Fiscal-Monetary Interactions: RANK vs HANK

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

June 15, 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 + strong empirical foundations)

RANK

- Multiple Equil due to Keynesian Cross (spending-income feedback)
- Active fiscal policy (or FTPL) = select a particular self-fulfilling prophesy
  - no wealth effect; spend more merely because others spend more
- Fragile, unravels with
  - economy returning to steady state in finite time
  - tax adjustment in long horizons
  - small noise as in global-games literature

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- Fragile, unravels with
  - economy returning to steady state in finite time
  - tax adjustment in long horizons
  - 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

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- Self-fulfilling prophesies still possible but can again be refined away
- FP now matters because **HHs are non-Ricardian**
- A robust and empirically founded way to model M-F interactions

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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) $\Rightarrow$

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

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

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

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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.*

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

How Can Deficits Matter?

- **The tension:** Ricardian equiv fails despite Ricardian households
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  - but why do Ricardian household spend more?

- Because of a **purely self-fulfilling loop**
  - PIH:

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

  - In any equilibrium, **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 Fiscal Theory of Y

- Wlog, let $\phi = 0 \Rightarrow$ HHs can coordinate on $y_t = y_0$ for arbitrary Y_0
- Next, consider an active FP: $t_0 = -\varepsilon_0 \qquad t_k = \tau_y t_k \; \forall k \geq 1$
- Can be supported in equil iff HHs coordinate on unique y_0 that satisfies gov's IBC
  - **FTY** w/ real debt ("cookies"),

$$\varepsilon_0 = \frac{\beta}{1-\beta}\tau_y y_0 \qquad \text{and} \qquad \pi_0 = \frac{\kappa}{1-\beta} y_0$$

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  - **FTPL** w/ nominal debt ("paper"):

$$\varepsilon_0 = \underbrace{\frac{D^{ss}}{Y^{ss}} \frac{\kappa}{1-\beta}}_{\text{debt erosion}} y_0 + \tau_y y_0 \qquad \text{and} \qquad \pi_0 = \frac{\kappa}{1-\beta} y_0$$

  - In both cases, active FP sustained by a self-fulfilling boom

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3. Unravels with appropriate noise or "bounded memory" (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 evidence)

  $\Longrightarrow$ turn deficits from sunspots to payoff-relevant $\Longrightarrow$ avoid all the "bugs"

HANK ($\omega < 1$)

Mechanism: classical non-Ricardian effects

- Same optimal c_t, modulo $\beta \mapsto \beta\omega$:

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

- 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_t 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?

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 $\tau_d \downarrow 0$, inflation in HANK converges smoothly to FTPL counterpart:*

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

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

Understanding the Limit Result

- **Intuition** (with $\tau_y = 0$) :

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

  - 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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- Generalizes to $\tau_y > 0$, albeit with a twist
  - less debt erosion needed because of automatic tax-base expansion

- **Takeaway:** deficits always inflationary, FTPL just a particular limit

Does the difference in mechanism matter?

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

1. **Robustness**

   - to active-monetary passive-fiscal ($\phi > 0, \tau_d > 0$)
   - to fiscal adjustment in far-ahead future
   - to refinements that rule out perpetual self-fulfilling booms (or "multiplicity bug")

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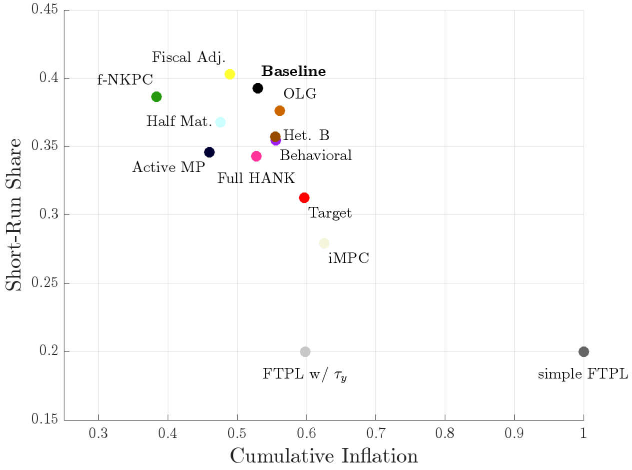
2. **Front-loading:** HANK predicts less persistent fiscal booms
   - because non-Ricardian households are relatively impatient (spend fast)
   - important testable difference (although not the focus here)
   - consistent with post-covid experience

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 $<$ FTPL, but $\approx$ FTPL if delayed hikes in taxes and real rates

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

Fiscal-Monetary Interactions in HANK

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

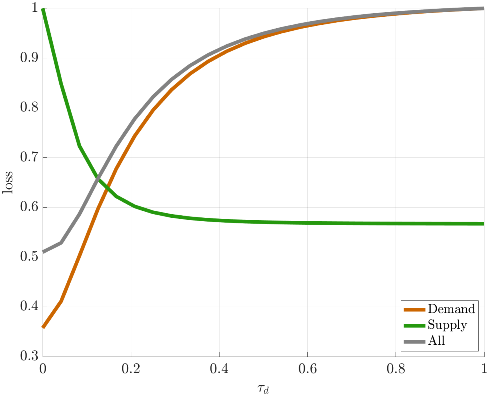
$$\mathscr{L}^{CB} = \min_{\{r_t\}} \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \left\{ \lambda_y y_t^2 + \lambda_\pi \pi_t^2 + \lambda_r r_t^2 \right\} \right]$$

  - subject to OLG/HANK for y_t, NKPC for π_t, and same FP rule as before
  - question: how does $\mathscr{L}^{CB}$ vary with τ_d?

- Lesson (so far):
  - CB prefers fast fiscal adj w/ supply shocks
  - ... slow fiscal adj w/ demand shocks

Fiscal-Monetary Interactions in HANK

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



[lower τ_d = slower fiscal adjustment]

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

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

Thank You!