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Output Gaps: Theory versus Practice
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• Issue
  – Cost-push shock (C) or potential-output shock (P)?
  – Optimization under discretion
  – CB assumes either C or P
  – Min max unconditional loss

• Result: Assume P
  – Better the more persistent the shock
  – If both transitory and persistent shocks: Assume persistent shock is P
  – Use low-frequency filter to estimate potential output

• Alternative models
  – Simple New Keynesian
  – Estimated simple Euro area model
  – Estimated DSGE Euro area model

• Intuition?
  – Optimization under discretion: Distortions
    * Average inflation bias (if average output target ≠ average potential output): Not relevant here
    * Conditional inflation bias (persistent deviations from target, if persistent shocks) (Svensson AER 97)
    * Stabilization bias (suboptimal response to unanticipated shocks)
    * Lack of history-dependence (Woodford)
  – Assuming P eliminates/reduces conditional inflation bias
    (w/o output gap deviating from optimal too much?)

Comment
• One can do better: Implement optimal policy under commitment, even w/o commitment to optimal instrument rule (Svensson JEL)
  – Implement optimal targeting rule (Svensson, Svensson-Woodford, Giovanni-Woodford)
  – Certainty equivalence (Svensson-Woodford)
  – Separation principle: Optimization and estimation separate (Svensson-Woodford)
• Example: Simple New Keynesian model: $\bar{y}_t$ unobservable

\[ \pi_t = \beta \pi_{t+1|t} + \kappa (y_t - \bar{y}_t) + (u_t + \kappa \bar{y}_t) \]

\[ L_{t|t} = E_t [\pi_t^2 + \lambda (y_t - \bar{y}_t)^2] \]

• Optimal targeting rule

\[ \pi_t + \frac{\lambda}{\kappa} [(y_t - \bar{y}_{t|t}) - (y_{t-1} - \bar{y}_{t-1|t-1})] = 0 \]

$\bar{y}_{t|t} \equiv E_t \bar{y}_t$, best estimate (Kalman filter)

Robust to additive shocks/add factors/judgment (Svensson JEL)

Implements optimal policy under commitment

• Implement in alternative ways: Commitment to alternative loss functions, optimization under discretion

- Targeting rule equivalent to quadratic loss function

\[ \hat{L}_t = \{ \pi_t + \frac{\lambda}{\kappa} [(y_t - \bar{y}_{t|t}) - (y_{t-1} - \bar{y}_{t-1|t-1})] \}^2 \]

Optimization under discretion results in optimal targeting rule

- Commitment to “continuity and predictability” (Svensson-Woodford)

\[ E_t \sum_{\tau=0}^{\infty} \beta^\tau \left[ \pi_t^2 + \lambda (y_t - \bar{y}_t)^2 \right] + \Xi_{t,t-1}(\pi_t - \pi_{t|t-1}) \]

$\Xi_{t,t-1}$ is Lagrange multiplier of Phillips curve from decision in period $t - 1$

Optimization under discretion results in optimal targeting rule

• Example: Simple Euro-area model

- Optimal targeting rule still simple (especially if $\lambda_r = 0$)
- Numerical implementation always possible

• Example: Estimated DSGE Euro area model

- Numerical implementation possible
- Staff shows graphs to decision makers