Optimal Monetary Plicy with Uncertain Fundamentals and Dispersed Information

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Outline

Motivation

- Characterizing optimal monetary policy when aggregate fluctuations are driven fundamental and noise shocks
- If central bank (CB) can observe shocks, response is simple
- Even if CB can achieve full information level of output, should it?

Preview of Results

- Heterogeneous agents with private and public info; CB with public
- By responding to past realizations of shocks, CB can affect relative responses to shocks
- CB can replicate full-information output
  - This is non-optimal
  - Cross-sectional and aggregate efficiency
- GE counterpart to Morris & Shin: Under optimal policy, precise public signal is always welfare enhancing
- Closed-form solutions

Outline

Model Overview

- Continuum of households, each with a consumer and producer
  - **Consumers**: Differentiated goods baskets
  - **Producers**: Monopolistic competitors
- Local and aggregate productivity, each with shocks and signals
- **Monetary policy** sets interest rates R_t via a rule
- Households trade in complete state-contingent asset markets
- **Government**: taxes production and provides lump-sum subsidies

Households (Consumers and Producers)

Consumers eat (C_{it}), work (N_{it}), and maximize

$$\mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \left\{ \frac{1}{1-\gamma} C_{it}^{1-\gamma} - \frac{1}{1+\eta} N_{it}^{1+\eta} \right\} \right], C_{it} \equiv \left(\int_{j \in J_{it}} C_{ijt}^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}}$$

They also save and trade in asset markets.

Producers (in logs) maximize profits by hiring, setting prices, and producing according to:

$$y_{it} = a_{it} + n_{it} \qquad a_{it} = a_t + \epsilon_{it}$$

$$\int_0^1 \epsilon_{it} di = 0 \qquad a_t = \rho a_{t-1} + \theta_t$$

Signals: HH observes a_{t-1}, and public and private signals, resp

$$x_{it} \equiv \theta_t + \epsilon_{it} \qquad s_t \equiv \theta_t + e_t$$

Consumer and Producer Matching[1]

Consumer i assigned a sampling shock v_{it} such that

$$\epsilon_{jt} \sim N(v_{it}, \sigma^2_{\epsilon|v}), \forall j \in J_{it}$$

Some properties

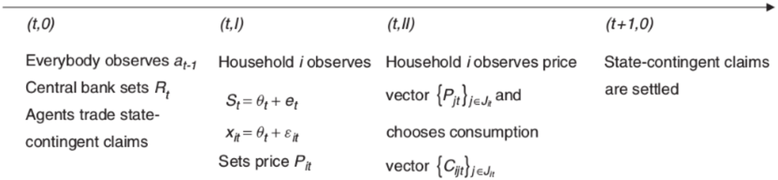
$$v_{it} \sim N(0, \sigma^2_v) \qquad \int_0^1 v_{it} di = 0$$

$$\sigma^2_\epsilon = \sigma^2_v + \sigma^2_{\epsilon|v} \qquad \sigma^2_v \in [0, \sigma^2_\epsilon]$$

Heterogeneity in consumption baskets: $\chi \equiv \frac{\sigma^2_v}{\sigma^2_\epsilon}$

[1] Or, what the #&$% is J_{it}?

Financial Markets and Trading



Define the state $\omega_{it} = (\epsilon_{it}, v_{it}, \theta_t, e_t)$ and state-contingent claim $Z_{it+1}(\omega_{it})$ with price $Q_t(\omega_{it})$. HH balances at the CB, $B_{it} \geq \underline{B}$ satisfy

$$B_{it+1} = R_t \Bigg[B_{it} - \int_{\mathbb{R}^4} Q_t(\tilde{\omega}_{it}) Z_{it+1}(\tilde{\omega}_{it}) d\tilde{\omega}_{it}$$

$$+ (1+\tau) P_{it} Y_{it} - \int_{J_{it}} P_{jt} C_{ijt} dj - T_t \Bigg] + Z_{it+1}(\omega_{it})$$

Identical ex-ante $\iff$ full insurance $\iff$ $B_{it} = 0$ in equilibrium.

Monetary Policy and Government

The CB follows a backward-looking rule $\mathcal{R}$

$$R_t = \mathcal{R}(h_t)$$

with $P_t \equiv \exp\left(\int_0^1 P_{it} di\right)$, $C_t \equiv \exp\left(\int_0^1 C_{it} di\right)$, and

$$h_t = \{C_{t-i}, P_{t-i}, \theta_{t-i}, \epsilon_{t-i}\}_{i=1}^{t}$$

and the government runs a balanced budget

$$T_t = \tau \int_0^1 P_{it} Y_{it} di$$

Outline

Equilibrium

- Households act optimally!
  - Choose assets, consumption, and set prices, given exogenous LOM for h_t, other HHs, monetary policy, financial prices, and information.
- Markets clear!
  - Goods market and asset markets claim for all h_t
- Everything is consistent! ($\mathcal{D}$)

Separable isoelastic utility and normal shocks $\Rightarrow$ linear solution

More Precision

APPENDIX

More-Precise Equilibrium Characterization

A symmetric rational expectations equilibrium under the policy rule $\mathcal{R}$ is given by the following functions, which together must satisfy optimality, market clearing, and consistency.

$$\begin{aligned} Z_{it+1}(\omega_{it}) &= \mathcal{Z}(\omega_{it}, B_{it}, h_t) \\ P_{it} &= \mathcal{P}(B_{it}, h_t, s_t, x_{it}) \\ C_{it} &= \mathcal{C}\left(B_{it}, h_t, s_t, x_{it}, \{P_{jt}\}_{j \in J_{it}}\right) \\ Q_{it}(\omega_{it}) &= \mathcal{Q}(\omega_{it}, h_t) \\ B_{it} &\sim \mathcal{D}(\cdot \mid h_t) \end{aligned}$$

▸ Less Precision