A Fiscal Theory of Sovereign Risk

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Question

- How does monetary policy regime impact stochastic process for default on government debt when fiscal policy does not act to stabilize debt?
  - Monetary Regimes: Taylor Rules, Price Level targeting
  - Tension between price stability and government solvency depending on monetary regime
  - Small differences in monetary policy specification can imply large differences in default outcomes

Approach

- To ensure government PVBC holds, typically assume either fiscal or monetary policy is passive
  - Fiscal Policy - Passive if adjust primary surplus to ensure solvency
  - Monetary Policy - Active if reacts sufficiently strongly to inflation (Taylor Principle)
- This Paper - Assumes Fiscal Policy is Active (primary surplus set exogenously), and Monetary Policy is Active
  - To ensure solvency, government may have to default on portion of (nominal) liabilities

Model

- Constant Endowment y, (real) lump sum taxes τ_t, identical households
- Assets - Complete Markets (D_t - Arrow Securities), (Risky) Government Debt B_t with default rate δ_t
- max $\mathbb{E}_t \sum_{t=0}^{\infty} \beta^t U(C_t)$
  - s.t. $P_t C_t + \mathbb{E}_t m_{t+1} D_{t+1} + B_t + P_t \tau_t \leq D_t + P_t y + B_{t-1} R_{t-1}(1-\delta_t)$
- Where $\tau_t - \bar{\tau} = \rho(\tau_{t-1} - \bar{\tau}) + \epsilon_t$, with $\epsilon_t \sim N(0, \sigma^2)$
- Gov't BC: $B_t = R_{t-1} B_{t-1}(1-\delta_t) - \tau_t P_t$
- Euler: $\beta R_t \mathbb{E}_t (1-\delta_{t+1}) \frac{P_t}{P_{t+1}} = 1$
- Goal: Characterize δ_t given monetary policy stance

Default Process

- Iterate forward on Government Flow BC:
- $\delta_t = 1 - \frac{\sum_{h=0}^{\infty} \beta^h \mathbb{E}_t \tau_{t+h}}{R_{t-1} B_{t-1} / P_t}$
- Government defaults to extent present value of primary surpluses falls short of initial government liabilities
  - If $\delta_t = 0$, obtain Fiscal Theory of Price Level Determination
- $\delta_t = 1 - \frac{(1-\beta)(\tau_t - \bar{\tau}) + (1-\beta\rho)\tau}{R_{t-1} B_{t-1} / P_{t-1} (1-\beta)(1-\beta\rho)}$ (Given $\tau_t \sim AR(1)$)
  - More persistent tax processes imply larger default on public debt for given decline in current tax revenues
- Equilibrium Characterization requires P_t law of motion - need to specify monetary policy

Solution - Contemporaneous Taylor Rule

- $R_t = \frac{\pi^*}{\beta} + \alpha(\frac{P_t}{P_{t-1}} - \pi^*)$, MP active ($\alpha\beta > 1$)
- CB cannot achieve inflation target without defaulting:
  - $\delta_0 = 0$ implies $P_0 = \frac{R_{-1}B_{-1}}{\sum_{h=0}^{\infty} \beta^h \mathbb{E}_0 \tau_h}$
  - $\frac{P_0}{P_{-1}}$ will thus differ from target
- Taylor Rule + Euler Equation imply
  $\pi_{t+1} = \alpha\beta\pi_t + (1 - \alpha\beta)\pi^*$
  - Eventual hyperinflation/hyperdeflation

Solution - Contemporaneous Taylor Rule

- CB can achieve inflation target in every period if default occurs:
  - $\delta_0 = 1 - \frac{\pi^* \sum_{h=0}^{\infty} \beta^h \mathbb{E}_0 \tau_h}{R_{-1} B_{-1} / P_{-1}}$
  - $\delta_t = 1 - \frac{\sum_{h=0}^{\infty} \beta^h \mathbb{E}_t \tau_h}{\sum_{h=0}^{\infty} \beta^h \mathbb{E}_{t-1} \tau_h}, t \geq 1$
  - Default occurs in proportion to innovations in expectations to PV surpluses
- Default rate unforecastable: $\mathbb{E}_t \delta_{t+1} = 0$ for all t

Contemporaneous Taylor Rule - Delaying Default

- Delaying Default counterproductive if MP follows contemporaneous Taylor Rule
- Assume perfect foresight, $\pi_0 > \pi^*$, $\tau_t = \bar{\tau}$
- Fiscal Authority sets $\delta_t = 0$, for $0 \leq t < T$
- Period T set default rate to ensure inflation target met (thereafter no default)
- $\pi_t = \pi^* + (\alpha\beta)^t(\pi_0 - \pi^*)$, for $0 \leq t < T - 1$
- In period T default rate: $\delta_T = 1 - \frac{\pi^*}{\pi^* + (\alpha\beta)^T(\pi_0 - \pi^*)}$
  - Longer default delayed - Higher inflation rate, higher default rate required to stabilize prices

Solution - Forward Looking Taylor Rule

- $R_t = \frac{\pi^*}{\beta} + \alpha(\frac{1}{\mathbb{E}_t P_t/P_{t+1}} - \pi^*)$ MP active ($\alpha\beta > 1$)
- CB can anchor expected inflation at target with no default:
  - $\frac{1}{\mathbb{E}_t P_t/P_{t+1}} = \pi^*, \delta_t = 0$ for all t
  - $\frac{P_t}{P_{t-1}} = \pi^* \frac{\sum_{h=0}^{\infty} \beta^h \mathbb{E}_{t-1} \tau_h}{\sum_{h=0}^{\infty} \beta^h \mathbb{E}_t \tau_h}$
  - Unexpected innovations in inflation absorb shocks to PV of primary surpluses

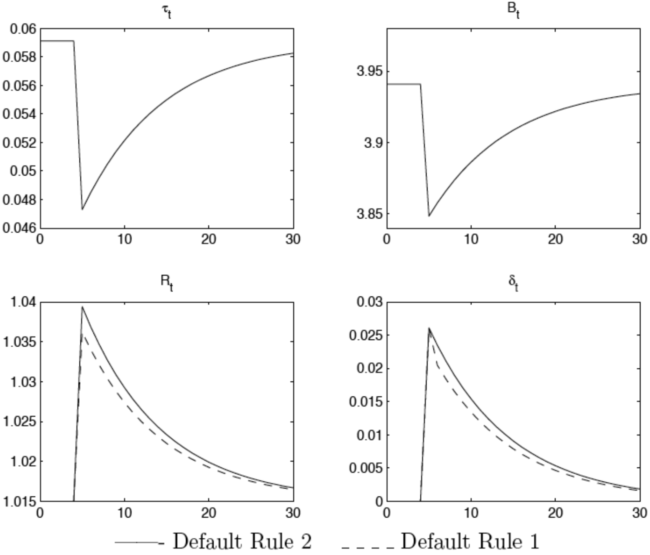
Solution - Price Level Targeting

- Now suppose MP strictly targets price level: $P_t = 1 \quad \forall t$
- Government loses ability to inflate away real value of liabilities
  - Since fiscal policy is exogenous, default will occur in equilibrium
- $\delta_t = 1 - \frac{(1-\beta)(\tau_t - \bar{\tau}) + (1-\beta\rho)\bar{\tau}}{R_{t-1}B_{t-1}(1-\beta)(1-\beta\rho)}$
- $B_t = 1 - \frac{\beta\rho(1-\beta)(\tau_t - \bar{\tau}) + \beta(1-\beta\rho)\bar{\tau}}{(1-\beta)(1-\beta\rho)}$
  - More persistent tax process implies greater fall in debt for given fall in tax revenue

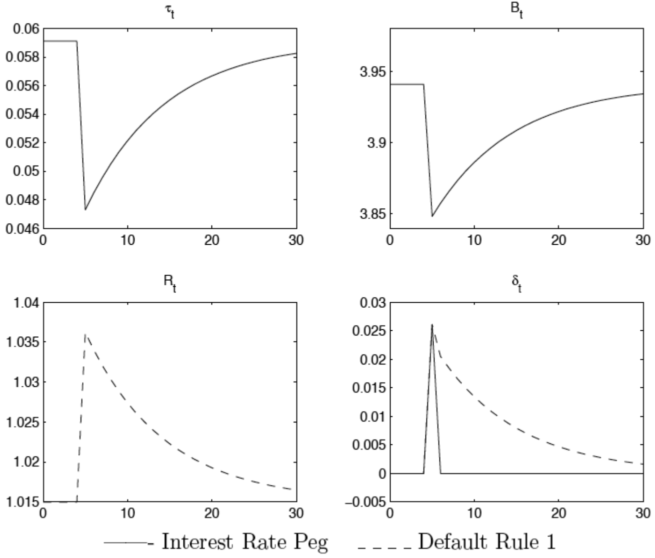
Solution - Price Level Targeting

- Solve for default process under three default rules:
  - Rule 1 - $\delta_t = \begin{cases} > 0 & \text{if } \frac{\tau_t}{B_{t-1}} < \gamma \\ 0 & \text{if } \frac{\tau_t}{B_{t-1}} = \gamma \\ < 0 & \text{if } \frac{\tau_t}{B_{t-1}} > \gamma \end{cases}$
  - Rule 2 - $\delta_t = \begin{cases} > 0 & \text{if } \frac{\tau_t}{y} < \gamma \\ 0 & \text{if } \frac{\tau_t}{y} = \gamma \\ < 0 & \text{if } \frac{\tau_t}{y} > \gamma \end{cases}$
  - Rule 3 - Interest Rate Targeting: $R_t = \beta^{-1}$
- Calibration - Real Interest Rate 6%, Debt/GDP ratio 100%, $\rho = 0.9$, γ chosen so that in steady-state government does not default
- Negative shock to tax revenues (20% below average)

Solution - Price Level Targeting Rule 1 and 2



Solution - Price Level Targeting Rule 1 and 3



Solution - Price Level Targeting

- Rules reacting to Taxes/Debt or Taxes/GDP: default rate persistent, very similar dynamics
  - Default rate larger if stabilize Taxes/GDP - Debt falls in response to drop in tax revenue, while output is exogenous
- Interest rate targeting: $\mathbb{E}_t \delta_{t+1} = 0$
  - Cumulative default much lower under interest rate targeting - lower debt burden because of lower interest rate