DYNARE WORKSHOP *LEARNING AND MONETARY POLICY*

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DYNARE

1. computes the steady state of the model
2. computes the solution of deterministic models (arbitrary accuracy)
3. computes first and second order approximation to solution of stochastic models
4. estimates (maximum likelihood or Bayesian approach) parameters of DSGE models
5. computes optimal policy in linear-quadratic models (non documented yet)

The general problem

$$E_t \{f(y_{t+1}, y_t, y_{t-1}, u_t; \theta)\} = 0$$

y : vector of endogenous variables

u : vector of exogenous shocks

Solution of deterministic models

- based on work of Laffargue, Boucekkine and myself
- approximation: impose return to equilibrium in finite time instead of asymptotically
- computes the trajectory of the variables numerically
- uses a Newton–type method
- usefull to study full implications of non–linearities

Stochastic models: First order approximation

In a a stochastic framework, the unknowns are the decision functions.
For a large class of DSGE models, DYNARE computes approximated decision rules and transition equations of the form

$$y_t = \bar{y} + A\hat{y}_{t-1} + Bu_t$$

with $\hat{y}_t = y_t - \bar{y}$.
Method proposed by Klein (2000) and Sims (2002).
DYNARE computes also theoretical moments and IRFs.

Second order approximation

Two features:

- decision rules and transition functions are 2nd order polynomials
- departure from certainty equivalence: the variance of future shocks matters

Decision rules and transition equations of the form

$$y_t = \bar{y} + A\hat{y}_{t-1} + Bu_t + 0.5\left(\hat{y}'_{t-1}C\hat{y}_{t-1} + u'_t D u_t\right) + \hat{y}'_{t-1}Fu_t + \Delta\left(\Sigma_u\right)$$

Method suggested by K. Judd, developped by C. Sims (2002), S. Schmitt-Grohe and M. Uribe (2003), F. Collard and M. Juillard (2000).

Estimation

DYNARE estimates the structural parameters of a model based on a linear approximation.
Estimation steps

1. steady state
2. linearization
3. solution of the linear rational expectation model
4. computation of the likelihood via the Kalman filter
5. finding the maximum of the likelihood or posterior mode
6. simulate posterior distribution with Metropolis algorithm
7. computes various statistics on the basis of the posterior distribution