Information-driven business cycles

Ryan Chahrour & Robert Ulbricht

Discussion by G. Chevillon
ESSEC Business School & CREST, Paris

Information Frictions & Uncertainty in Macroeconomics
Barcelona GSE Summer Forum
June 8, 2016

Motivation of the paper

Main idea:

- Propose a methodology for solving and estimating DSGE models with incomplete information.
- relies on solving the aggregate model with full information
- without solving for the disaggregate incomplete information equilibrium

Overview

- Prototypical NK model where agents have incomplete information.
- Introduce informational "wedges" instead of usual expectational errors
  - e.g. partial information for agents i, $\mathcal{J}_{it} \subset \mathcal{I}_t$ (full information): aggegrate expectational error solves

$$\epsilon_t = E\left[\cdot \middle| \int \mathcal{J}_{it} di\right] - E\left[\cdot|\mathcal{I}_t\right]$$

  - (aggregate) wedge solves

$$\tau_t = \int E\left[\cdot|\mathcal{J}_{it}\right] di - E\left[\cdot|\mathcal{I}_t\right]$$

- Paper proposes an estimation methodology to that does not involve solving for incomplete information equilibrium
  - minimal exclusion restrictions for information sets of individual agents
  - mix bootstrapped GMM + simulations + priors on parameters
- Study the impact of wedges on business cycle dynamics

The paper

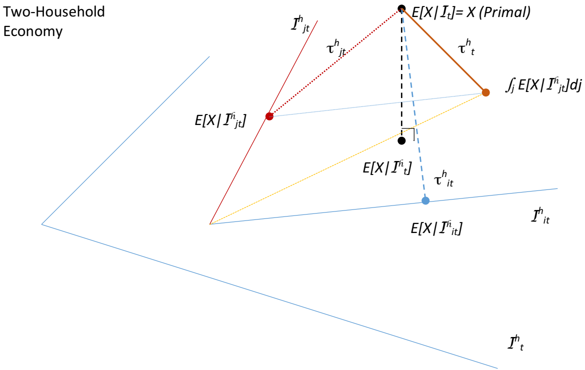
DSGE models where agents have incomplete information

- Agents i of type $a \in \{h, f, b\}$ possess information $\mathcal{I}_{it}^{a}$ with aggregate $\mathcal{I}_{t}^{a} \subset \mathcal{I}_{t}$
- 3-equation aggregate new Keynesian model derived with expectations condtional on each set of agents' information
    - PC involves $E\left[\cdot|\mathcal{I}_{it}^{h}\right]$, IS involves $E\left[\cdot|\mathcal{I}_{jt}^{f}\right]$, Taylor rule $E\left[\cdot|\mathcal{I}_{t}^{b}\right]$.
- Related "Primal" economy under complete information $E_t\left[\cdot\right] \equiv E\left[\cdot|\mathcal{I}_t\right]$
- Informational "wedges" (where complete information $\mathcal{I}_t = \left\{\mathcal{I}_{it}^{h}\right\} \cup \left\{\mathcal{I}_{jt}^{f}\right\} \cup \left\{\mathcal{I}_{t}^{b}\right\}$.)

$$\begin{bmatrix} \tau_t^h \\ \tau_t^f \\ \tau_t^b \end{bmatrix} \equiv \begin{bmatrix} \int_i E\left[\lambda' X_t|\mathcal{I}_{it}^{h}\right] di \\ \int_j E\left[\mu' X_t|\mathcal{I}_{jt}^{f}\right] dj \\ E\left[\nu' X_t|\mathcal{I}_{t}^{b}\right] \end{bmatrix} - \begin{bmatrix} E\left[\lambda' X_t|\mathcal{I}_t\right] \\ E\left[\mu' X_t|\mathcal{I}_t\right] \\ E\left[\nu' X_t|\mathcal{I}_t\right] \end{bmatrix}$$

- Conditional expectations as projections to understand Theorem 1

Informational wedges and Theorem 1



Given the Primal eqm X and the individual wedges τ^h_{jt}, candidate individual information sets must be orthogonal to the wedges.

Questions on the Primal/Wedge decomposition

- What is the rationale in using minimum assumptions on agent's information? (robustness?)

  i.e. What do wedges represent

  - if postulated $\mathcal{I}_t \subsetneq$ **actual** full info (news shocks....), does the misspecification appear in the wedges?
  - if postulated individual information $\subsetneq \mathcal{I}_t^h$: wedges artificially correlate with 'true' info (e.g. historic aggregates) as in your case?
- How are the inclusion restriction imposed? (link with the Wold decomposition?)
- How is the aggregate economy different from complete info + serially correlated errors? (e.g. Milani, Fanelli)

Econometric Methodology

- Propose a generating process for $\left(a_t, \tau_t^h, \tau_t^f, \tau_t^b\right)$ and estimate model parameters ψ as

$$\widehat{\psi} = \text{argmin}_{\psi} \left(\widehat{\Omega} - \Omega\left(\psi\right)\right)' V^{-1} \left(\widehat{\Omega} - \Omega\left(\psi\right)\right)$$

  Ω is simulated vectorized autocovariance matrix (up to k lags) of $\left(y_t, \pi_t, n_t, i_t, a_t\right)'$,
  $\widehat{\Omega}$ empirical estimate, V diagonal with bootstrapped variance estimates of $\widehat{\Omega}$.

Issues to clarify about econometrics & empirics

- Econometrics
  - why V diagonal? artificially imposes identification? (Gospodinov et al, 2016)
  - $a_t \equiv y_t - \alpha n_t$ induces reduced rank in (nondiagonal) V?
  - heteroscedasticity? (Bloom, Jurado et al. 2015...)
  - What if *wedges* are persistent?
    e.g. risk preference and/or habits? or simply aggregation of AR(2), see Granger (1980)
    $\rightarrow$ you may replace orthogonality restriction on τ_t with that on the corresponding innovations
  - Ω obtained by simulation $\rightarrow$ what distribution for the innovations to a_t, τ_t?
- Empirics
  - HP filtered: assumes individual agents have perfect foresight of aggregate? (as opposed to e.g. Lorenzoni (2009), Blanchard et al. 2013).
  - Measure of fit + estimation uncertainty?
  - past aggregates are not part of agents' information set?
  - impact of weak identification:
    $\rightarrow$ clarify the link between between rank of V, # of orthogonality conditions, weak role of wedges in some IRFs, and the bivariate VMA structure for expectational shocks u_t

Conclusion

A PROMISING FIRST DRAFT!