"Strategic Interactions," and FTPL Modeling Strategy

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Comments

Sargent / Wallace anniversary. Lesson for today?

1. "Ends of inflations" as well as "unpleasant arithmetic." All (?) successful inflation stabilizations include monetary, fiscal, and microeconomic reforms. Regimes not decisions. 1980 is no exception. 2030 will not be an exception either.

2. Higher interest rates do not lower inflation unless accompanied by more surpluses, now or future. Interest costs + outstanding debt.

Chen, Leeper, Leith. Also no longer 1980.

1. Central bankers do not all hate inflation and Treasuries like it.

2. Current issue: Use monetary policy for "inclusive growth," regulatory power for climate change, inequality, race. (see "strategic review", https://www.minneapolisfed.org). Yellen: Only lend to companies with approved net-zero climate plan. Fed?

3. Do we need to model internal conflicts that produce government preferences, or just a policy process? Household economics? A: We do not *need* to do so, but it can be enlightening. Under the hood preference formation / budgets / precommitment devices.

How do we apply FTPL?

▶ Leeper et. al. (enormously simplified, my notation):

$$i_t = E_t \pi_{t+1} \tag{1}$$
$$i_t = \phi \pi_t + u_{i,t} \tag{2}$$
$$s_{t+1} = \gamma v_t + u_{s,t} \tag{3}$$
$$\rho v_{t+1} = v_t + i_t - \pi_{t+1} - s_{t+1} \tag{4}$$
$$u_t = \eta u_{t-1} + \varepsilon_t$$

▶ Need 1 forward-looking root for unique equilibrium:

(1)-(2): $E_t \pi_{t+1} = \phi \pi_t + u_{i,t}$
(3)-(4): $\rho v_{t+1} = (1-\gamma)v_t + \Delta E_{t+1} \pi_{t+1} - u_{s,t+1}$

▶ AM/PF: $\phi > 1$, $\gamma > 0$.
▶ AF/PM: $\phi < 1$, $\gamma = 0$.
▶ Markov switching! Locally AM/PF but really AF/PM & vice versa.
▶ Can estimate, test regime.

My approach

$$i_t = E_t \pi_{t+1}$$
$$i_t = \theta \pi_t^* + \phi(\pi_t - \pi_t^*) + u_{i,t}$$
$$s_t = \alpha v_t^* + \gamma \left(v_t - v_t^* \right) + u_{s,t}$$
$$\rho v_{t+1}^* = v_t^* - \Delta E_{t+1} \pi_{t+1}^* - s_{t+1}$$
$$\rho v_{t+1} = v_t - \Delta E_{t+1} \pi_{t+1} - s_{t+1}$$
$$(\Delta E_{t+1} \equiv E_{t+1} - E_t)$$

▶ (Equivalent to generalized processes for $u_{i,t}$, $u_{s,t}$.)

▶ Intuition: v^* gives a surplus that responds to debt accumulated from past deficits, but does not respond to changes in the value of debt from arbitrary values of unexpected inflation.

▶ Unchanged: AM/PF $\phi > 1$, $\gamma > 0$. AF/PM $\phi < 1$, $\gamma = 0$.

▶ Either way, $\pi_t = \pi_t^*$, $v_t = v_t^*$ in equilibrium.

▶ *Time series drawn from AM/PF and AF/PM equilibrium are observationally equivalent.*

▶ *Parameters ϕ and γ are not identified from equilibrium time series.*

Observational equivalence is a feature, not a bug

$$i_t = E_t\pi_{t+1} \qquad\qquad \text{Observed:}$$
$$i_t = \theta\pi_t^* + \phi(\pi_t - \pi_t^*) + u_{i,t} \quad = \theta\pi_t + u_{i,t}$$
$$s_t = \alpha v_t^* + \gamma(v_t - v_t^*) + u_{s,t} \quad = \alpha v_t + u_{s,t}$$
$$\rho v_{t+1}^* = v_t^* - \Delta E_{t+1}\pi_{t+1}^* - s_{t+1}$$
$$\rho v_{t+1} = v_t - \Delta E_{t+1}\pi_{t+1} - s_{t+1}$$

▶ Observational equivalence throughout economics and finance.

▶ Leeper et al.: *Identification restriction* $\theta = \phi$, $\alpha = \gamma$, $u \sim$ AR(1). Off-equilibrium behavior = on-equilibrium behavior.

▶ Theorem: "... from equilibrium time series." History, institutions, narratives, common sense are identifying information.

    ▶ Do restrictions make sense? $\theta = \phi$? $\alpha = \gamma$?

    ▶ AM? Fed acts so $E_t\pi_{t+1} = \phi\pi_t$, with $\phi > 1$? "Strategy review?"

    ▶ AF? s response to debt $\neq$ inflation? $\gamma > 0$ in 1933? 2008?

▶ $\rightarrow$ Forget about AM/PF. Use AF/PM to describe the whole sample. OE means you can't be proved wrong, AM/PF cannot improve fit! Any AM/PF can be rewritten AF/PM. OE is a feature not a bug!

ID restrictions hurt fit a lot

▶ AF restrictions $\alpha = \gamma$, $\gamma = 0$, AR(1) $u_{s,t}$ really hurt fit.

▶ A positive shock to surpluses *raises* the value of debt!

$$\rho v_{t+1} = v_t + i_t - \pi_{t+1} - u_{s,t+1}$$

$$v_t = u_s, t + E_t \sum_{j=1}^{\infty} \rho^j u_{s,t+j}$$

All deficits financed by inflating away debt, inflation more volatile than surplus/deficit, debt issues cannot raise real resources...

▶ Not about $s_t = \alpha v_t + u_t$ t-stats. Whole model implications are nuts.

▶ Can only fit when $i_t = \phi \pi_t$, $\phi > 1$ causes *even more* damage to data. 1970s. 2010s? Overall fit must be pretty bad.

▶ $\alpha > 0$, $\gamma = 0$ allows governments to borrow, pledge future surpluses, repay; rather than always inflate, unable to borrow in real terms; with active fiscal policy.

▶ Am I wrong? To identify regimes, the model fit *must* be restricted.

An alternative path

- ▶ Embrace AF/PM for whole sample. AM doesn't make any sense.
- ▶ Model in equilibrium

$$i_t = E_t \pi_{t+1}$$
$$i_t = \theta \pi_t + u_{i,t}$$
$$s_t = \alpha v_t + u_{s,t}$$
$$\rho v_{t+1} = v_t - \Delta E_{t+1} \pi_{t+1} - s_{t+1}$$

- ▶ Despite $\alpha > 0$, it is AF. v^* etc. tells you $\Delta E_{t+1} \pi_{t+1}$ is unique.
- ▶ Let θ, α and other (observable) parameters (more θ in i, s) vary over time; Markov if you wish. Make all the same points!
- ▶ Untie changing parameters *in* equilibrium from changing AF/AM regime parameters. We are always in AF/PM.
- ▶ Observational Equivalence: Can rewrite Leeper et al. exactly. Removing id restrictions can only improve model fit. Possibly, a lot.
- ▶ Test regimes? Why test a theory ($\phi > 1$) that doesn't make sense?
- ▶ Keynesian vs. monetarist, behavioral vs. rational, RBC vs new-Keynesian were never settled by one grand F test. Stop trying.
- ▶ Test of theory is its *usefulness*, understand episodes, analyze policy.
- ▶ Do like Sargent and Wallace!