Fiscal Regimes and Fiscal Sustainability in Sri Lanka

Chew Lian Chua (Nottingham-Ningbo University, China)
Nelson Perera (UOW, Australia)
Sandy Suardi (UOW, Australia)

11th International Research Conference 2018, Central Bank of Sri Lanka

Motivation

- CBSL geared to adopt a flexible inflation targeting (IT) framework (4-6% of annual inflation) from 2020

- Fiscal outlook not bright so doubtful of satisfying the pre-condition for IT

- Some studies on fiscal sustainability of Sri Lanka's fiscal stance fail to adopt model-based fiscal sustainability framework except for Ehelepola (2015).
  - Ekanayakae (2011) SVAR determinants of debt level include economic growth, real interest rate and exchange rate shocks
  - Dayaratna-Banda and Ruyadarshanee (2014): govt. debt as a ratio of GDP is not sustainable as inferred from unit root test
  - Ehelepola (2015): a plethora of fiscal policy rules, found that Taylor fiscal rules, where the government adjusts the tax rate in response to any deviation in long-run debt, output or government expenditure best characterise SL fiscal data

- Comprehensive study involving models within Bohn's (1998) model-based sustainability framework of fiscal policy rules.

Contributions

- Adopt Bohn's model-based sustainability framework of fiscal policy rules.

- Primary budget balance must increase after an increase of the public debt-to-GDP ratio to ensure government intertemporal budget constraint is satisfied.

- Flexible specifications allowing for:
  - fiscal fatigue of Ghosh et al. (2013 a,b)
  - fiscal regimes of Aldama and Creel (2017, 2018): trade-off between duration of regimes and reaction of primary surplus to debt
  - time-varying parameter (TVP) fiscal reaction function (Nguyen et al., 2017): could capture gradual or abrupt changes in fiscal policy resulting from crisis and war

- Demonstrate how fiscal regimes which are incorporated in the Bohn's model-based fiscal policy rule can yield testable hypothesis for No-Ponzi game condition and long-term debt stability condition.

Results Overview

- No evidence of fiscal fatigue; primary balance adjusts to stabilize debt beyond a maximum level of public debt.

- Evidence of fiscal regimes: 2 periods of non-sustainable fiscal regimes (1978-1983 and 1986-1990).

- Regime-specific feedback coefficients of FP rule and average durations of fiscal regimes, Sri Lanka's FP satisfies No-Ponzi game condition. But long-run stricter debt-stabilizing condition is violated thus the credibility of adopting an IT framework may be in doubt.

- TVP model indicates fiscal unsustainability in 1978-1983 which coincides with one of the non-sustainable regimes.

Literature Survey

- Intertemporal government budget constraint (IBC) approach focuses on the long-run and evaluated at steady state by relating primary fiscal balances as a share of GDP and the debt-output ratio (Buiter, 1985; Blanchard, 1990).

$$b_t = -pb_t + (1 + r_t)b_{t-1} \quad \text{where } pb_t = \frac{\tau_t - g_t}{Y_t}$$

- r_t is the real interest rate adjusted for real output growth rate

- The future path of public debt for an arbitrary sequence of government spending and taxes is

$$b_t = -\sum_{j=0}^{n}(1 + r)^j E_t\left(pb_{t+j}\right) + \lim_{n \to \infty}(1 + r)^{-n} E_t(b_{t+n}).$$

- Fiscal solvency is satisfied provided that the second term in equation (2) is zero; tranversality condition or No-Ponzi game (i.e. government cannot continuously rely on the issue of new debt to pay maturing old debts)

Literature Survey

- Bohn (1995) argues IBC tests that discount future primary balances at the risk free rates are mis-specified because the **correct discount factors** *depends on the state-contingent equilibrium pricing kernel*.

- Implications: incorrect inferences which reject fiscal solvency despite the actual existence of fiscal solvency.

- Another criticism is that testing for debt sustainability is futile given that the IBC holds under very weak conditions. The **constraint holds if either debt or revenue and spending inclusive of debt service are integrated of finite but arbitrarily high order** (Bohn 2007).

- Implications: invalidate several fiscal solvency tests based on specific stationarity and cointegration conditions (e.g. Hamilton and Flavin, 1986; Trehan and Walsh, 1988; Quintos, 1995).

Literature Survey

- A natural approach to understanding deficit problems is to identify in the data the dynamics of fiscal reaction functions which support fiscal solvency (Bohn, 2007).

- Bohn (2008) demonstrates the linear fiscal reaction function is sufficient to satisfy the IBC:

$$pb_t = \alpha_t + \beta b_{t-1} + \varepsilon_t$$

  for all t and $\beta > 0$, and α_t is a vector of additional determinants of the primary balance.

- Intuition: when pb changes by the positive factor β as debt increases, the growth of debt j periods ahead fall by $(1 - \beta)^j$, so that as $j \to \infty$, then $(1 - \beta)^j b_t \to 0$. This implies the No-Ponzi game so the IBC holds.
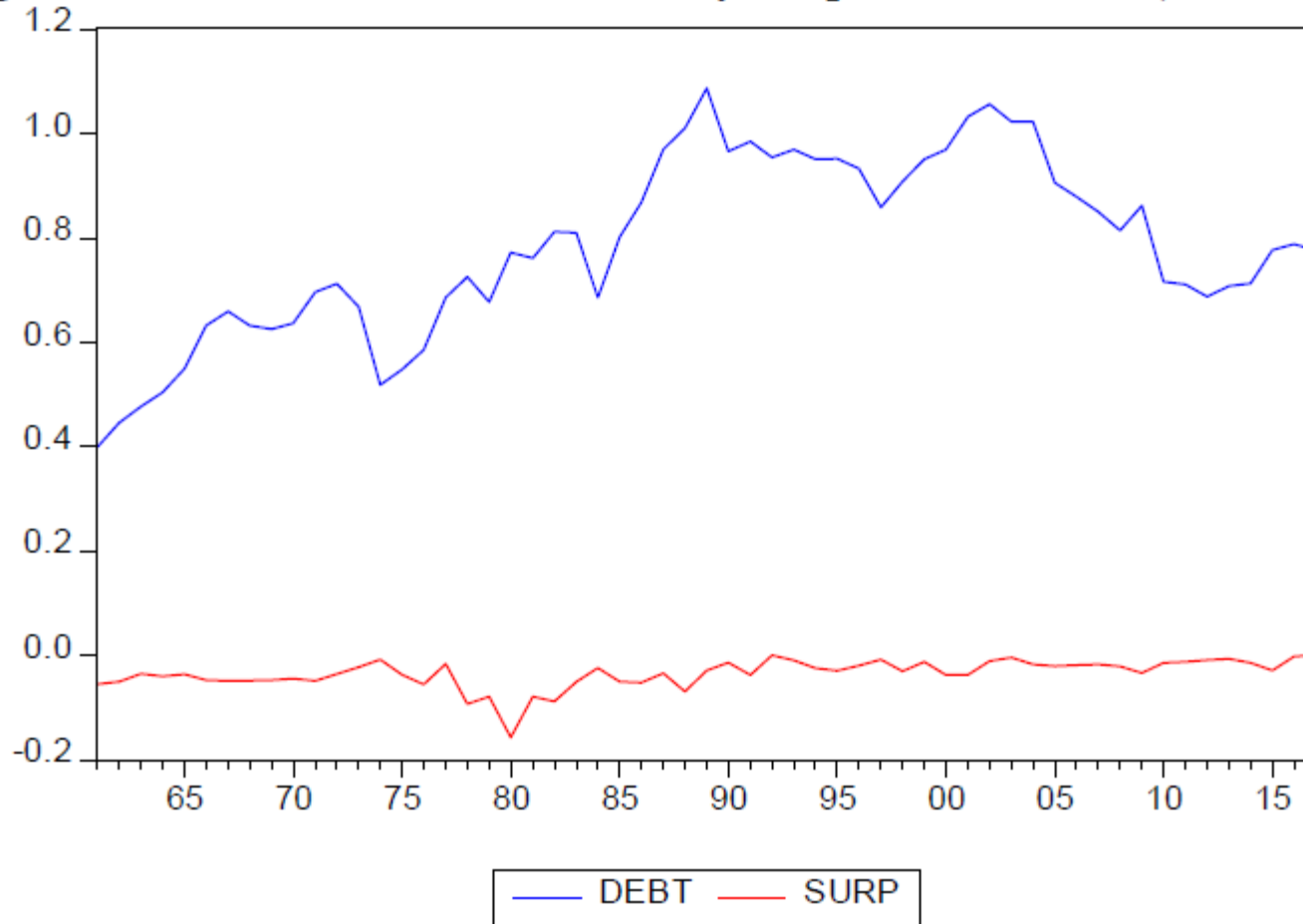
Data

- The two series of interest are the public debt-GDP ratio and the primary surplus to GDP ratio.

- Primary surplus is constructed by subtracting outlays (or government expenditures) from government revenues excluding interest payment.

- Annual reports of the Central Bank of Sri Lanka and the Public Debts Bulletin for the period 1961 and 2017.

Data

Figure 1. Debt-GDP ratio and Primary Surplus-GDP ratio (1961-2017)

Data

- Highest budget deficit occurred in 1980 which sits at 19% of GDP.

- Public debt-to-GDP ratio has displayed a positive trend for most of the sample period as is evident from 1961 to about 2002. This ratio declines after 2002.

- The new record level of debt in the economy during 1983–2009 reflects the economy was continually burdened by a massive military expenditure due to the long-lasting civil war.

- There was a dip in primary surplus around 1978-1983 accompanied by a rise in debt-GDP ratio; this coincides with the unsustainable regime identified in our model.

- Both debt-GDP ratio and primary surplus-GDP series are found to be stationary based on the ADF test.

Models

- **Bohn's (1989) fiscal reaction function:**
  $$ps_t = \alpha + \beta b_{t-1} + \alpha_x x_t + \alpha_z z_t + u_t$$
- x_t and z_t are output gap and the cyclical real government spending.
- $u_t = (1 - \rho L)^{-1} e_t$ such that $e_t \sim i.i.d.\, N(0, \sigma_e{}^2)$
- $\beta > 0, \alpha_x > 0$ while $\alpha_z < 0$

- **Nonlinear response to increasing public debt or "fiscal fatigue":**
- $ps_t = \alpha + \beta_1 b_{t-1} + \beta_2 b_{t-1}{}^2 + \alpha_x x_t + \alpha_z z_t + u_t$;
- $ps_t = \alpha + \beta_1 b_{t-1} + \beta_2 b_{t-1}{}^2 + \beta_3 b_{t-1}{}^3 + \alpha_x x_t + \alpha_z z_t + u_t$
- $ps_t = \alpha + \beta_m \max(b_{t-1} - \bar{b}, 0) + + \alpha_x x_t + \alpha_z z_t + u_{t.}$
- Negative coefficients of β_2 and β_3

Models

- **Aldama and Creel (2017, 2018) regime switching fiscal reaction function:**
- $ps_t = \alpha(s_t) + \beta(s_t)b_{t-1} + \alpha_x(s_t)x_t + \alpha_z(s_t)z_t + u_t$
- s_t=0 : non-sustainable fiscal regime (i.e. $\beta_0 \leq 0$)
- s_t=1 : sustainable fiscal regime (i.e. $\beta_1 > 0$)
- Local NPG condition: $\beta_1 > |\beta_0|\frac{d_0}{d_1}$ where $d_i = \frac{1}{1-p_{ii}}$
- Global stability condition: $\beta_1 > |\beta_0|\frac{d_0}{d_1} + \frac{r-y}{1+y}\frac{d_0+d_1}{d_1}$

- **Nguyen et al. (2017) TVP fiscal reaction function:**
- Signal equation: $ps_t = \alpha + \beta_{t-1}b_{t-1} + \alpha_x x_t + \alpha_z z_t + u_t$
- State equation: $\beta_{t-1} = \beta_{t-2} + \varepsilon_{t-1}$
- $u_t \sim N(0, \sigma_u{}^2)$ and $\varepsilon_t \sim N(0, \sigma_\varepsilon{}^2)$; u_t and ε_t are uncorrelated with each other

Table 1: Empirical results of various fiscal rule models

	(1) Linear	(2) Quadratic	(3) Cubic	(4) Kinked	(5) Markov Switching Regime1 ($s_t = 0$)	Regime 2 ($s_t = 1$)	Long-run estimates	(6) TVP
α	-0.087***	-0.131	-0.181	-0.035***	0.031	-0.078***	-0.066***	-0.072***
	(0.026)	(0.083)	(0.255)	(0.009)	(0.140)	(0.018)	(0.022)	(0.023)
β_1	0.068**	0.181	0.375		-0.142	0.064***	0.042*	
	(0.030)	(0.204)	(0.977)		(0.166)	(0.021)	(0.024)	
β_2		-0.071	-0.318					
		(0.126)	(1.227)					
β_3			0.102					
			(0.504)					
β_m				0.040				
				(0.050)				
α_x	0.028	0.026	0.026	0.000	-1.358*	0.024	-0.127	0.012
	(0.113)	(0.110)	(0.112)	(0.114)	(0.742)	(0.078)	(0.093)	(0.138)
α_z	-0.188***	-0.189***	-0.189***	-0.190***	-0.430***	-0.160***	-0.190***	-0.188***
	(0.018)	(0.019)	(0.019)	(0.020)	(0.063)	(0.015)	(0.013)	(0.021)
ρ	0.768***	0.762***	0.760***	0.783***	0.669***			
	(0.092)	(0.091)	(0.091)	(0.094)	(0.091)			
σ	0.013***	0.013***	0.013***	0.014***	0.009***			
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)			
Adjusted R^2	0.7468	0.7431	0.7376	0.7267				
DW stat	2.1647	2.1699	2.1648	2.1771				

Notes: Figures in parentheses are standard errors. *** is significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 2: Transition and Ergodic Probabilities, and expected duration of regimes

	Regime 1 (Unsustainable)	Regime 2 (Sustainable)
Transition prob	0.58	0.94
Ergodic prob	0.10	0.89
Expected Duration (d_t)	2.40	19.46

Figure 3: Filtered and Smoothed Transition Probability of being in an Unsustainable Fiscal Regime
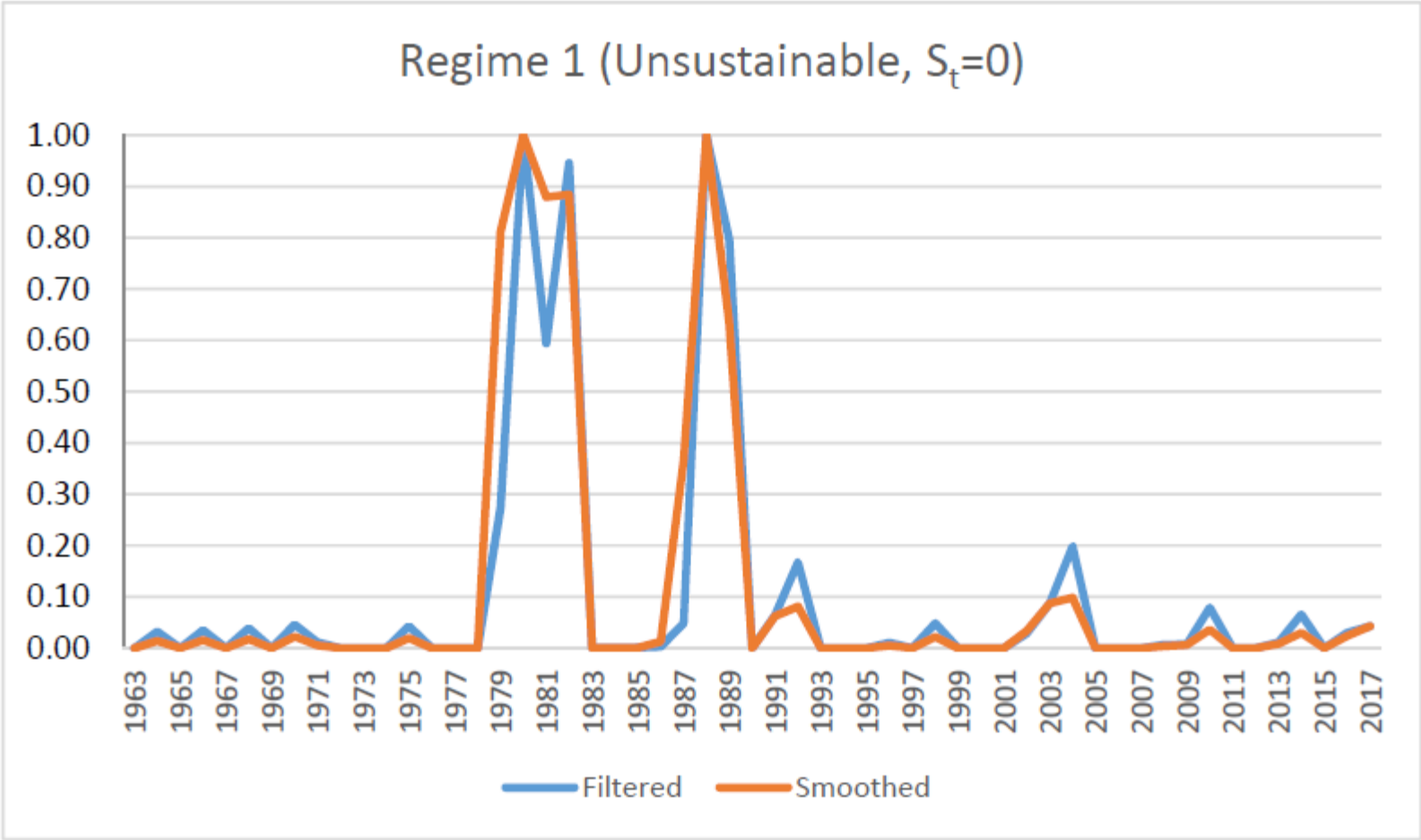
Results

- First episode of unsustainable fiscal regime (1978-1983) coincides with the dip in primary surplus-to-GDP ratio and the rise in debt-to-GDP ratio as seen in Figure 1.

- There was a massive economic liberalization process which took place in Sri Lanka, but there was also a sharp devaluation of its exchange rate which hampered the confidence of foreign investors. Hence, post-1977, the increase in government expenditures was not covered by a corresponding increase in revenue, which subsequently resulted in public debt rapidly increasing.

- Second fiscal unsustainable regime (1986-1990) occurred at a time when the economy continued to be burdened by massive military expenditure. Given the government's concerns with the civil war, Sri Lanka failed to capture the full benefits of economic liberalization.

NPG and Global Stability

- The sufficient NPG condition requires that the initial public debt-to-GDP ratio is backed by the sum of future expected and discounted real primary surpluses-to-GDP.

- Condition to satisfy is $\beta_1 > |\beta_0|\frac{d_0}{d_1}$, which is satisfied since β_1=0.064 and $|\beta_0|\frac{d_0}{d_1}$=0.0175

- Necessary global stability condition is $\beta_1 > |\beta_0|\frac{d_0}{d_1} + \frac{r-y}{1+y}\frac{d_0+d_1}{d_1}$.

- $r = 4\%$ while $y = 5\%$, RHS = 0.294, while this is clearly larger than β_1=0.064.

- Hence, the long-run global stability condition is not satisfied.

- The government must react more to initial debt increases by increasing primary surplus during sustainable regimes to ensure that the long-run debt steady-state level remains below the fiscal limit.

Figure 4: Smoothed $\beta_{1,t}$ Estimates
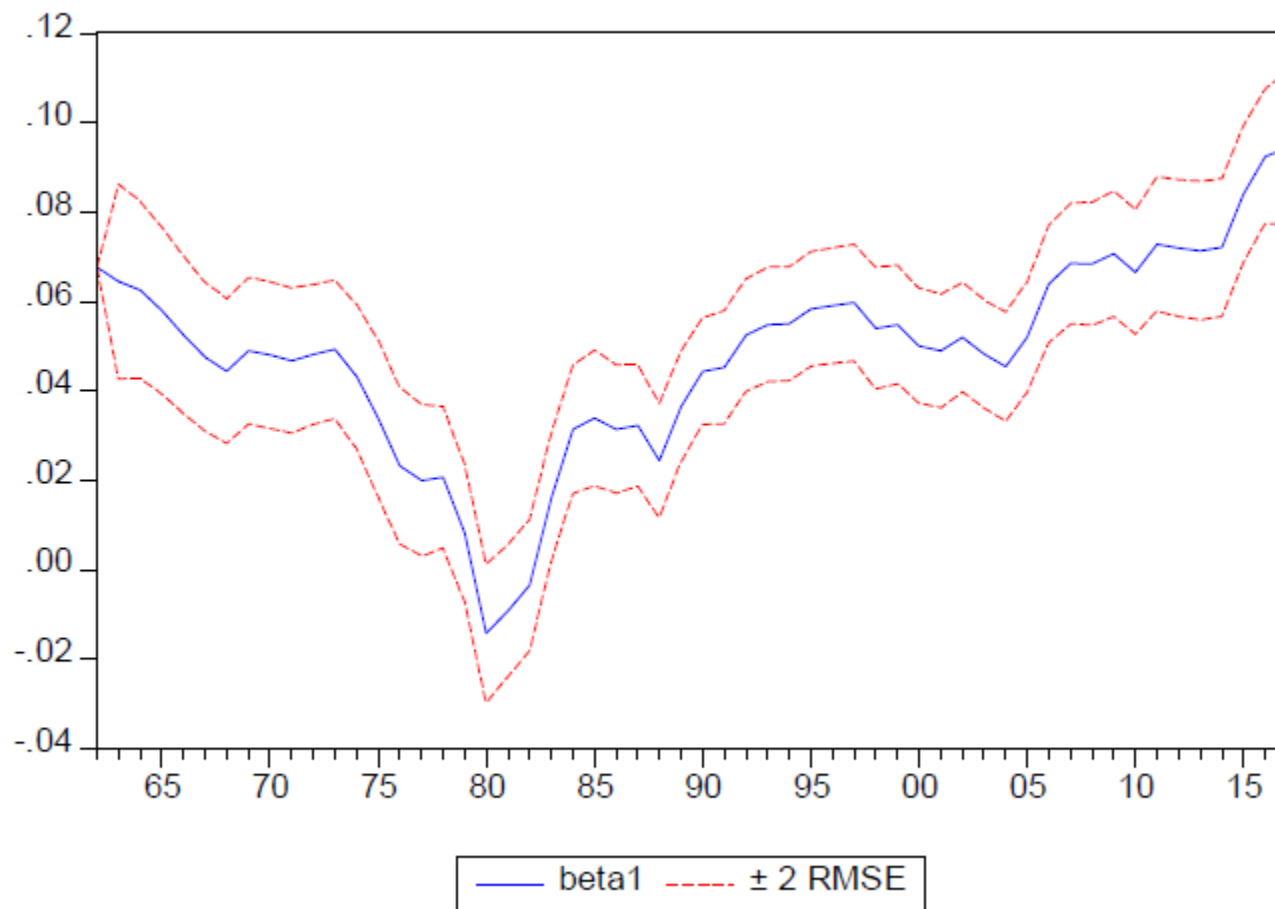
Conclusion

- This paper examines fiscal sustainability in Sri Lanka using variants of the fiscal rule of Bohn (1989).

- Linear models and TVP models seem to suggest that Sri Lanka's fiscal rule is sustainable.

- But incorporating regimes which capture periodically explosive path for debt-GDP ratio shows that the NPG condition is satisfied, albeit the long-run debt stabilizing condition is not satisfied.

- The lack of long-run debt stability may jeopardize the implementation of inflation targeting.