Stabilizing Expectations under Monetary and Fiscal Policy Coordination

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Motivation

- Standard account of policy: Ricardian fiscal policy
  - Leeper (1991)
- Regime change/non-recurrent regimes: Davig and Leeper (2007)
  - Bond price support regime in U.S.
  - Expectations formation

What we do

- Simple model of output gap and inflation determination
- Two key informational frictions: Friedman (1947, 1968)
  - Central bank cannot observe current state: current policy decisions depend on estimates of the current state
  - Agents have incomplete knowledge about the economy
- Expectations need not be consistent with policy
- Explore constraints these friction impose on stabilization policy

Analytical Strategy

- Benchmark analysis: regime uncertainty

- Evaluate advantages of:
  - Communicating complete details of policy regimes
  - Isolate/identify sources of expectational instability

Results

- Under regime uncertainty, stabilization policy more difficult than under rational expectations
  - Failure of traditional aggregate demand management vs. stabilizing wealth effects
- Under regime certainty, stabilzation policy unambiguously improved
- But limits to communicaiton:
  - the more heavily indebted the economy, the more difficult to stabilize expectations

Beliefs

Under rational expectations:

1. Agents optimize given beliefs

2. The probabilities they assign to future state variables coincide with the predictions of the model

This paper retains (1) and replaces (2) with

2′. Future state variables outside agent's control are forecasted using an econometric model.

Model Summary I

- Log-linear approximation implies aggregate dynamics

$$\begin{aligned}\hat{x}_t &= \delta\beta^{-1}\left(\hat{b}_t - \hat{\pi}_t\right) - \beta^{-1}\delta\hat{s}_t + \\ &\quad \hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t}\left[(1-\beta)\left(\hat{x}_{T+1} - \delta\hat{s}_{T+1}\right) - (\sigma-\delta)\left(\hat{\imath}_T - \hat{\pi}_{T+1}\right) + \sigma r_T\right] \\ &\rightarrow \textit{ optimal Consumption Decision Rule}\end{aligned}$$

$$\begin{aligned}\hat{\pi}_t &= \kappa\hat{x}_t + \hat{E}_t \sum_{T=t}^{\infty} (\alpha\beta)^{T-t}\left[\kappa\alpha\beta\hat{x}_{T+1} + (1-\alpha)\beta\hat{\pi}_{T+1}\right] \\ &\rightarrow \textit{ optimal Pricing Decision Rule}\end{aligned}$$

$$\begin{aligned}\hat{b}_t &= \beta^{-1}\left(\hat{b}_{t-1} - \hat{\pi}_{t-1} - (1-\beta)\,\hat{s}_{t-1}\right) + \hat{\imath}_{t-1} \\ &\rightarrow \textit{ government flow budget constraint}\end{aligned}$$

Model Summary II

- Policy Rules

$$\begin{aligned} \hat{\imath}_t &= \phi_\pi E_{t-1}\hat{\pi}_t \\ &\rightarrow \textit{Taylor Rule} \end{aligned}$$

$$\begin{aligned} \hat{s}_t &= \phi_\tau \hat{b}_t \\ &\rightarrow \textit{Tax Rule} \end{aligned}$$

  - Fiscal authority also specifies average structural surplus-to-output ratio

Keynesian Expenditure Effects

- Households imperfectly forecast future tax changes
  - Barro (1974)

- Aggregate demand implies:

$$\begin{aligned}\hat{x}_t &= \delta\left(\beta^{-1}\left(\hat{b}_t-\hat{\pi}_t\right)-\beta^{-1}\hat{s}_t+\hat{E}_t\sum_{T=t}^{\infty}\beta^{T-t}\left[\left(\hat{\imath}_T-\hat{\pi}_{T+1}\right)-(1-\beta)\,\hat{s}_{T+1}\right]\right)\\ &\quad+\hat{E}_t\sum_{T=t}^{\infty}\beta^{T-t}\left[(1-\beta)\,\hat{x}_{T+1}-\sigma\left(\hat{\imath}_T-\hat{\pi}_{T+1}\right)+\sigma r_T\right]\end{aligned}$$

Learning and Stability

- Marcet and Sargent (1989): Beliefs

$$z_t = a_t + b_t z_{t-1} + \varepsilon_t$$

where $z_t = \{x_t, \pi_t, b_{t+1}, i_t, s_t\}$

  - Expectations anchored if $\hat{a}_t, \hat{b}_t \to a^*, b^*$ (REE)

- Actual dynamics depend on beliefs

$$z_t = T_a\left(\hat{a}_{t-1}\right) + T_b(\hat{b}_{t-1}) z_{t-1} + \tilde{\varepsilon}_t$$

where $a^* = T_a\left(a^*\right)$ and $b^* = T_b(b^*)$

- Transitional model mis-specification — beliefs might not converge!

The Fiscal Theory of the Price Level

- Under rational expectations the first order conditions imply

$$\begin{aligned}\hat{b}_t - \hat{\pi}_t &= E_t \sum_{T=t}^{\infty} \beta^{T-t} \left[(1-\beta)\, \hat{s}_T - \beta \left(\hat{\imath}_T - \hat{\pi}_{T+1} \right) \right] \\ &= E_t \sum_{T=t}^{\infty} \beta^{T-t} \left[(1-\beta)\, \hat{s}_T - \beta \left(\hat{Y}_T - \hat{Y}_{T+1} \right) \right]\end{aligned}$$

Rational Expectations: Ricardian

- Requirements for determinacy

$$\phi_\pi > 1 \text{ and } 1 < \phi_\tau < \frac{1+\beta}{1-\beta}$$

- Solution:

$$\hat{\pi}_t = \bar{\alpha}_0 r_t^n$$

Rational Expectations: Non-Ricardian

- Requirements for determinacy

$$0 \leq \phi_\pi < 1 \text{ and } \quad 0 \leq \phi_\tau < 1 \text{ or } \phi_\tau > \frac{1+\beta}{1-\beta}$$

- Solution:

$$\hat{\pi}_t = \bar{\alpha}_1 \hat{b}_t + \bar{\alpha}_2 r_t^n$$

  - Leeper conditions

Assumption

- Economy with limited nominal rigidities: $\alpha \longrightarrow 0$

Regime Uncertainty: Ricardian

- Proposition I: For any Ricardian fiscal policy stability requires

$$1 < \phi_\tau < \frac{1+\beta}{1-\beta}; \qquad \phi_\pi > \frac{1}{1-\beta}$$

  - Violation of the Taylor principle
  - Tighter restrictions on policy choice

Regime Uncertainty: Non-Ricardian

- Proposition: For any $0 \leq \phi_\pi < 1$ then stability requires $0 \leq \phi_\tau < \phi_\tau^*$ where

$$\phi_\tau^* = \frac{2}{\left[(1-\beta\phi_\pi)^{-1} + (1-\beta)\right]}$$

or

$$\phi_\tau > \frac{1+\beta}{1-\beta}$$

  - Coordination desirable
  - Always exists a fiscal policy that is consistent with expectations stabilization

Intuition: Learning to Believe in the Fiscal Theory

- Two effects from a shock to inflation expectations
  1. Demand and inflation rise immediately
  2. Higher inflation reduces real value of debt which in turn lowers inflation expectations

- Stability across both regimes hinges on relative magnitudes of these effects

The Role of Indebtedness

- Instability results independent of one dimension of fiscal policy: δ

- Aggregate demand implies:

$$\begin{aligned}\hat{x}_t &= \delta\left(\beta^{-1}\left(\hat{b}_t-\hat{\pi}_t\right)-\beta^{-1}\hat{s}_t+\hat{E}_t\sum_{T=t}^{\infty}\beta^{T-t}\left[\left(\hat{\imath}_T-\hat{\pi}_{T+1}\right)-(1-\beta)\,\hat{s}_{T+1}\right]\right)\\ &\quad+\hat{E}_t\sum_{T=t}^{\infty}\beta^{T-t}\left[(1-\beta)\,\hat{x}_{T+1}-\sigma\left(\hat{\imath}_T-\hat{\pi}_{T+1}\right)+\sigma r_T\right]\end{aligned}$$

  - Equivalently: independent of knowledge of solvency of the intertemporal accounts

The Role of Informational Frictions

- Two key informational frictions
  - Central bank cannot observe current state
  - Agents do not know how aggregate prices determined

- If central bank observes current state so that $i_t = \phi_\pi \pi_t$
  - Leeper conditions restored
  - Not generally true: Eusepi and Preston (2007)

Resolving Regime Uncertainty

- Communication foundation of central banking best practice
- Model as agents having knowledge of monetary policy rule
  - Agents need not forecasts $\{i_t\}$ independently
- Aggregate demand given by

$$\hat{x}_t = \delta\beta^{-1}\left(\hat{b}_t - \hat{\pi}_t\right) - \beta^{-1}\delta\hat{s}_t - (\sigma - \delta)\,\phi_\pi \hat{E}_{t-1}\pi_t +$$

$$\hat{E}_t \sum_{T=t}^{\infty} \beta^{T-t}\left[(1-\beta)\left(\hat{x}_{T+1} - \delta\hat{s}_{T+1}\right) - (\sigma - \delta)\left(\beta\phi_\pi - 1\right)\hat{\pi}_{T+1} + \sigma r_T\right]$$

Ricardian Case

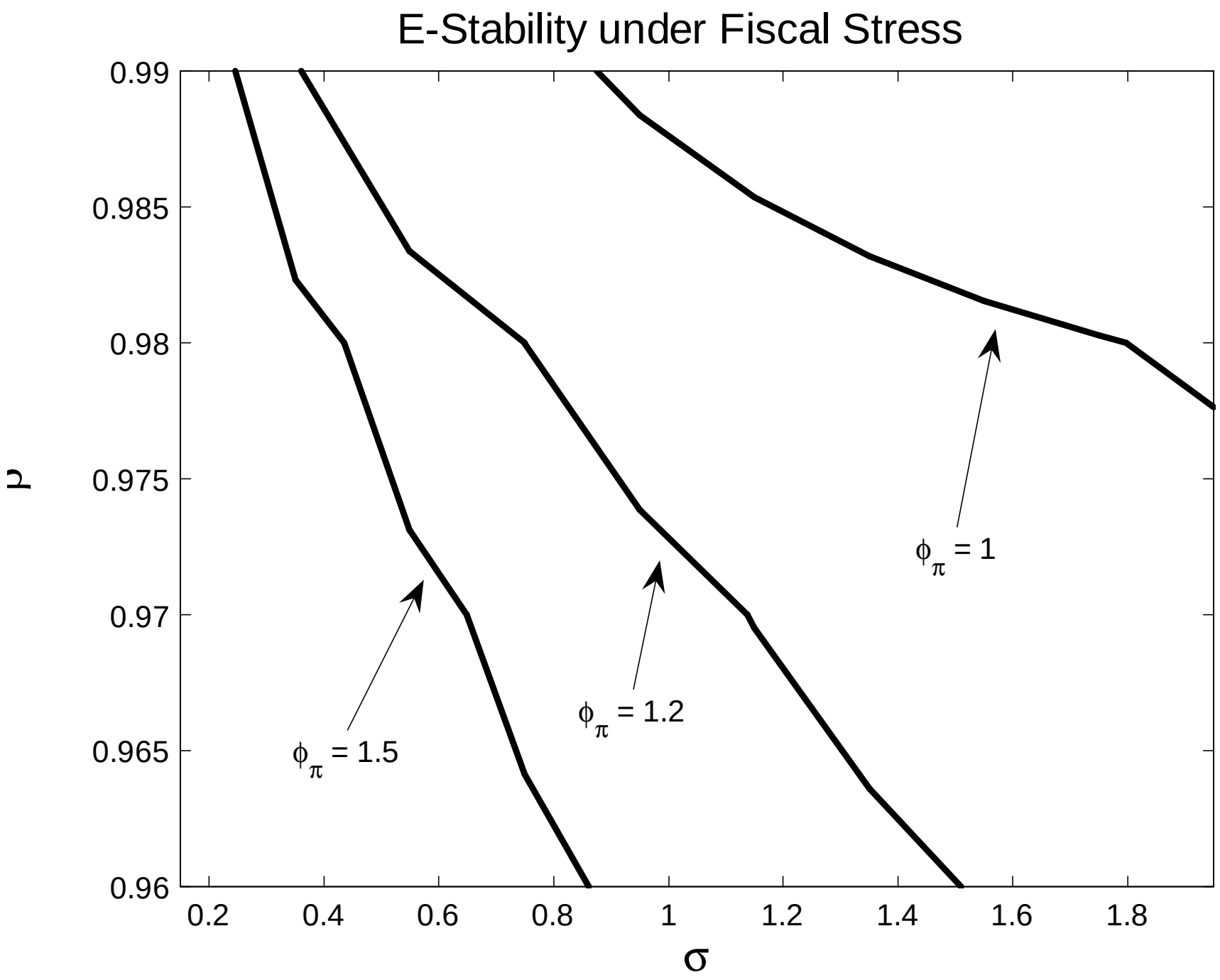
- Under communication of the policy regime and Ricardian fiscal policy,

$$1 < \phi_\tau < \frac{1+\beta}{1-\beta},$$

stability obtains if and only if

$$\phi_\pi > \frac{1}{1-\beta\delta}$$

  - Steady state implications of policy matter
  - Resonates with practical policymaking


E-Stability under Fiscal Stress
0.99
0.985
0.98
0.975
0.97
0.965
0.96
ρ
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
σ
ϕ_π = 1
ϕ_π = 1.2
ϕ_π = 1.5

Non-Ricardian Case

- Under central bank communication, passive monetary policy $0 \leq \phi_\pi < 1$ and non-Ricardian fiscal policy stability obtains if and only if

$$0 \leq \phi_\tau < 1 \quad \text{and} \quad \delta < \frac{\left(1 - \beta + \beta^2 \phi_\pi\right)(1 - \phi_\pi)}{\phi_\pi \beta \left(1 - \beta \phi_\pi\right)}$$

  or

$$\phi_\tau > \frac{1 + \beta}{1 - \beta}$$

  - Special case: $\phi_\pi = 0$ guarantees stability

Intuition

- Knowledge of regime implies
  - agents know the policy rule
  - correctly project path of real interest rates
  - monetary policy a more stabilizing force
- But higher nominal interest rates implies higher future wealth
  - destabilizing force

The Value of Communication

- Communication
  - Unambiguously improves stabilization policy
  - Valuable precisely when there is uncertainty about the state
- Limits to communication: average level of indebtedness constrains efficacy of policy
  - When $\delta = 1$, *no communication* conditions restored
  - When $\delta = 0$, Leeper conditions restored

Conclusions

- Nature of expectations formation imposes significant constraints on policy design
  - Greater incentive to coordinate choice of fiscal and monetary policy
- Types of information that economic actors possess matters
  - Observing the state helps
  - Communication helps
- Limits to resolving regime uncertainty
  - Economies with higher debt face greater stabilization challenges

Friedman's Money Growth Rule Revisited

- Non-Ricardian policy regimes relatively robust
  - Policies that are more sensitive to endogenous state more fragile
  - Suggests fine tuning undesirable or at least difficult

- Perhaps:

$$\phi_\tau = \phi_\pi = 0$$