Fiscal-Monetary Interactions: RANK vs HANK

HANK meets FTPL (Angeletos, Lian & Wolf)
plus ongoing work (ALW, ALW+Dalton Rongxuan Zhang)

June 13, 2025

Fiscal-Monetary Interactions in NK framework

- Two related questions:

  Q1 How do fiscal deficits influence AD, y, and π?

  Q2 How does FP affect what MP can achieve?

- **RANK:** equilibrium selection
- **HANK:** non-Ricardian consumers

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  Q1 How do fiscal deficits influence aggregate demand and inflation?

  Q2 How does FP affect what MP can achieve?

- **RANK:** equilibrium selection $\longmapsto$ **"crazy"** (fragile, no empirical foundations)
- **HANK:** non-Ricardian consumers $\longmapsto$ **"sensible"** (robust, ample empirical foundations)

RANK

- Multiple Equil due to Keynesian Cross (spending-income feedback)
- Active Fiscal (or FTPL) = select a self-fulfilling prophesy
  - fiscal deficits have no wealth effect in equilibrium
  - consumers spend more merely because other spends more *for ever after*
- Exceedingly fragile — unravels with simple refinements
  - economy returning to steady state in finite time
  - small noise as in global-games literature

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- Exceedingly fragile — unravels with simple refinements
  - economy returning to steady state in finite time
  - small noise as in global-games literature
- **Bottom line:** in (refined) RANK,
  - FP is entirely irrelevant
  - MP is "dominant" even if Taylor principle violated
  - traditional approach to F-M interactions is out

HANK

- Self-fulfilling prophesies still possible but can again be refined away
- FP now matters because HHs are non-Ricardian
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- A robust and empirically founded way to model M-F interactions
- **Lesson 1:** inflationary effects of fiscal deficits?
  - FTPL-like predictions even if Taylor principle satisfied
  - Mechanism behind FTPL is "crazy", but its empirical lessons could still apply!
- **Lesson 2:** how does FP affect what MP can achieve?
  - CB prefers *slow* fiscal adjustment in the presence of *demand* shocks
  - ... *fast* fiscal adjustment in the presence of *cost-push* shocks

Framework

AS, AD, and MP

- **AS:** standard, summarized in NKPC

$$\pi_t = \kappa y_t + \beta \mathbb{E}_t \pi_{t+1} = \kappa \sum_{k=0}^{\infty} \beta^k \mathbb{E}_t y_{t+k}$$

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- **AD:** perpetual youth OLG with survival rate $\omega \in (0,1]$

  $\omega = 1$ nests PIH/RANK $\quad \Rightarrow \quad y_t = -\sigma r_t + \mathbb{E}_t y_{t+1}$

  $\omega < 1$ mimics liquidity frictions/HANK

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- **MP:** interest rates set according to

$$r_t \equiv i_t - \mathbb{E}_t \pi_{t+1} = \phi y_t$$

  active MP when $\phi > 0$, passive when $\phi \leq 0$

Fiscal Block

- Flow budget plus no-Ponzi (or HH transversality) $\Rightarrow$

$$d_t = \mathbb{E}_t\left[\sum_{k=0}^{\infty}\beta^k\left(t_{t+k} - \beta\,\tfrac{D^{ss}}{Y^{ss}}\,r_{t+k}\right)\right]$$

- Debt structure: one-period bonds; fraction ζ nominal, $1-\zeta$ real $\Rightarrow$

$$d_t - \mathbb{E}_{t-1}[d_t] = -\zeta\,\tfrac{D^{ss}}{Y^{ss}}\left(\pi_t - \mathbb{E}_{t-1}[\pi_t]\right)$$

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- **FP:** taxes set according to

$$t_t = \underbrace{-\varepsilon_t}_{\text{i.i.d. deficit shock}} + \underbrace{\tau_y y_t}_{\text{tax base channel}} + \underbrace{\tau_d(d_t+\varepsilon_t)}_{\text{fiscal adjustment}}$$

passive FP when $\tau_d > 0$, active when $\tau_d = 0$

Equilibrium Definition

Definition. A stochastic path for y_t, π_t, d_t, r_t, etc such that

- π_t obeys NKPC (firm and worker optimality)
- c_t obeys aggregate consumption function (consumer optimality)
- $y_t = c_t$ and $a_t = d_t$ (goods and asset market clearing)
- d_t obeys gov's flow budget and no-Ponzi
- t_t and r_t obey assumed policy rules

(and y_t bounded)

RANK $(\omega = 1)$

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$$y_t = -\sigma r_t + \mathbb{E}_t y_{t+1} \qquad \pi_t = \kappa y_t + \beta \mathbb{E}_t \pi_{t+1} \qquad r_t = \phi y_t \qquad \text{(+fiscal block)}$$

Proposition

1. Conventional equil: *If* $\phi > 0$ & $\tau_d > 0$ *(active M, passive F),* $\exists$ *a unique equil and is s.t.*

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2. *FTPL equil:* *If* $\phi \leq 0$ & $\tau_d = 0$ *(active F, passive M),* $\exists$ *a different unique equil and is s.t.*

$$\frac{\partial \pi_t}{\partial \varepsilon_t} = \frac{\kappa}{\tau_y + (\kappa\zeta - \beta\phi)\frac{D^{ss}}{Y^{ss}}} \underbrace{= \left(\zeta \frac{D_{ss}}{Y_{ss}}\right)^{-1} \text{ when } \phi = \tau_y = \tau_d = 0}_{\text{simple FTPL arithmetic}}$$

How Can Deficits Matter?

- **The tension:** Ricardian equiv fails despite Ricardian households
  - deficits can be inflationary iff they trigger a boom in c, y
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  - deficits can be inflationary iff they trigger a boom in c, y
  - but why do Ricardian household spend more?

- Because of a **purely self-fulfilling loop**
  - Wlog, $\phi = 0$. Aggregate consumption:

$$c_t = (1-\beta)\sum_{k=0}^{\infty}\beta^k \mathbb{E}_t y_{t+k} + (1-\beta)\, z_t \qquad \text{with} \qquad z_t \equiv a_t - \sum_{k=0}^{\infty}\beta^k \mathbb{E}_t t_{t+k}$$

  - In equilibrium, debt and deficits have **no wealth effects**:

$$a_t = d_t = \sum_{k=0}^{\infty}\beta^k \mathbb{E}_t t_{t+k} \quad \Rightarrow \quad z_t = 0 \quad \Rightarrow \quad c_t = \underbrace{(1-\beta)\sum_{k=0}^{\infty}\beta^k \mathbb{E}_t y_{t+k}}_{\text{permanent income}}$$

  - **But:** if others spend more $\Rightarrow$ my permanent income increases $\Rightarrow$ I spend more!

The Crux of Active FP – with real debt

- Let **real** debt ($\zeta = 0$) or rigid prices ($\kappa = 0$), and constant rates ($\phi = 0$)
- $\exists$ continuum of equil with $Y_t = Y_0$ and "free" Y_0
- Now, let the following active FP:

$$T_0 = -\varepsilon_0 \qquad T_t = \tau_y Y_t \ \forall t \geq 1,$$

- This selects the following equil:

$$Y_0 = \frac{1-\beta}{\tau_y}(D_0 + \varepsilon_0)$$

- This is the "**Fiscal Theory of Output (FTY)**"
  - HHs coordinate on unique self-fulfilling boom that finances deficit or tax cut
  - Why? Just because that's what it takes to satisfy no-Ponzi when $\tau_d = 0$.

The Crux of Active FP – with nominal debt

- Now let **nominal** debt ($\zeta = 1$), and again constant rates
- Again, $\exists$ continuum of equil with $Y_t = Y_0$ and "free" Y_0.
- Next, let

$$D_0 = \frac{B_0}{P_0} \qquad \text{and} \qquad P_0 = \frac{\kappa}{1-\beta} Y_0 \text{ (by Phillips Curve)}$$

  and consider same active FP as before.
- This now selects unique Y_0 s.t.

$$Y_0 = \frac{1-\beta}{\tau_y} \left(\frac{B_0}{\frac{\kappa}{1-\beta} Y_0} + \varepsilon_0 \right)$$

  - Now any fiscal innovation is financed in part by $P_0 \uparrow$ and $D_0 \downarrow$
  - But $P_0 \uparrow$ only because $Y_0 \uparrow$, which in turn is sustained by same kind of self-fulfilling boom
- The **FTY** simply translates to the **FTPL**

Fragilities of FTY/FTPL/active FP

1. Unravels if fiscal adjustment at any finite horizon
   - can support $y_t = \pi_t = 0$ for any MP, active or passive, if taxes adjust after 1000 periods

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1. Unravels if fiscal adjustment at any finite horizon
   - can support $y_t = \pi_t = 0$ for any MP, active or passive, if taxes adjust after 1000 periods
2. Unravels if self-fulfilling boom cannot last literally for ever

Proposition

Suppose economy returns to steady state in finite time, instead of asymptotically. Then, $\exists$ *unique equilibrium and is s.t.*

$$\{y_t, \pi_t\} \text{ invariant to FP}$$

regardless of ϕ.

- deficits never matter, unless they move y_t *literally* for ever
- also ruled out by perturbations a la global games (Angeletos & Lian '23)

Taking Stock

Within (refined) RANK:

- FP is entirely irrelevant
- MP is "dominant" even if Taylor principle fails
- traditional modeling of F-M interaction is out

How to make progress?

- Move from RANK to HANK (i.e., let HHs be non-Ricardian, as in the micro evidence)

  $\Longrightarrow$ turn deficits from sunspots to payoff-relevant

  $\Longrightarrow$ avoid all the "bugs"

HANK ($\omega < 1$)

Mechanism: classical non-Ricardian effects

- Same aggregate consumption and same definition for z_t, modulo $\beta \mapsto \beta\omega$:

$$c_t = \underbrace{(1-\beta\omega)\, z_t}_{\text{wealth effect}} + \underbrace{(1-\beta\omega) \sum_{k=0}^{\infty} (\beta\omega)^k \, \mathbb{E}_t [y_{t+k}]}_{\text{permament income}}. \tag{1}$$

- In equilibrium, $a_t = d_t = NPV(\text{surpluses})$ but no more $z_t = 0$. Instead,

$$z_t = \mathbb{E}_t \left[\underbrace{\sum_{k=0}^{\infty} \beta^k t_{t+k}}_{\text{private assets}} - \underbrace{\sum_{k=0}^{\infty} (\beta\omega)^k \, t_{t+k}}_{\text{tax liability}} \right]$$

- Essence: FP stimulates c by shifting tax burden to future (or easing borrowing constraints)
- Key implication: Slower fiscal adjustment $\Rightarrow$ higher z_t for same ε_t $\Rightarrow$ larger stimulus

What's Next?

Answer two questions:

1. **How inflationary are fiscal deficits?**
   - fix MP response; study how $\frac{\partial \pi}{\partial \varepsilon}$ varies with τ_d
2. **When does the CB prefer slow/fast fiscal adjustment?**
   - optimize MP response; study how CB objective varies with τ_d

HANK meets FTPL

Theorem

Let $\omega < 1$, $\phi = 0$. Then, $\exists$ unique equil and is such that:

1. ***Deficits are always expansionary/inflationary.*** *For any τ_d, $\frac{\partial y_{t+k}}{\partial \varepsilon_t} > 0$ and $\frac{\partial \pi_{t+k}}{\partial \varepsilon_t} > 0$.*
2. ***Monotonicity.*** *Lower τ_d (slower fiscal adjustment) $\Rightarrow$ bigger and more persistent boom*
3. ***Limit.*** *As fiscal adjustment gets slower and slower, the fiscally-led inflation in HANK converges smoothly to its FTPL counterpart:*

$$\lim_{\tau_d \to 0^+} \left. \frac{\partial \pi_t}{\partial \varepsilon_t} \right|_{HANK} = \left. \frac{\partial \pi_t}{\partial \varepsilon_t} \right|_{FTPL}$$

- Different mechanism, but similar predictions!
- Avoids the fragilities, moots the controversy

Understanding the Limit Result

- **Intuition for $\tau_y = 0$:**

$$\underbrace{\varepsilon_0}_{\text{deficit}} = \underbrace{\frac{D^{ss}}{Y^{ss}}\pi_0}_{\text{debt errosion}} + \underbrace{T}_{\text{NPV(tax hikes)}}$$

  - as long $T > 0$, delaying tax hikes yields $\uparrow$AD, $\uparrow \pi_0$, and $\downarrow T$
  - this keeps working till $T \to 0$ and hence $\pi_0 \to \left(\frac{D^{ss}}{Y^{ss}}\right)^{-1} \varepsilon_0$
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  - i.e., same debt erosion and same inflation as in simple FTPL arithmetic!
- Generalizes to $\tau_y > 0$, albeit with a twist
  - less debt erosion needed b/ automatic tax-base expansion
- **Takeaway:** deficits always inflationary, FTPL just a particular limit

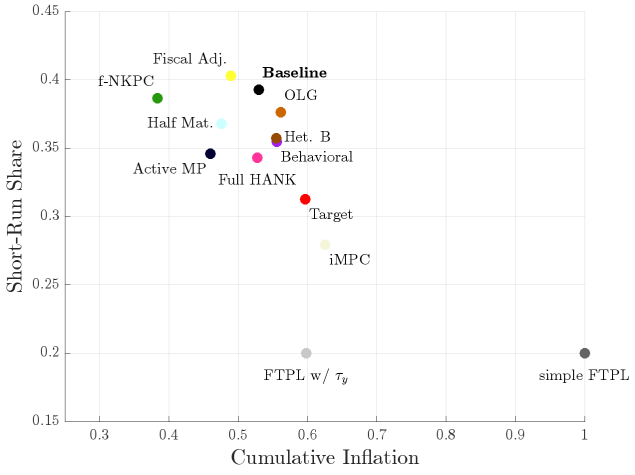
Does the difference in mechanism matter?

Same predictions about π and debt erosion, but two notable differences:

1. **Robustness**
   - to active-monetary passive-fiscal ($\phi > 0, \tau_d > 0$)
   - to refinements of far-ahead beliefs (steady state; Angeletos & Lian '23)

2. **Front-loading:** HANK predicts less persistence in y and π
   - because non-Ricardian households are relatively impatient (spend fast)
   - important testable difference (although not the focus here)
   - consistent with post-covid experience

Cumulative Inflation and Front-Loading



*Short-Run Share = cumulative π in year 1 relative to cumulative π in years 1-5

Taking Stock

Q1: inflationary effects of deficits?

- In RANK, robust answer is 0, regardless of MP
- In HANK, robust answer is $\approx$FTPL when fiscal and MP adj is slow

Q2 (next): how does FP influences, constrains, or helps optimal MP?

- Again: payoff/liquidity effects in HANK as opposed to equil selection in RANK

Fiscal-Monetary Interactions in HANK

- **Setting (so far):**
  - triple-mandate CB:

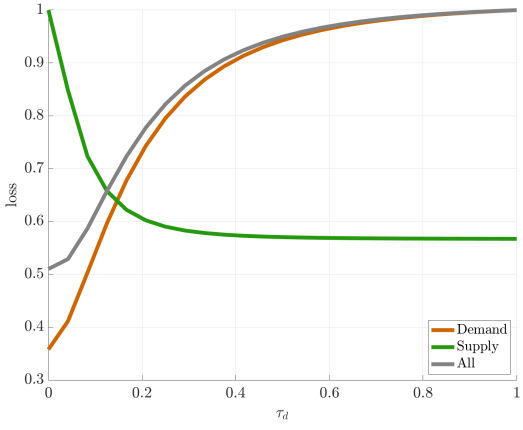
$$\min \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \left\{ \lambda_y y_t^2 + \lambda_\pi \pi_t^2 + \lambda_r r_t^2 \right\} \right]$$

  - subject to OLG/HANK for y, PC for π, and FP as before

- **Lesson (so far):**
  - CB prefers fast fiscal adj w/ supply (cost-push) shocks
  - CB prefers slow fiscal adj w/ demand (discount-rate) shocks

Fiscal-Monetary Interactions in HANK

- **CB loss, at optimal MP, as a function of τ_d:**



- **Contrast with RANK:** there, τ_d is irrelevant regardless of shocks

Conclusion

- **Fiscal-Monetary Interactions in New Keynesian Paradigm**
  - not flexible-price models, not Sargent-Wallace
- Two methodological approaches:

  [1] equilibrium selection in RANK

  [2] payoff/liquidity effects in HANK
- **My recommendation: abandon [1], focus on [2]**
  - different, more palatable, mechanism
  - grounded on evidence about stimulus checks, MPCs, etc
  - robust to delicate assumptions about far-ahead beliefs

Aside: Info Frictions

- Angeletos & Lian (JPE 2023)
  - eliminate FTPL and other sunspot solutions
  - select conventional solution even if Taylor principle violated
- Woodford (2001), Angeletos & Huo (2021), etc
  - add inertia+myopia (or backward-lookingness+discounting) to conventional solution
  - reconcile hump-shapes at macro level with quick jumps at micro level
- Two birds with one stone!

Thank You!