

Discussion of ‘Monetary Policy
Analysis with Potentially
Misspecified Models’
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- Main idea
 - DSGE-VAR can parameterize degree of model misspecification
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- Construct policy that takes misspecification into account
- Relevant for policy in practice

Context:

Monetary policy under uncertainty

- Policy problem under uncertainty:
 - Minimize expected loss function
s.t. structural equations
 - Structural equations involve uncertain elements

Example:

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t + u_t$$

Context: Monetary policy under uncertainty (continued)

- Which uncertainty?
 - Data uncertainty (SW, Orphanides, Aoki, Rudebusch, etc)
 - Parameter uncertainty (Wieland, Sack, etc)
 - Model uncertainty (Levin-Wieland-Williams)
 - Model misspecification (Sargent, HS)
Example: $\pi_t = \beta E_t \pi_{t+1} + \kappa x_t + u_t$
- This paper:
 - Model misspecification + parameter uncertainty

Context: Monetary policy under uncertainty (continued)

- CB behavior
 - Bayesian (SW, Aoki, Wieland)
 - Adaptive behavior (Sargent)
 - Robust decision (HS, Onatski-Stock)
- This paper
 - Bayesian

Model

DSGE-VAR

- DSGE as a prior data generating process
 - Benchmark model: CEE, Smets-Wouters
 - DEGE model with
 - Sticky prices and wages
 - Capital utilization
 - Indexation
 - Habit persistence

- VAR representation of the DSGE

$$y'_t = x'_t \Phi^*(\theta) + u'_t, \quad E[u_t u'_t] = \Sigma^*(\theta)$$

- Use this as prior

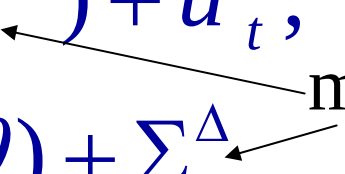
Modeling Misspecification

- Reduced-form misspecification:

Suppose true data generating process is

$$y'_t = x'_t \Phi(\theta, \Psi^\Delta) + u'_t,$$
$$E[u_t u'_t] = \Sigma^*(\theta) + \Sigma^\Delta$$

misspecification



Set prior for Ψ^Δ and Σ^Δ

- Using economic data, compute posterior of
 - Structural parameters
 - misspecification

Monetary Policy under Misspecification

- 4 possibilities depending on the treatment of misspecification
 1. Ignore misspecification. Parameter uncertainty only
 2. Prior misspecification
 3. Posterior misspecification (policy-invariant)
 4. Posterior misspecification (new drawing after new policy regime)

Policy experiments

- Commitment to a simple interest rate rule

$$i_t = \rho_R i_{t-1} + \psi_1 \pi_t + \psi_2 \Delta y_t$$

- Focus on response coefficient to inflation
- Find Ψ_1 that minimizes an ad-hoc loss function

$$L(\theta_p, \theta_s, \Psi^\Delta, \Sigma^\Delta)$$

(quadratic function of inflation, output growth, interest rate)

Results

- Under the benchmark DSGE, a larger ψ_1 is welfare-improving
- This is not necessarily the case when model misspecification is taken into account
- Misspecification matters for policy evaluation

Model misspecification and policy problem

- Typical policy problem under uncertainty:
 - Minimize expected loss function
s.t. structural equations
 - Structural equations involve uncertain elements
- In this paper, misspecification introduced in reduced-form representation of DSGE

What can misspecification in reduced form tell us?

- Mapping from misspecification in reduced-form model $(\Psi^\Delta, \Sigma^\Delta)$ to misspecification in structural model?
- Optimal policy under misspecification in structural model may be different (especially if the model is forward-looking)
- Do $\Psi^\Delta, \Sigma^\Delta$ have useful information to improve structural model?

What can misspecification in reduced form tell us? (continued)

- Example:
 - Suppose true data generated by sticky price&wage model
 - Suppose CB's model has only sticky price model (Model is misspecified)
 - We can compute $\Psi^{\Delta}, \Sigma^{\Delta}$ using reduced-form VAR
 - Can we know from $\Psi^{\Delta}, \Sigma^{\Delta}$ that CB's model is missing wage stickiness?

Modeling misspecification/uncertainty in structural form

- Micro-founded loss function depends on economic structure and parameter values (Rotemberg and Woodford)
- Example:

$$\sum_{t=0}^{\infty} \beta^t U_t \approx \sum_{t=0}^{\infty} \beta^t \left(\pi_t^2 + \frac{\kappa}{\theta} x_t^2 \right)$$

Modeling misspecification/uncertainty in structural form (continued)

- Misspecification/uncertainty in structural model implies misspecification/uncertainty in micro-founded loss function
(Levin, Kimura-Kurozumi)
- Cross restriction between structural model and loss function