Deficits and Inflation: HANK meets FTPL

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Big-Picture Comments

- The usual treatment of the FTPL induces a stark contrast between active-money and passive-money regimes
- Here the distinction becomes more blurred and FTPL elements emerge even under active money

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- The usual treatment of the FTPL induces a stark contrast between active-money and passive-money regimes
- Here the distinction becomes more blurred and FTPL elements emerge even under active money
- Events far into the future matter less...
  - ... FTPL question is whether the government will pay its debt soon
  - Not in a million years!

Plan of the Talk

- Provide insights into how the sausage is made
- Will work with the difference equation system

The General Difference Equation System

- Debt evolution:

$$d_{t+1} = \frac{d_t - t_t}{\beta} + \frac{\bar{d}}{y}(i_t - E_t\pi_{t+1})$$

- Euler equation (+mkt clearing)

$$y_t = y_{t+1} + \frac{1}{\beta\omega}(1-\beta\omega)(d_t - t_t) - d_{t+1} - \beta\left(\sigma - \frac{1-\beta\omega}{\omega}\frac{\bar{d}}{y}\right)(i_t - E_t\pi_{t+1})$$

- NKPC:

$$\pi_t = \kappa y_t + \beta E_t\pi_{t+1}$$

- Taylor rule

$$i_t = \phi E_t\pi_{t+1}$$

- Tax policy

$$t_t = \tau_d d_t + \tau_y y_t + \epsilon_{t+1}(1-\tau_d)$$

Matrix form after substitution with $\phi = 1$ and $\omega = 1$

$$\begin{bmatrix} \pi_{t+1} \\ y_{t+1} \\ d_{t+1} \end{bmatrix} = \begin{bmatrix} 1/\beta & -\kappa/\beta & 0 \\ 0 & 1 & 0 \\ 0 & -\tau_y/\beta & (1-\tau_d)/\beta \end{bmatrix} \begin{bmatrix} \pi_t \\ y_t \\ d_t \end{bmatrix}$$

- System triangular
- Eigenvalues $(1, 1/\beta, (1-\tau_d)/\beta)$
- $\tau_d = 0 \Longrightarrow$ FTPL
- $0 < \tau_d < 1 - \beta \Longrightarrow$ local determinacy, global indeterminacy
  - ... but should study nonlinear system
- $\beta < \tau_d < 1$ local indeterminacy

Matrix form after substitution with $\phi = 1$ and $\omega < 1$ and $\tau_y = 0$

$$\begin{bmatrix} \pi_{t+1} \\ y_{t+1} \\ d_{t+1} \end{bmatrix} = \begin{bmatrix} 1/\beta & -\kappa/\beta & 0 \\ 0 & 1 & -\frac{(1-\tau_d)(1-\omega)(1-\beta\omega)}{\beta\omega} \\ 0 & 0 & (1-\tau_d)/\beta \end{bmatrix} \begin{bmatrix} \pi_t \\ y_t \\ d_t \end{bmatrix}$$

- Still triangular
- Same eigenvalues $1, 1/\beta, (1-\tau_d)/\beta$
- Explosion in d triggers explosion in π, y
- IF we accept Taylor-style global determinacy, then get it for $0 < \tau_d < \beta$
  - ... otherwise, get purely nominally explosive equilibria of the type in Woodford's book

$\phi = 1,\ \omega < 1,\ \tau_y > 0$

$$\begin{bmatrix} \pi_{t+1} \\ y_{t+1} \\ d_{t+1} \end{bmatrix} = \begin{bmatrix} 1/\beta & -\kappa/\beta & 0 \\ 0 & 1 + \frac{\tau_y(1-\omega)(1-\beta\omega)}{\beta\omega} & -\frac{(1-\tau_d)(1-\omega)(1-\beta\omega)}{\beta\omega} \\ 0 & -\tau_y/\beta & (1-\tau_d)/\beta \end{bmatrix} \begin{bmatrix} \pi_t \\ y_t \\ d_t \end{bmatrix}$$

- $\omega < 1, \tau_y > 0$
- Now, feedback from output to debt
- Eigenvalues: 2 unstable, 1 stable for all $\tau_d \in [0, 1]$
- IF we accept Taylor-style global determinacy, then get it for $0 < \tau_d < \beta$
  - ... otherwise, get purely nominally explosive equilibria of the type in Woodford's book

What if $\phi > 1$?

- Nothing magic happens at $(\omega, \tau_y) = (1, 0)$ anymore
- Proposition: For (ω, τ_y) sufficiently close to (1,0)
  - Unique stable equilibrium (usual Taylor rule selection) for $1 > \tau_d > 1 - \beta$
  - Generically no stable equilibrium with $0 \leq \tau_d < 1 - \beta$

What if $\phi < 1$?

Proposition: For (ω, τ_y) sufficiently close to (1,0)

- Leeper-Bianchi FTPL with $0 \leq \tau_d < 1 - \beta$
- Indeterminacy with $1 > \tau_d > 1 - \beta$

Taylor rule timing

- Same conclusion about $\phi > 1$, $\phi < 1$ if $i_t = \phi\pi_t$
- Numerically, same if $i_t = \phi\pi_{t-1}$

An important difference ($\tau_y = 0$)

- Compare:
  - $\phi = 1.001$ and $\tau_d = 1.001 - \beta$ (barely active M, barely passive F)
  - $\phi = .999$ and $\tau_d = .999 - \beta$ (barely passive M, barely active F)
- Under RANK, completely different response to fiscal shock (no response under passive F)
- Under $\omega < 1$, response in the two economies is similar
- Can I generalize to $\tau_y > 0$?