Public Debt Thresholds, Self-Discipline and Sustainability

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Introduction

- We study the non-linear behavior of public **debt to GDP ratios in 43 economies** using Threshold Autoregressive (TAR) models.
- The goal is testing for mean-reverting behavior if debt ratios are above an **endogenous threshold**.
- Such behavior is compatible with fiscal reaction functions that become **self-disciplining** only if debt levels are high enough.
- We use IMF´s **public debt database** for the period 1950-2015.

Literature Review

- Bohn (2007): **Intertemporal Budget Constraint** is too weak a condition for sustainability, new approaches are needed.
- Ostry et al (2010) and IMF (2011): computation of **maximum debt limits** given a fixed fiscal reaction function.
- Recent Literature: Estimate **non-linearities and structural breaks** between debt and other macroeconomic variables.

A Model of Public Debt Dinamics

- **Debt to GDP** evolves according to the real interest rate, real economic growth and the primary balance:

$$\left(\frac{D}{Y}\right)_t = \left(\frac{1+r}{1+g}\right)\left(\frac{D}{Y}\right)_{t-1} - \left(\frac{B}{Y}\right)_t$$

- There is a **fiscal reaction** function which reacts to the debt level:

$$\left(\frac{B}{Y}\right)_t = \alpha_0 + \alpha_1\left(\frac{D}{Y}\right)_{t-1} + \varepsilon_t$$

- Debt to GDP is **mean reverting** if $\left(\frac{r-g}{1+g}\right) < \alpha_1$

A Model of Public Debt Dynamics

- But the adjustment can be non-linear:

$$d_t = \begin{cases} (1+\rho)d_{t-1} + \eta_t & if\ d_{t-1} > \theta \\ d_{t-1} + \eta_t & if\ d_{t-1} \leq \theta \end{cases}$$

  - This is the **asymmetric** model

- This non-linearity can be symmetric:

$$\delta_t = \begin{cases} (1+\rho)\delta_{t-1} + \eta_t & if\ \delta_{t-1} > \theta \\ \delta_{t-1} + \eta_t & if\ -\theta \leq \delta_{t-1} \leq \theta \\ (1+\rho)\delta_{t-1} + \eta_t & if\ \delta_{t-1} < -\theta \end{cases}$$

  - In this case θ is in **differences** from average debt

Results from the Asymmetric SETAR Model
Countries with evidence of fiscal sustainability

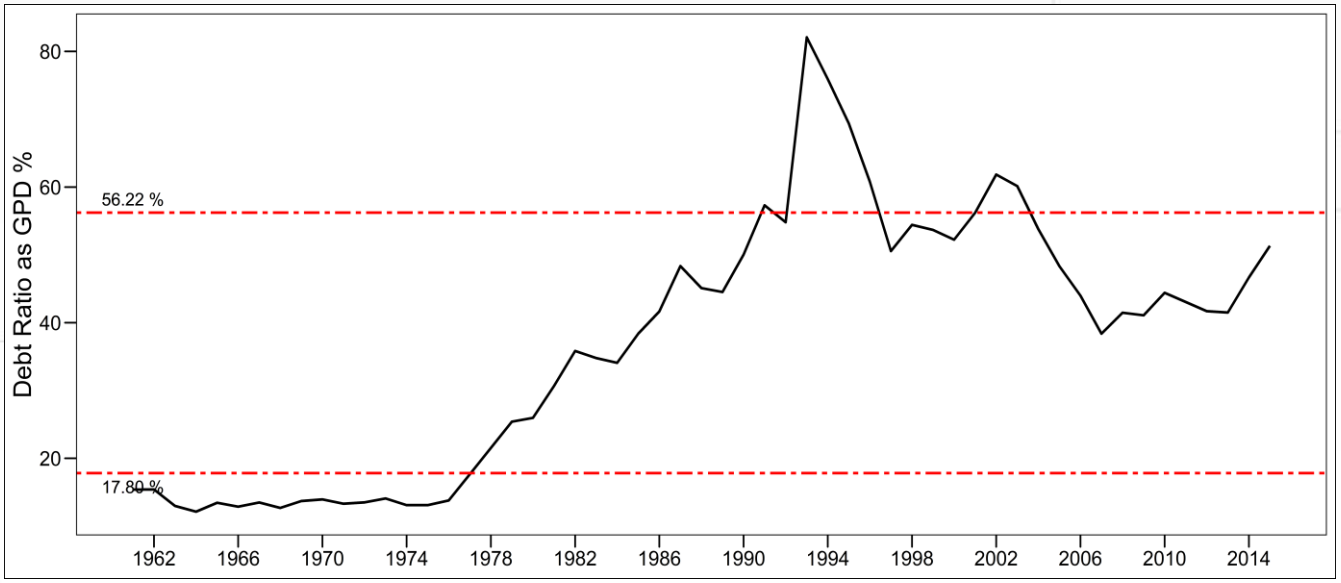
Country	Confidence Level	Debt Threshold	Half Life (Years)
Australia	99%	36%	9,4
Costa Rica	96%	58%	13,2
Ecuador	92%	62%	13,8
Ghana	90%	71%	9,5
Honduras	97%	70%	11,2
Ireland	91%	87%	14,4
Kenya	99%	55%	9,2
Malta	91%	68%	19,9
Mexico	99%	52%	7,0
Netherlands	100%	76%	8,7
New Zealand	100%	71%	7,7
Norway	98%	43%	9,6
United Kingdom	100%	118%	10,5
Zimbabwe	94%	67%	7,4

Results from the Symmetric SETAR Model
Countries with evidence of fiscal sustainability

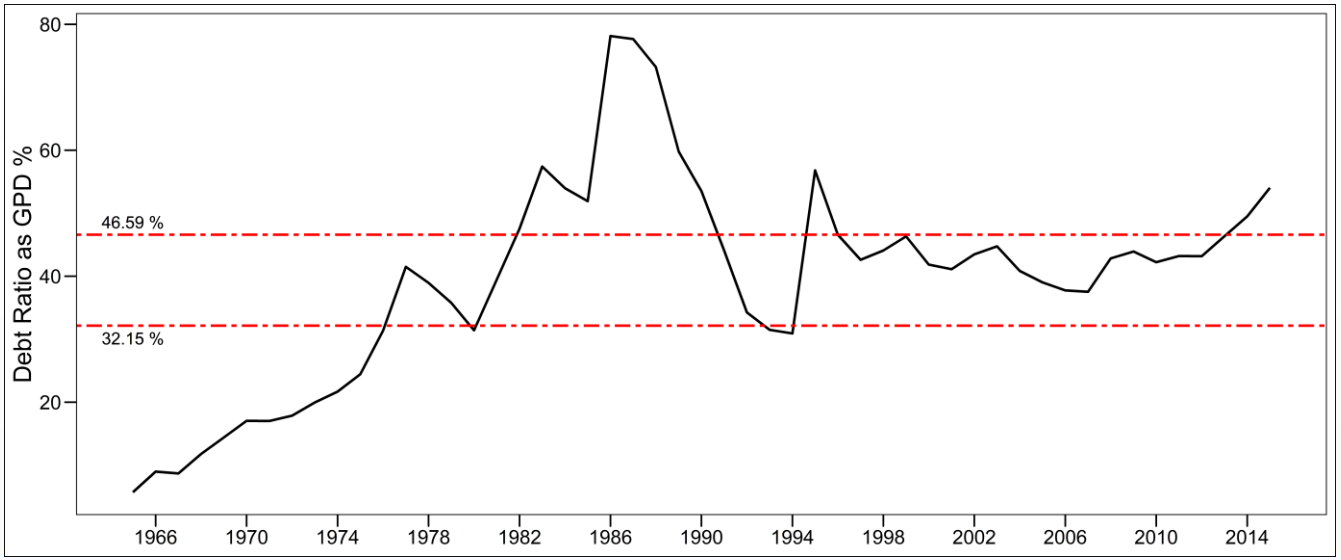
Country	Confidence Level	Average Debt/GDP	Band Threshold	Half Life (years)
Australia	99%	42%	7%	5,6
Costa Rica	94%	39%	24%	8,3
Ecuador	92%	33%	31%	8,0
Honduras	94%	32%	37%	7,9
Kenya	97%	37%	19%	7,4
Mexico	96%	39%	7%	5,0
Netherlands	100%	71%	14%	3,9
New Zealand	100%	87%	13%	6,2
Norway	97%	34%	7%	4,2
Singapore	90%	72%	32%	7,4
South Africa	96%	57%	6%	5,6
Sri Lanka	94%	65%	14%	15,4
United Kingdom	100%	115%	40%	6,0
Zimbabwe	99%	45%	18%	2,6

Examples with symmetric model

Kenya

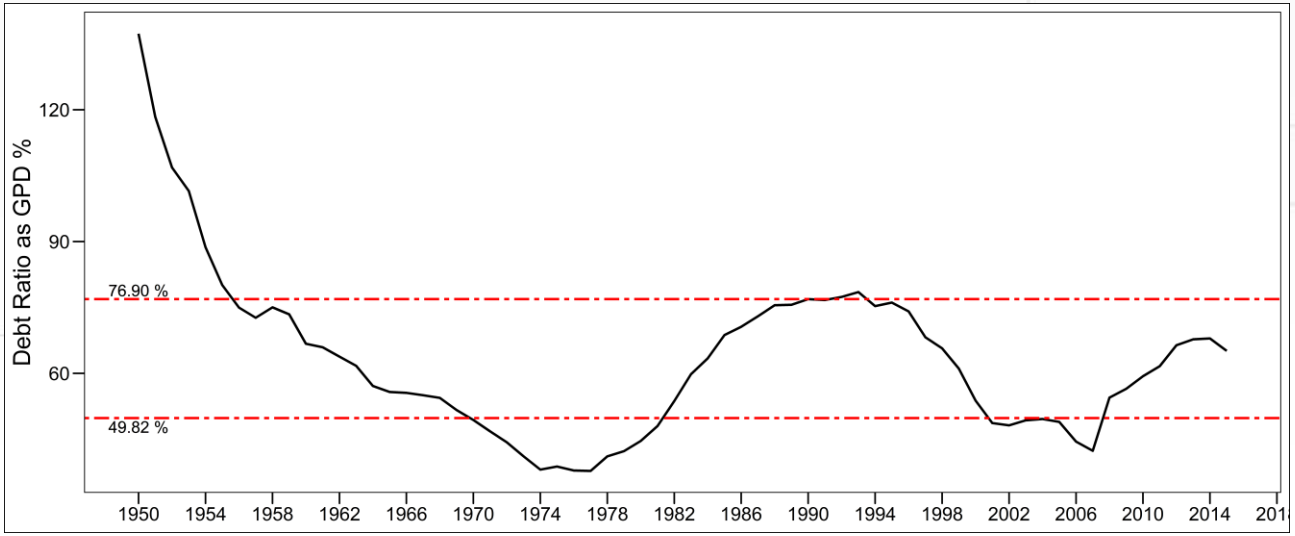


Mexico

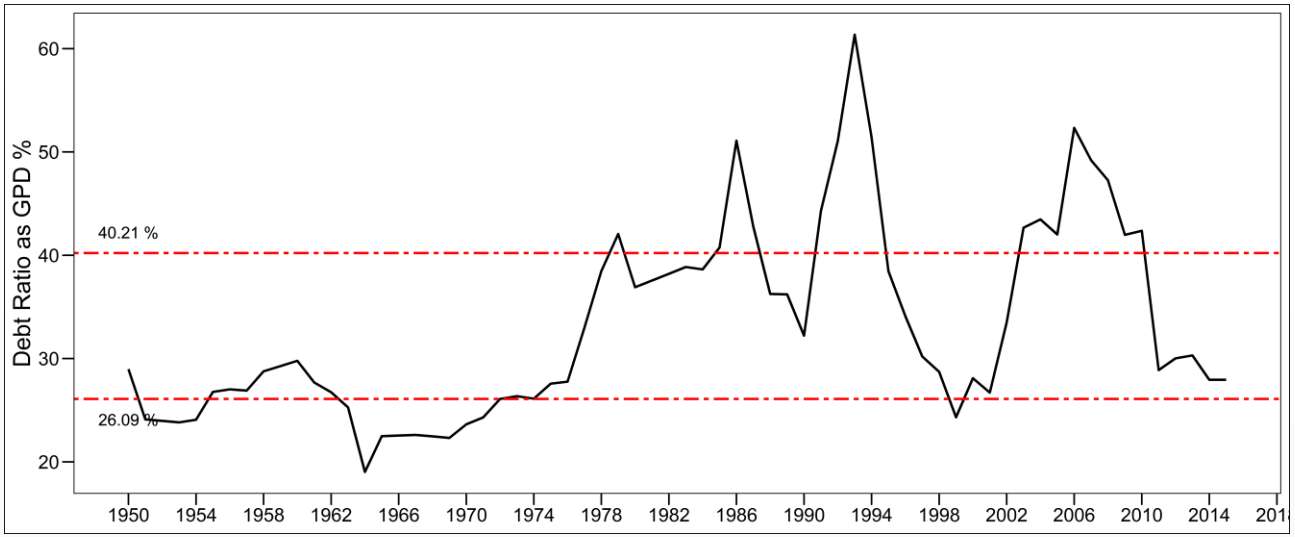


Examples with symmetric model

Netherlands



Norway



Concluding Comments

- We highlight **a new angle** on the study of fiscal sustainability by providing a method to detect non-linear behavior associated to self-discipline by fiscal authorities.
- We detect **19 economies out of 43** in which there is evidence public-debt mean reversion when its levels are above an endogenous threshold.
- 11 out of these 19 economies are **developing**.
- **Developed economies** with sustainability evidence tend to have higher debt thresholds and mean-reversion speeds.