Endogenous Persistence in an Estimated DSGE Model under Imperfect Information
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PSE and CEPREMAP

March 2010, Monfispol meeting
The paper in short

- Consider a general NK framework
- Compares the standard asymmetric informational approach with a symmetric one:
  - private agents knowing more than the econometricians estimating a model.
  - what about the "informational consistency principle"? → Same imperfect info for both econometricians and agents.
- Discuss the role of expectations.
- Empirically investigate the relevance of the above assumptions.
  - with Bayesian maximum likelihood
  - first providing the software; then incorporating into the Dynare framework.
In line with the (Miller, 2009) agenda on future GE macroeconomics:
- analyzing the impact of information asymmetries
- rational expectations and the implications for aggregate decisions

Confronting some of DSGE modelling "Achille’s heels"

Introduces a rule on expectations so as to match with data

Provides tools for estimating DSGE models with Bayesian Maximum-likelihood under very general informational assumptions.
Traditionally strong separation between rational vs adaptive vs static expectations.

RE: agents decisions are best responses to the optimal responses by others.

Optimal behaviour at the roots of forecasts.

Generally, with RE in agents’ behaviour, $E_{t-1}x_t = x_t$

based on a great deal of knowledge!

(RE behaviours can also be influenced by sticky diffusion of info $x_t = E_{t-j}x_t^*$, see Mankiw and Reis, 2001)
Limitations on knowledge

Explicit forecast (exogenous) rule: OLS.

Rule for estimating unknown parameters and updating the estimates as data are accumulated (e.g., recursive OLS)

The current state depend on expectations

Equilibrium is based on the concept of e-stability and can converge to the RE equilibrium.

Not trivial: there may be a wedge between determinacy and learnability conditions (Bullard, Eusepi 2009).
Rational inattention

- Agents have limited information processing capacity.
- They have problems in extracting signals (human information; costly investigation; wiring capacity.. Sims, 2002).
- In practice, there is a constraint on the flow of information. With finite capacity, an optimal social planner could (optimally) choose a signal that reduce the uncertainty of the state (Luo and Young, 2009).
- Agents are rational but constrained → They behave as if observing a noisy measurement
- (Kalman) filter to describe the evolution of the information set (with optimal weight, Luo and Young, 2009)
Agents have much less info than the above
Base their forecasts on heuristics
Have a bias on the forecast. The bias evolves with a "learning" procedure
Expectations are eventually aggregated
Rational expectations with imperfect symmetric vs asymmetric info (Levine, Pearlman and Perendia, 2007)

The standard II RE model assumes agents to know more than econometricians → informational consistency problem.

The II RE model is thus solved both with symmetry and asymmetry assumptions on info (measurement errors on 2 vs all 3 observables)

It is possible to solve the model extending the Pearlman et al (1986) framework (with Kalman filtering)

Determinacy conditions don’t depend on the information set (≠ learning)
Expectations in this paper: behavioural model

- A share of agents form rational expectations and the remaining ones form adaptive expectations.
- Adaptive expectations depend on past observations and past expectations.
- Adaptive expectations are "dominated" by rational expectations.
- (Eventually, the system can be rewritten and solved with RE.)
Adaptive behaviours

- As in de Grauwe 2009, there are some behavioural assumption.

- $E^a_t \bar{q}_t^r = \bar{q}_t^r$ (as in RE) BUT

- Adaptive agents do not think that they are able to have better expectations than rational agents $\rightarrow E^a_t \bar{q}_t^{r+1} = E^a_t [E^r_t \bar{q}_t^{r+1}]$

- Rational agents are aware that they can form superior estimates to adaptive agents of $\bar{q}_t^{a+1}$.

- They also know: $E^r_t [E^a_t \bar{q}_t^{a+1}] = E^a_t \bar{q}_t^{a+1}$
Adaptive behaviours

- This creates "asymmetry" between rational and adaptive agents. But adaptive agents are eventually very rational.
- So, why don’t they eventually form rational expectations?
- May they be just rationally inattentive/uncapable to process info?
- Indeed, it is possible to encompass Luo and Young (2009) rational inattention model.
- Developing the linkage may build a bridge between rational and adaptive expectations literature
- Moreover, adaptive behaviours appear empirically significant (especially when combined with habit formation)
- Finally, the presence of informational symmetry helps improve the model to fit the data.