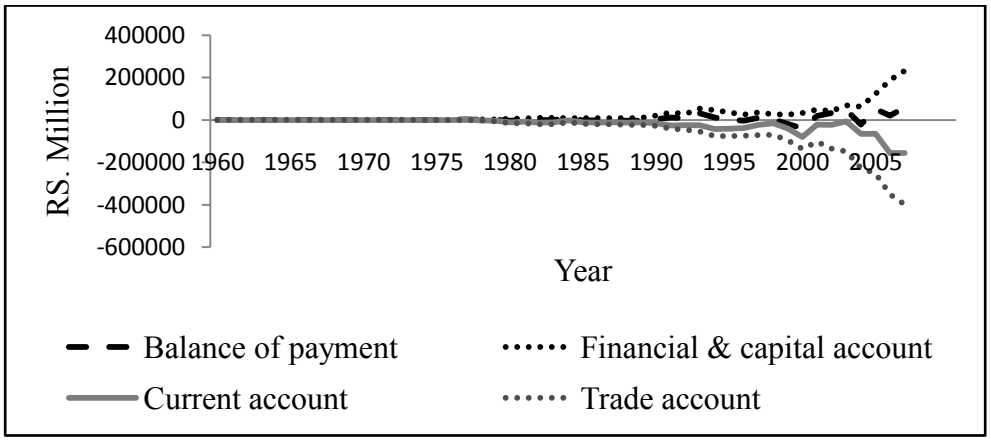


Source: Authors' calculation based on CBSL data.

It confirms that there would be no significant impact of budget deficit on nominal interest rate. Accommodative monetary policy appears to have been possible in Sri Lanka, and the country appears to have effectively used accommodative monetary policy to offset the pressure on interest rates and private investment in the long run.

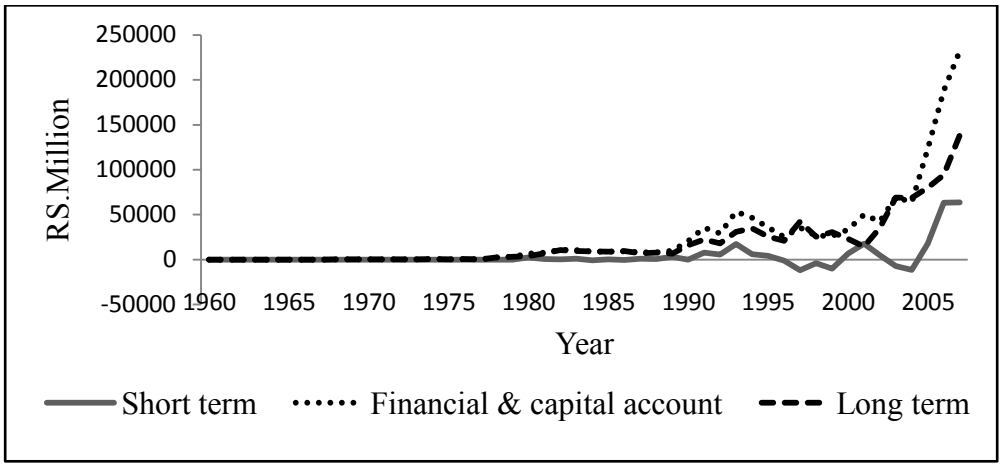
Sri Lanka also has been able to maintain a positive balance in the capital account and financial account of the balance of payments by adopting unilateral liberalisation of capital account (Figures 9, 10, 11). Sri Lanka appears to have been able to do this by borrowing heavily from multilateral financial institutions and bilateral donors as well as Euro dollar markets. The significant amount of worker remittances Sri Lanka has managed to receive also appears to have helped.

Figure 9: Balance of payment 1960 -2007



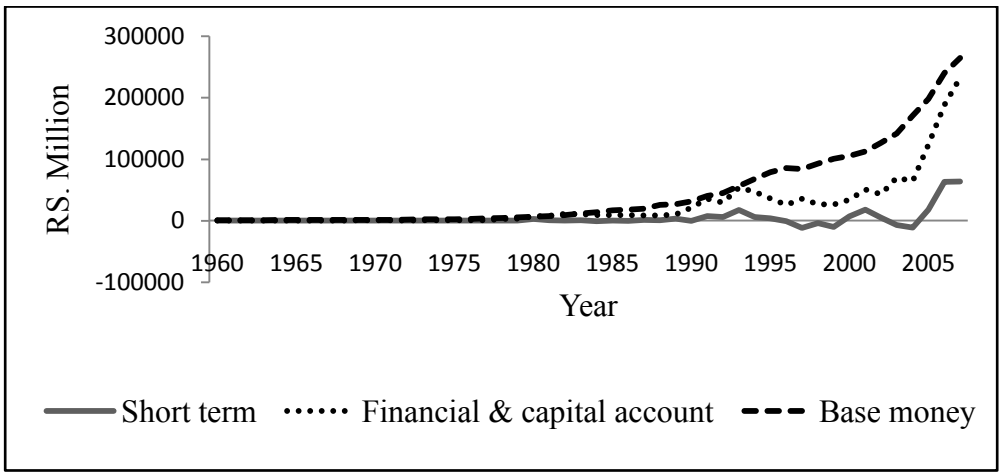
Sources: Authors' calculation based on CBSL data.

Figure 10: Finance and Capital Account 1960 - 2007



Sources: Authors' calculation based on CBSL data.

Figure 11: Base Money, and Finance and Capital Account 1960-2007



Sources: Authors' calculation based on CBSL data.

CONCLUSIONS

According to our empirical results, interest rates in Sri Lanka declined when the budget deficit increased owing to increased Government spending. This implies the absence of a financial crowding-out effect due to fiscal expansions. This result contradicts the hypothesis that higher budget deficits would increase real interest rates, thereby reducing private investment. In Sri Lanka, private investment appears to have increased with increasing budget deficits associated with fiscal expansions. The absence of the

crowding out effect could be attributed to accommodative monetary expansion, meaning that the Central Bank of Sri Lanka has effectively mitigated the crowding out effect of expansionary fiscal policy through accommodative monetary policy. The monetary expansions appear to have been financial through short term capital inflows resulted from financial liberalisation. Graduation from the poorest country status to the level of a middle income country would have caused reduction of Official Development Assistance (ODA). Though this could have reduced the scope for accommodative monetary policy, the Government of Sri Lanka appears to have managed to cope with this development by shifting away from her conventional foreign borrowing sources to emerging lenders such as China, India and Iran. Foreign remittances, which have increased during the last few decades, also appear to have eased the constraints. Thus, the Sri Lankan Government appears to still be capable of employing accommodative monetary policies to reduce the negative effects of the country's expansionary fiscal policy.

Such Keynesian-type demand management policies appear to be possible in Sri Lanka as the economy has been operating well below its full employment level.

REFERENCES

Amirkhalkhali, Saleh, Atul Dar and Samad Amirkhalkhali (2003) "Saving-Investment Correlations, Capital Mobility And Crowding Out: Some Further Results" *Economic Modelling*20:1137-1149

Aschauer, David A. (1989) "Is Public Expenditure Productive?." *Journal of Monetary Economics* 23: 177-200.

Bahmani-Oskooee, Moshe (1999) "Do Federal Budget Deficits Crowd Out or Crowd In Private Investment?." *Journal of Policy Modelling* 21: 633-640.

Baldacci, Emanuele, AryeL. Hillman and Naoko C. Kojo (2004) "Growth, Governance, and Fiscal Policy Transmission In Low-Income Countries." *European Journal of Political Economy*. Forthcoming.

Barro, Robert J. (1974) "Are Government Bonds Net Wealth?". *Journal of Political Economy* 82: 1095-1117.

Barro, Robert J. (1978) "Comments from an Unreconstructed Ricardian." *Journal of Monetary Economics* 4: 569-581.

Barro, Robert J. (1989) "The Ricardian Approach to Budget Deficit". *Journal of Economic Perspective.* 3: 37-54.

Beck, Stacie E. (1993) "The Ricardian Equivalence Proposition: Evidence from Foreign Exchange Markets." *Journal of International Money and Finance* 12: 54-169.

Blinder, and Solow (1973) "Does Fiscal Policy Matter?." *Journal of Public Economics*: 319-337.

Buiter, William (1990) "Principles of Budgetary and Financial Policy."New York: Harvester Wheatsheaf.

Cebula, R. J. (1978) "An Empirical Analysis of the "Crowding Out" Effect of Fiscal Policy in the United States and Canada."*Kyklos* 31(3).

Cebula, Richard and W. Belton (1992) "Deficits and Real Interest Rates in the United States: A Note on the Barro Theory Versus the Cukierman-Meltzer Theory of Government Debt and Deficits in a Neo-Ricardian Framework." *Economia Internazionale* 45(3-4): 289-295.

Cebula, Richard, Hung Chao-Shun, and Manage Neela (1996) "Ricardian Equivalence, budget deficits, and saving in the United States, 1995:1-1991:4"*.Applied Economics Letter.* 3: 525-528.

Cebula, Richard and Scott Gerald (1991) "Budget Deficits, Debt Service, and Real Interest Rates in the United States."*Rivista Internazionale di Science Economiche Commerciali.* 38(10-11): 865-870.

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

Chakraborty, Lekha (2006) *"*Fiscal Deficit, Capital Formation, and Crowding Out : Evidence From India."*Working Paper.06/43*.National Institute of Public Finance and Policy.

Chowdhury, Khorshed (2004) "Deficit Financing in LDCs: Evidence From South Asia." *Faculty of Commerce - Economics Working Papers(wp04-18).*Department of Economics, University of Wollongong.

Darrat, Ali F. and M. O. Suliman (1991) "Have Budget Deficits and Money Growth Changes in Interest Rates and Exchange Rates in Canada.?" *North American Review of Economics and Finance* 2: 69-82.

Eisner, R. (1989) "Budget Deficits: Rhetoric and Reality" *Journal of Economic Perspectives*3:73 93

Enders, Walter (2004) "Applied Econometric Time-Series (2nd ed.)." USA: Wiley.

Evans, Paul (1985) "Do Large Deficits Produce High Interest Rates?." *American Economic Review* 75(1): 68-87.

Feldstein, Andrew (1986) "Financial Crowding out: The Theory with Application to Australia." *IMF Staff Papers* 33 (1): 60-90.

Ganelli, Giovanni (2003) "Useful Government Spending, Direct Crowding-Out and Fiscal Policy Interdependence."*Journal of International Money and Finance* 22: 87-103.

Ghatak, Anita and Subrata Ghatak (1996) "Budgetary Deficits and Ricardian Equivalence: The Case of India -1950-1986." *Journal of Public Economics* 60: 267-282.

Grieve, Roy (2004) "Macro Matters: Classical, Neoclassical and Keynesian Perspectives." 31 463 Economic Thought And Method Class Notes: 1-17. University of Strathclyde. Department of Economics.

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

Heijdra, Ben J., and Jenny E. Ligthard (1997) "Keynesian Multipliers, Direct Crowding Out, and The Optimal Provision of Public Goods." *Journal of Macroeconomics* 9: 803-826.

Kormendi, R. C. (1983) "Government Debt, Government Spending and Private Sector Behaviour." *American Economic Review* 73: 994-1010

Mundell, Robert A. (1963) "Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates". *Canadian Journal of Economic and Political Science*29 (4): 475–485.

Ostrosky, Anthony (1979) "An Empirical Analysis of the Crowding Out Effect of Fiscal Policy in the United States and Canada: Comments and Extensions." Kyklos 32.

Ouattara, B. (2004) "Foreign Aid and Fiscal Policy in Senegal." Mimeo University of Manchester.

Pesaran, M.H. and B. Pesaran (1997) "Working with Micro fit 4.0: Interactive Econometric Analysis." Oxford, Oxford University Press.

Pesaran, M.H., Y. Shin and R.J. Smith (2001) "Bounds testing approaches to the analysis of level relationships." *Journal of Applied Econometrics* 16: 289-326.

Tanzi, V. (1985) "Fiscal Deficits and Interest Rates in the United States: An Empirical Analysis." *IMF Staff Papers* 32(4).

Voss, Graham M. (2002) "Public and Private Investment In The United States and Canada." *Economic Modelling* 19: 641-664