A Dynamic Theory of Public Spending, Taxation and Debt

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Introduction

- Introduce into a tax-smoothing problem with incomplete markets political-economy considerations.

- Not a benevolent Ramsey planner anymore but legislatures that can be involved in pork-barrel spending.

- A preview of the results: economy can be in perpetual debt, taxes too high and volatile, provision of public good too low.

Setup

- $i = 1, ..., n$ districts with a continuum of agents in each district.
- Incomplete markets with one period risk-free debt b with net return ρ.
- Linear technology: consumption z produced with technology $z = wl$.
- Public good: produced from consumption $g = z/p$.
- Uncertainty: value of public good $A \sim G(A)$ with support $[\underline{A}, \bar{A}]$.

- Quasi-linear period utility

$$z + Ag^{\alpha} - \frac{l^{1+\frac{1}{\varepsilon}}}{1+\varepsilon}$$

with $\varepsilon > 0$ and $\alpha \in (0, 1)$.

- Govennment policy:

$$(r, g, x, s_1, ..., s_n)$$

r :linear tax rate, x: new debt and $s_i \geq 0$: district-specific transfers.

- Government budget constraint

$$(1 + \rho)b + pg + \sum_i s_i \leq rnwl + x$$

Political process

- Each district has a representative in the legislature.

- Meeting at the beginning of each period. They decide on government policy. There are T rounds of proposals. At each round a proposer is selected randomly.

- The proposal passes with a majority of q votes. If rejected, go to next round.

- If after T rounds there is no decision: a legislator is appointed that chooses a default policy that is feasible and gives the *same* transfers to each district.

Consumer's problem

- Quasi-linearity$\Rightarrow$equilibrium interest rate: $\rho = \frac{1}{\delta} - 1$

- optimal labor: $\frac{U_l}{U_c} = w(1-r) \Rightarrow l^*(w(1-r)) = (\varepsilon w(1-r))^{\varepsilon}$

- optimal period utility (excluding transfers): $u(w(1-r), g; A)$

- Net of transfer surplus $B(r, g, x; b) = rnwl^* + x - pg - (1+\rho)b$

Normative Analysis: Ramsey problem

$$v(b, A) = \max_{r,g,x,s_i} u(w(1-r), g; A) + \frac{\sum s_i}{n} + \delta E v(x, A')$$
$$\text{s.t. } B(r, g, x; b) \geq \sum s_i, s_i \geq 0, x \in [\underline{x}, \bar{x}]$$

- $\bar{x}$: maximum amount that the government can borrow $\bar{x} \leq \max_r R(r)/\rho$

- $\underline{x}$: maximum amount of assets that the govenment can accumulate, $\underline{x} = -p\frac{g_S(A)}{\rho}$ where $g_S(A)$: *Samuelson* level of g that solves $nAag^{a-1} = p$.

- Simplify problem: $B(r, g, x; b) = \sum s_i \geq 0$ so

$$v(b, A) = \max_{r,g,x} u(w(1-r), g; A) + \frac{B(r, g, x; b)}{n} + \delta E v(x, A')$$
$$\text{s.t. } B(r, g, x; b) \geq 0, \text{ and } x \in [\underline{x}, \bar{x}]$$

Optimality conditions: Assign λ/n on constraint $B \geq 0$.

- wrt r :

$$1 + \lambda = \underbrace{\frac{1 - r}{1 - r(1 + \varepsilon)}}_{\text{marginal cost of taxation}}$$

- wrt g:

$$naAg^{a-1} = \frac{1 - r}{1 - r(1 + \varepsilon)} p$$

- wrt x:

$$\begin{aligned} 1 + \lambda &= -\delta E v_x(x, A') \\ \text{use envelope} &\implies \lambda = E\lambda', \text{ so} \lambda \text{ is a } \textit{martingale} \end{aligned}$$

Two possibilities

- $\lambda = 0$ so $\sum s_i \geq 0 \Rightarrow r = 0, g = g_s(A), x = x^o$

- $\lambda > 0$, so $B = 0 \Rightarrow r > 0$, $g < g_S$

- We can show that $x^o = \underline{x}$, i.e. amount of assets necessary to finance g_S and $\sum s_i = 0$.

- In the *long run* (AMSS 02): λ converges to 0, no taxes, government has accumulated enough assets to finance g_S. Tax-smoothing achieved through asset accumulation.

- Problem: In reality we see debt in the long run.

Political Equilibrium

- Construct a Markov-perfect equibrium with state (b, A)
- Show that the lesgilatures decision-making can be represented *as if* the proposer tries to maximize the utility of a coalition of q representatives.
- Two regimes:
  - Business-as-usual (BAU): If the A and/or b is low: The proposer is proposing transfers for his coalition of q members.
  - Responsible-Policy-Making (RPM): If the A and/or b high enough, proposer acting as if maximizing the welfare of the *entire* legislature.

BAU

$$v(b,A) = \max_{r,g,x} \quad u(w(1-r),g;A) + \frac{B(r,g,x;b)}{q} + \delta E v(x,A') \text{ s.t. } x \in [\underline{x},\bar{x}]$$

- foc wrt r:

$$\frac{1}{q} = \frac{\frac{1-r^*}{1-r^*(1+\varepsilon)}}{n}$$

- wrt g:

$$aAg^*(A)^{a-1} = \frac{p}{q}$$

- wrt x :

$$\frac{1}{q} = -\delta E v_x(x^*, A')$$

Divide the state space in two regions with $A^*(b, x^*)$

- If $A \geq A^*(b, x^*)$ then *RPM* regime

$$\begin{aligned} v(b, A) &= \max_{r,g,x} u(w(1-r), g; A) + \frac{B(r, g, x)}{n} + \delta E v(x, A') \\ \text{s.t. } B &\geq 0 \text{ and } x \in [\underline{x}, \bar{x}] \end{aligned}$$

- If $A < A^*(b, x^*)$ then *BAU*.

- $\underline{x} < x^* < \bar{x}$

- *Long-run*: The debt converges to a unique invariant distribution with support a subset of $[x^*, \bar{x}]$. There is a mass point at x^* but the distribution is *non-degenerate*. At x^* (BAU) we have $r^*, g^*(A)$ and pork-barrel spending. For $x > x^*$ (RPM) we have $r > r^*$, $g < g^*(A)$ and no transfers.

- Fluctuating regimes in the long run between BAU and RPM.

- If $x^* > 0 \Rightarrow$ economy in perpetual *debt*.

Another view on the Political Equilibrium: A *constrained* Ramsey problem.

$$
\begin{aligned}
v(b, A) &= \max_{r,g,x} \{u(w(1-r), g; A) + \frac{B(r, g, x; b)}{n} + \delta E v(x, A')\} \\
\text{s.t. } B &\geq 0,\ r \geq r^*, g \leq g^*(A) \text{ and } x \in [x^*, \bar{x}]
\end{aligned}
$$

- The political process imposes additional *endogenous* constraints on the tax rate, debt and the public good.

- Compare with ad-hoc debt limits of AMSS (02).