Fiscal deficits, monetary policy, and inflation

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Based on joint work with Marios Angeletos (Northwestern) and Chen Lian (Berkeley).

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  1. Fiscal transfers ("stimulus checks") are not inflationary, Ricardian equivalence holds
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- **Fiscal dominance** – fiscal deficits are *unbacked* by future tax revenue
  This is the "Fiscal Theory of the Price Level", e.g., see Cochrane (2022).
  1. Unbacked deficits (e.g., transfers) cause a jump in prices large enough to stabilize debt
  2. Monetary policy can't implement strict inflation targeting, fiscal policy invariably moves π

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- **Lessons**

  1. Fiscal deficits w/ delayed tax adjustment tend to "**finance themselves**" in other ways

     - Benign scenario: deficit causes demand-led **output boom** that leads to enough tax revenue
       Demand analogue of Laffer curve arguments. Plausible if economy is demand-constrained.

     - Less benign: **prices increase** to deflate real value of gov't debt
       This looks just like the FTPL, even though fiscal policy is textbook "passive."

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  2. Inflation targeting by the central bank requires **sufficiently fast** fiscal adjustment

Model

Fiscal policy

- **Government budget constraint**
  - Issue 1-period nominal debt b_t, levy lump-sum taxes t_t, pay nominal return i_t
  - In real terms [d_t = real debt, r_t = real returns, π_t = inflation], the linearized gov't budget is

$$d_{t+1} = (1+\bar{r}) \times (d_t - t_t) + \frac{\bar{d}}{\bar{y}} r_t - \frac{\bar{d}}{\bar{y}} (\pi_{t+1} - \mathbb{E}_t [\pi_{t+1}]) \tag{1}$$

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- **Taxes & fiscal adjustment**

$$t_t \quad = \quad \tau_d \times (d_t + \varepsilon_t) + \tau_y y_t - \varepsilon_t \tag{2}$$

  - $\tau_d \in [0,1]$ captures delay in fiscal adjustment, with $\tau_d > \frac{\bar{r}}{1+\bar{r}}$ = "passive" fiscal policy
    For transparent intuition also look at H-rule: $\tau_{d,t} = 0$ initially, then $= 1$ after H, giving $d_{H+1} = 0$.
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today's **Q**: what are the effects of deficit shocks ε_t for different τ_d / H?

Monetary policy

- The monetary authority sets returns i_t on 1-period nominal bonds
- **Monetary policy rule**
  - We will study monetary policy rules of the form

$$i_t - \mathbb{E}_t[\pi_{t+1}] \;=\; \phi \times y_t \;\equiv\; r_t \tag{3}$$

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  - For the two lessons:

    1. How does ϕ interact with τ_d/H in the financing of fiscal deficits ε_t?
       Will pay particular attention to $\phi = 0$, i.e., "neutral" monetary policy.
    2. When is strict inflation targeting [i.e., $\phi = \infty$] actually feasible?

Aggregate demand & supply

- **Aggregate demand**
  - Unit continuum of OLG households with survival probability $\omega \in (0, 1]$. Nests standard PIH model with $\omega = 1$, and mimics HANK with $\omega < 1$. Implies $\beta(1 + \bar{r}) = 1$, so $\bar{r} > 0 = g$.

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  - Optimal consumption-savings behavior yields aggregate demand relation: ▸ Details

$$c_t = \underbrace{(1-\beta\omega)}_{\text{MPC}} \times \left(\underbrace{d_t}_{\text{wealth}} + \underbrace{\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k \left(y_{t+k} - t_{t+k} \right) \right]}_{\text{post-tax income}} - \underbrace{\tilde{\gamma}\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k r_{t+k} \right]}_{\text{real rates}} \right) \quad (4)$$

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  Key features: (i) elevated MPC + (ii) addt'l discounting of future income & taxes

- **Aggregate supply**
  - Standard labor supply + nominal rigidities + lump-sum taxes yields NKPC ▸ Details

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t \left[\pi_{t+1} \right] \quad (5)$$

Lesson I

How are fiscal deficits financed?

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- **Eq'm existence & uniqueness** ▸ Full eq'm characterization

  Results for alternative monetary policy reaction functions follow at the end.

Proposition

Let $\omega < 1$, $\tau_y > 0$, and $\phi = 0$. The economy (1) - (5) *has a unique bounded eq'm.*

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Let $\omega < 1$, $\tau_y > 0$, and $\phi = 0$. The economy (1) - (5) *has a unique bounded eq'm.*

- Our first **Q**: how are fiscal deficits in this eq'm financed?
  - From the intertemporal gov't budget constraint:

$$\underbrace{\varepsilon_0}_{\text{deficit}} = \underbrace{\tau_d \times \left(\varepsilon_0 + \sum_{k=0}^{\infty} \beta^k \mathbb{E}_0\left(d_k\right)\right)}_{\textbf{fiscal adjustment}:\ (1-\nu)\times\varepsilon_0} + \underbrace{\overbrace{\frac{\bar{d}}{\bar{y}}\left(\pi_0 - \mathbb{E}_{-1}\left(\pi_0\right)\right)}^{p \text{ “self-financing”}} + \overbrace{\sum_{k=0}^{\infty} \beta^k \tau_y \mathbb{E}_0\left(y_k\right)}^{y \text{ “self-financing”}}}_{\textbf{“self-financing”}:\ \nu\times\varepsilon_0}$$

  - Next: characterize ν as a function of fiscal adjustment delay (τ_d or H)

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2. ***[Limit]*** *As fiscal financing is delayed more and more (i.e., as $H \to \infty$ or $\tau_d \to 0$), ν converges to 1. In words, delaying the tax hike makes it vanish.*

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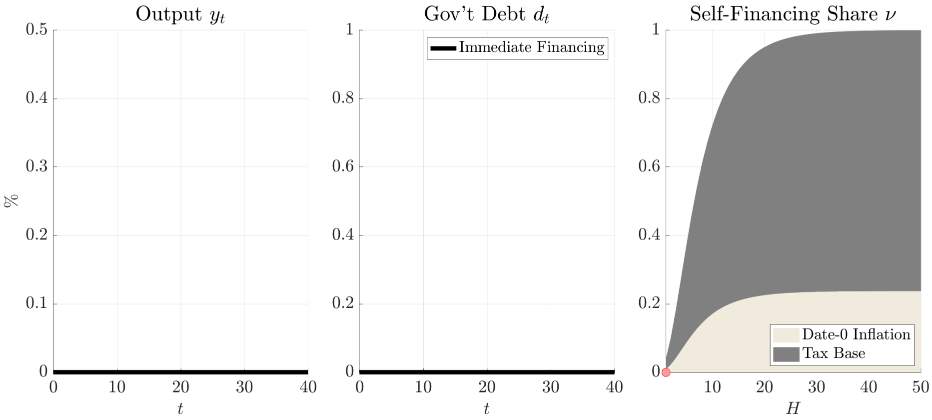
2. ***[Limit]*** *As fiscal financing is delayed more and more (i.e., as $H \to \infty$ or $\tau_d \to 0$), ν converges to 1. In words, delaying the tax hike makes it vanish. In this limiting eq'm:*

    a) *Gov't debt returns to steady state even without any fiscal adjustment.*

    b) *The share of self-financing coming from the tax base expansion is increasing in the strength of nominal rigidities. With rigid prices the cumulative output multiplier is $\frac{1}{\tau_y}$.*

A graphical illustration



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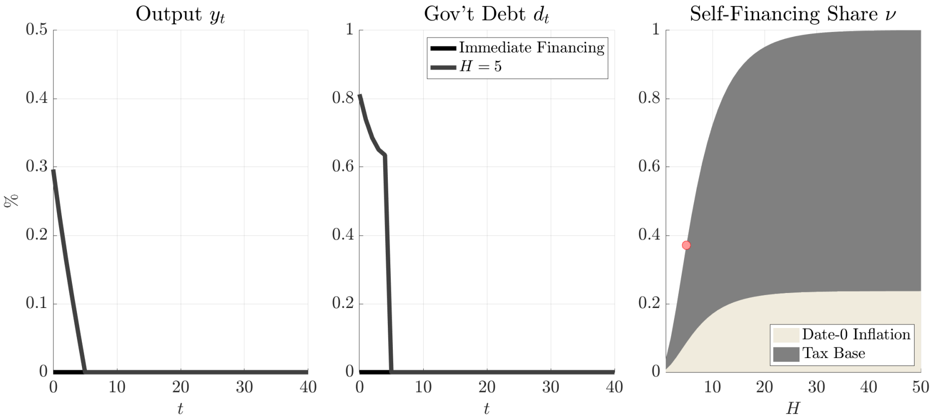

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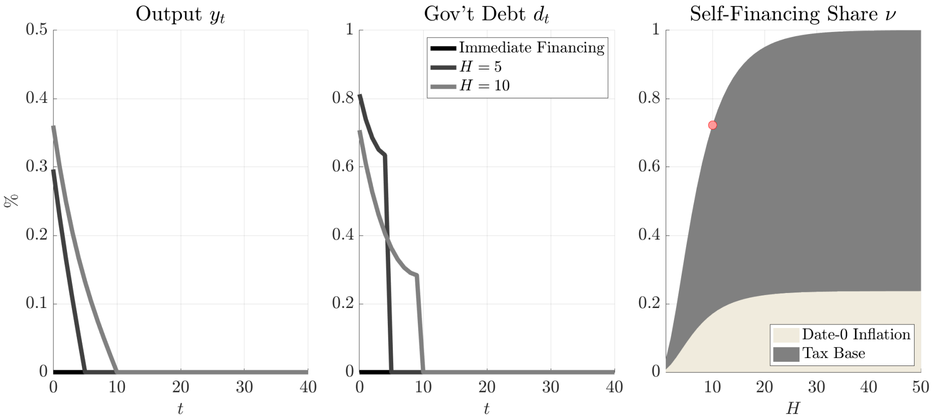

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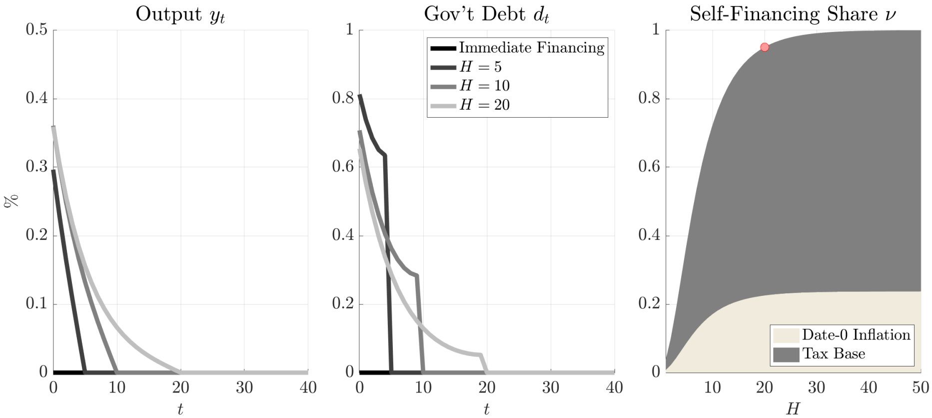

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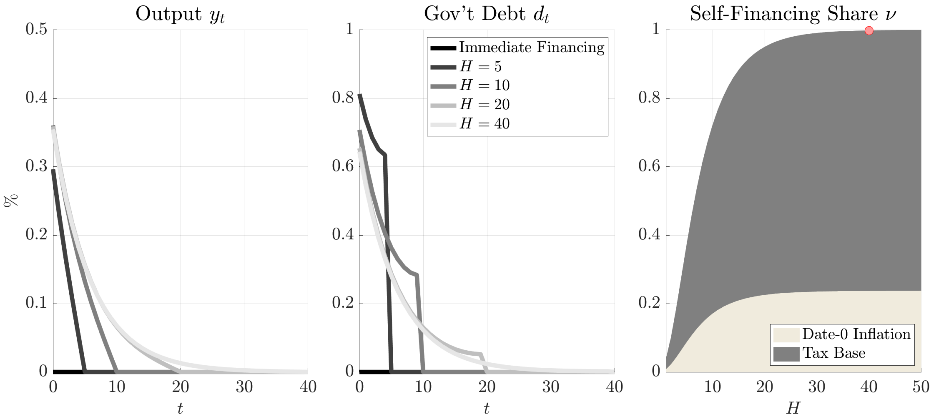

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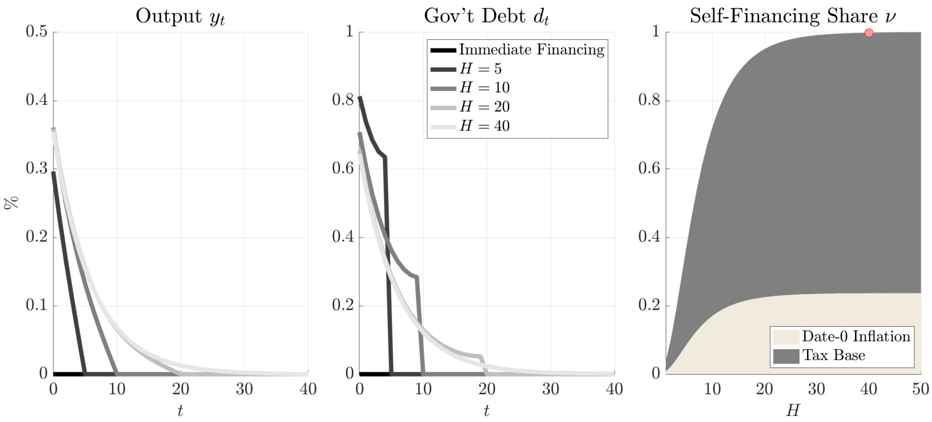

if **fiscal adjustment** is delayed, then financing will come via eq'm **prices & quantities**

Tax base financing – "demand-side nirvana"

- Background: self-financing in a **"static" Keynesian cross** w/ the tax base channel
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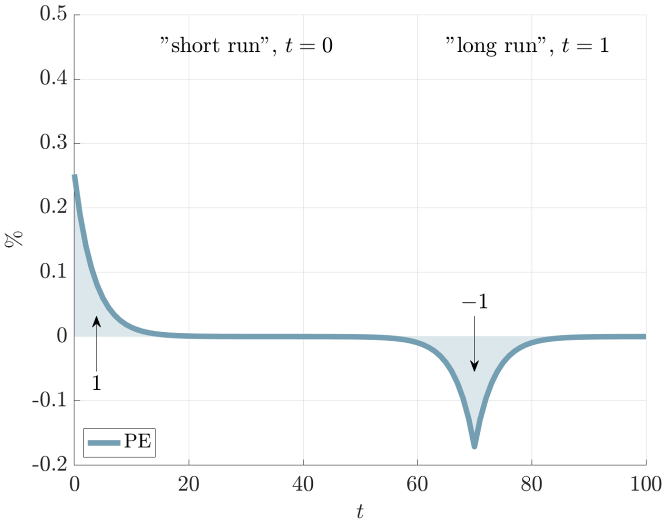

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GE Spend GE income gains quickly, so multiplier converges to **size $1/\tau_y$** quickly—akin to denominator above. Thus debt stabilizes on its own before H, and tax hike is not needed.

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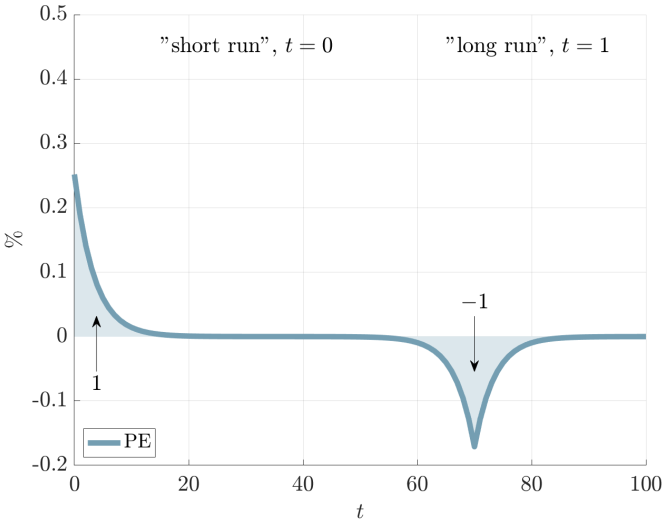

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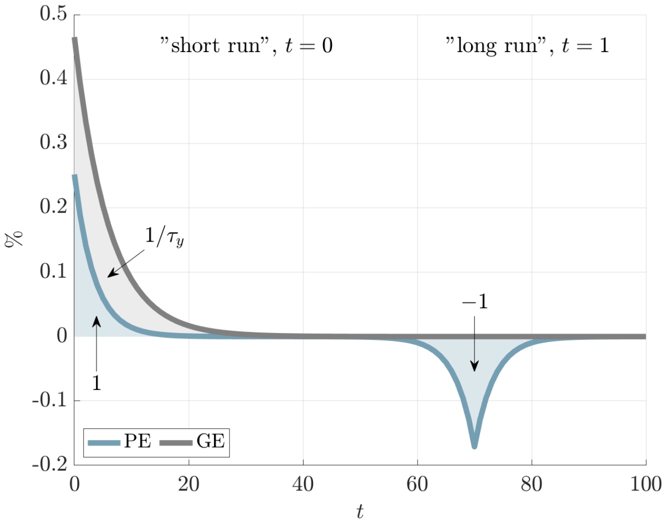

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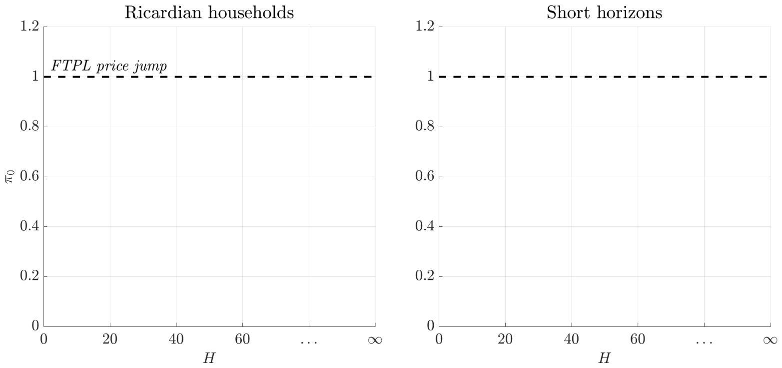

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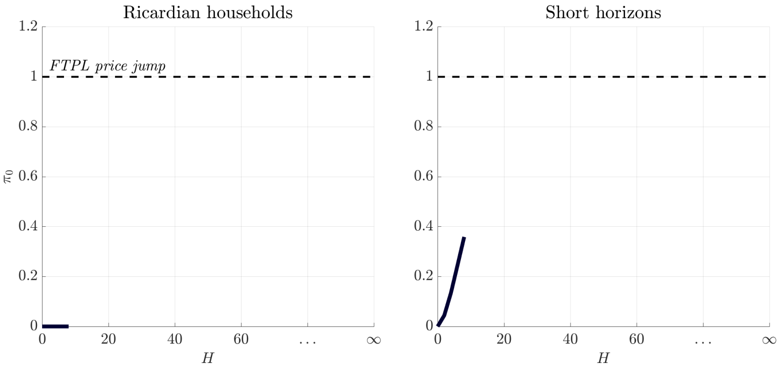

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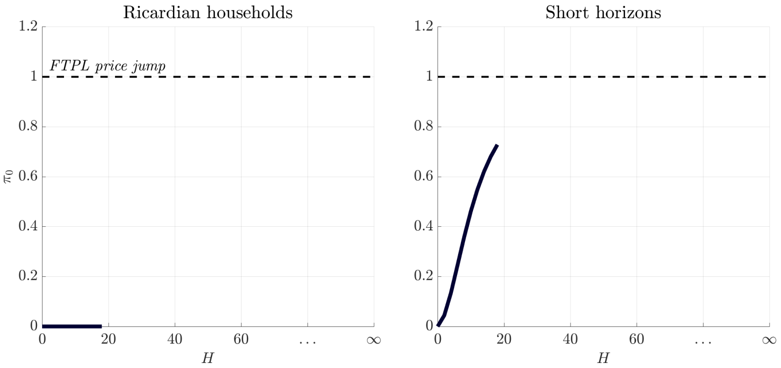

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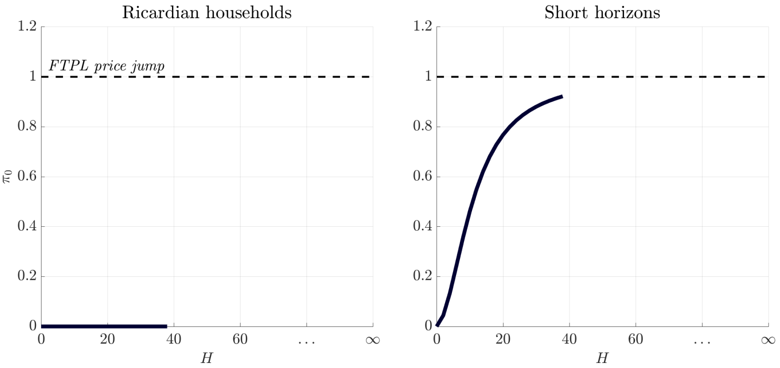

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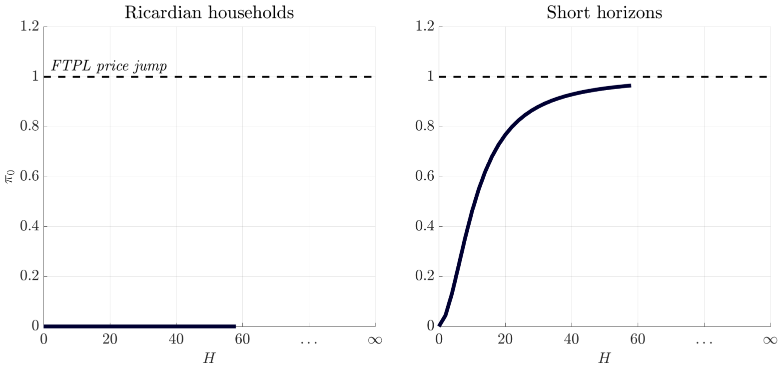

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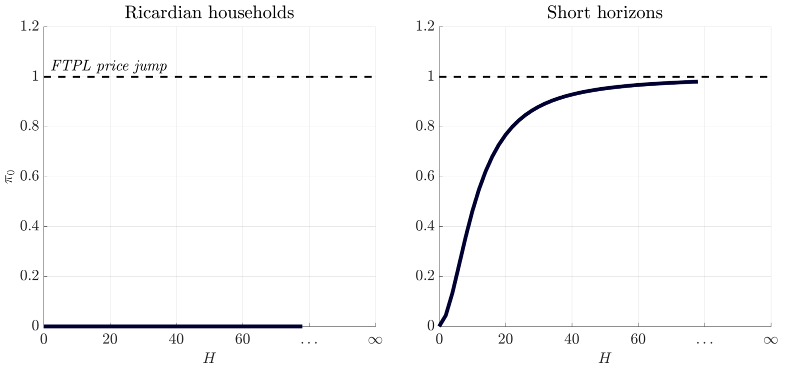

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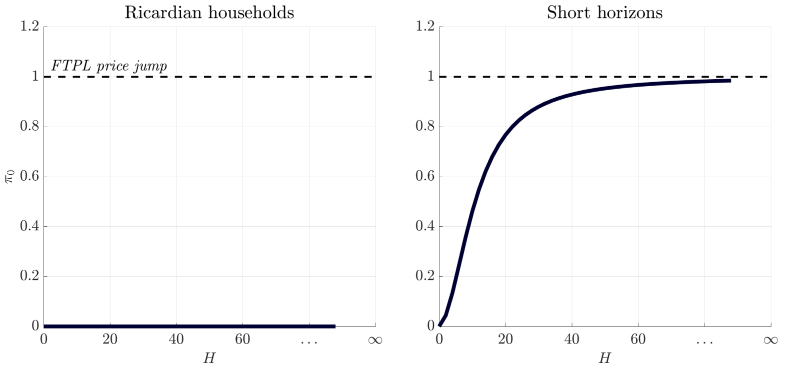

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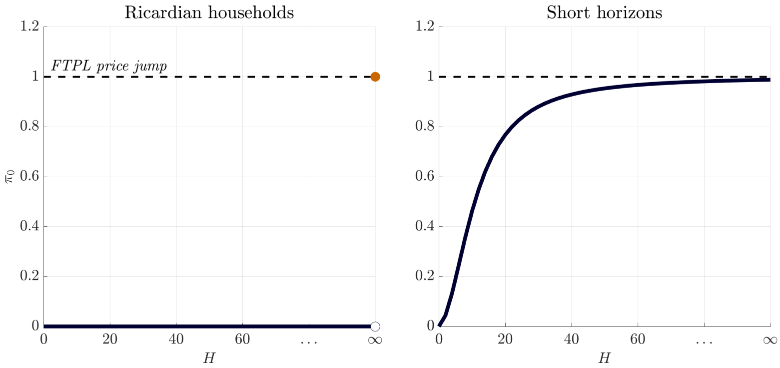

FTPL predictions have bite even with passive fiscal policy – delays in fiscal adjustment suffice.

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       Simple example: fiscal adjustment in far-ahead future [+ active MP] eliminates FTPL eq'm.
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- Previous slide: **HANK** naturally sidesteps those controversies
  Key idea: finite delays already enough, hard-to-test asn's about far-ahead future much less central.

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Note: same logic for standard Taylor-type rules like $i_t = \phi \times \pi_t$.

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Note: same logic for standard Taylor-type rules like $i_t = \phi \times \pi_t$.

- Next: what happens with **strict inflation targeting**? [i.e., $\phi = \infty$]

Lesson II

Inflation targeting

Implementing strict inflation targeting

Theorem

Suppose that $\omega < 1$, $\tau_y > 0$, and $\phi = \infty$. Then, for a bounded equilibrium to exist, fiscal adjustment needs to be ***sufficiently fast****:*

$$\tau_d \;\geq\; \underline{\tau}_d \;>\; \frac{\bar{r}}{1+\bar{r}}, \tag{6}$$

where $\underline{\tau}_d$ is decreasing in ω, and equal to $\frac{\bar{r}}{1+\bar{r}}$ if $\omega = 1$.

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  - RANK: if $\tau_d > \frac{\bar{r}}{1+\bar{r}}$, then fiscal shocks ε_t have no effect, without *any* monetary reaction
  - HANK: if $\tau_d > \underline{\tau}_d$, then *bounded* interest rate movements suffice to offset ε_t

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Today: *delays* in fiscal adjustment already suffice for **fiscal dominance**-like outcomes

- **Concrete lessons**

  1. Deficits w/ delayed tax adjustment: financing instead via debt erosion & tax base boom
     Demand-side nirvana vs. unpleasant FTPL arithmetic depends on supply/demand constraints.
  2. Implementing strict inflation targeting requires relatively *fast* fiscal consolidation

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- **Open Q's**

  - The insights today were mostly qualitative. What's a plausible **p/y split**? How fast is fast enough for **fiscal adjustment**? Discussion in Angeletos-Lian-Wolf (2024a, 2024b).

  - **Open economy** considerations: spending leakage abroad + borrowing from abroad

Thank you!

Appendix

Aggregate demand

- **Consumption-savings problem**
  - OLG hh's with survival probability $\omega \in (0,1]$ [can interpret as $\approx$ 1 - prob. of liq. constraint]

$$\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k \left[u(C_{i,t+k}) - v(L_{i,t+k}) \right] \right]$$

  - Invest in actuarially fair annuities. Budget constraint:

$$A_{i,t+1} = \underbrace{\frac{I_t}{\omega}}_{\text{annuity}} \left(A_{i,t} + P_t \cdot \left(\underbrace{W_t L_{i,t} + Q_{i,t}}_{Y_{i,t}} - C_{i,t} - T_{i,t} + \text{transfer to newborns} \right) \right)$$

- **Aggregate demand relation**

$$c_t = \underbrace{(1-\beta\omega)}_{\text{MPC}} \times \left(\underbrace{d_t}_{\text{wealth}} + \underbrace{\mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k (y_{t+k} - t_{t+k}) \right]}_{\text{post-tax income}} - \underbrace{\tilde{\gamma} \mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k r_{t+k} \right]}_{\text{real rates}} \right) \quad (7)$$

Key features: (i) elevated MPC + (ii) addt'l discounting of future income & taxes

back

Aggregate supply

- **Unions** equalize post-tax wage and average consumption-labor MRS. This gives

$$(1-\tau_y)W_t = \frac{\chi \int_0^1 L_{i,t}^{\frac{1}{\varphi}} di}{\int_0^1 C_{i,t}^{-1/\sigma} di}$$

  Log-linearizing:

$$\frac{1}{\varphi}\ell_t = w_t - \frac{1}{\sigma}c_t$$

- Combining with optimal firm pricing decisions we get the **NKPC**:

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t\left[\pi_{t+1}\right]$$

  - Note: no time-varying wedge since distortionary taxes τ_y are fixed

back

Equilibrium characterization

- First step to eq'm characterization is a more concise representation of agg. demand
- Combining (4), (3), (1), (2), and output market-clearing, we get

$$y_t = \mathcal{F}_1 \cdot (d_t + \varepsilon_t) + \mathcal{F}_2 \cdot \mathbb{E}_t \left[\sum_{k=0}^{\infty} (\beta\omega)^k \, y_{t+k} \right] \tag{8}$$

  - Here: $\mathcal{F}_1 \equiv \frac{(1-\beta\omega)(1-\omega)(1-\tau_d)}{1-\omega(1-\tau_d)}$ and $\mathcal{F}_2 = (1-\beta\omega)\left(1 - \frac{(1-\omega)\tau_y}{1-\omega(1-\tau_d)}\right)$
  - Note: $\mathcal{F}_1 = 0$ if $\omega = 1$—reflects lack of direct effect of deficit on consumer spending/ aggregate demand under Ricardian equivalence
- Equilibrium: (5), (8) and law of motion for government debt

▸ back

Equilibrium characterization

- We will look for **bounded equilibria** in the sense of Blanchard-Kahn
  - Note: in our case—with $\omega < 1$ and $\tau_y > 0$—this is enough to rule out sunspot solutions. Recover same eq'm through limit $\phi \to 0^+$.
- The unique bounded eq'm takes a particularly simple form:

$$y_t = \chi(d_t + \varepsilon_t), \quad \mathbb{E}_t\left[d_{t+1}\right] = \rho_d(d_t + \varepsilon_t)$$

where $\chi > 0$ (deficits trigger boom) and $0 < \rho_d < 1$ (debt goes back to steady state).

back