Fiscal Policy and Debt Management with Incomplete Markets

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How should gov't manage its debt over business cycle?

- Is there an "optimal" level of debt?
- How quickly should debt be repaid if away from the optimum?
- How should debt and taxes respond to aggregate shocks?

What we do

- Our framework
  - Ramsey planner with distortionary taxation and incomplete markets
- Existing answers: polar cases
  - complete markets: Lucas Stokey (1983)
  - risk-free bond only: Barro (1979), AMSS (2002)

    $\Longrightarrow$ in both cases: expected level of debt is constant
- This paper
  - target level of debt minimizes fiscal risk
  - simple formulas to compute that level, speed of reversion to it

Ramsey problem in a simple environment

- Ramsey problem: $\{\tau_t, B_t\}$ that implement the best competitive eqb
- Let $l(s,\tau)$ and $c(s,\tau)$ be the HH's optimal choices given tax rate τ
- Bellman equation

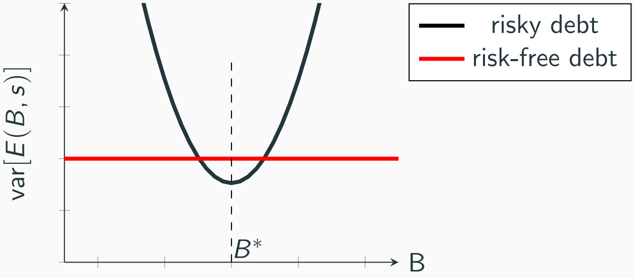
$$V(B_-) = \max_{\{\tau(s),B(s)\}} \mathbb{E}\left[c(s,\tau(s)) - \frac{1}{1+\gamma} l(s,\tau(s))^{1+\gamma} + \beta V(B(s))\right]$$

subject to

$$B(s) + \tau(s) l(s,\tau(s)) = \underbrace{R(s)\, B_- + g(s)}_{E(B_-,s)} \text{ for all } s$$

Risk minimization

- Amount of risk depends on debt level: $E(B, s) = R(s)\, B + g(s)$



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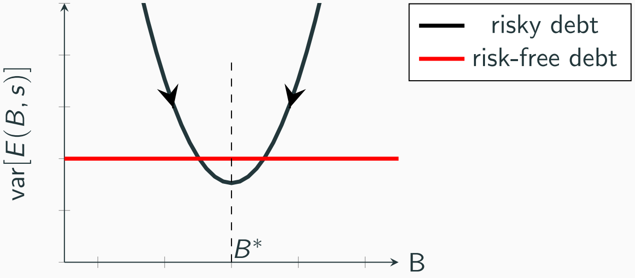

- Drift in debt dynamics and variance minimization

$$\mathbb{E}_t B_{t+1} \approx B_t - \beta^2 \times \text{slope of var}[E(B_t)]$$

Main result

Risk minimizing debt

Let B^* be debt level that minimizes $\text{var}\left(R(s)B + g(s)\right)$

- Mean of invariant distribution of debt

$$B^* = -\frac{\text{cov}\left(R, g\right)}{\text{var}(R)}$$

- Speed of mean reversion

$$\frac{\mathbb{E}_t B_{t+1} - B^*}{B_t - B^*} = \left(\frac{1}{1 + \beta^2 var\left(R\right)}\right)$$

Extensions

- Isoelastic preferences, more general shocks processes
  - endogeneous feedback of tax policy on returns
  - formulas continue to hold with marginal utility-adjusted returns

- $K \geq 1$ securities
  - government chooses portfolio to minimize fiscal risk
  - simple applications to optimal maturity management

Quantitative investigation

- Preferences

$$\ln c - \frac{1}{3} l^3$$

- 1 security with returns $R_t = \frac{p_t}{q_{t-1}}$
- 3 shock process:

$$\begin{aligned}
\text{TFP: } \ln \theta_t &= \rho_\theta \theta_{t-1} + \sigma_\theta \epsilon_{\theta,t} \\
\text{spending: } \ln g_t &= \ln \bar{g} + \chi_g \epsilon_{\theta,t} + \sigma_g \epsilon_{g,t} \\
\text{payoffs: } \ln p_t &= \chi_p \epsilon_{\theta,t} + \sigma_p \epsilon_{p,t}
\end{aligned}$$

- Benchmark: p_t to match real returns on outstanding U.S. debt
  - robustness checks: security that matches realized returns on 1-y bill; riskfree security

Optimal policy: Comparing simulations to formula

Ergodic Distribution : Effective Debt, $U_{c,t}B_t$

Effective debt:	Using simulation	Using formula
Mean	-0.07	-0.06
Half life (years)	237	244
Std. deviation	0.18	0.2

- Correlation of returns and output is close to 0:
    - large orthogonal component
    - correlation of effective deficits and effective returns is positive
- Variability of effective returns is low
    - slow convergence to the mean

Conclusion

- A comprehensive theory of optimal debt management with incomplete markets
- Tractable approximations of optimal policies
  - methods can be extended to other environments
- Key insight for the optimal debt management
  - target debt that minimizes risk