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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

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

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

- Optimal targeting rule

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

  $\bar{y}_{t|t} \equiv \mathrm{E}_t\bar{y}_t$, 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

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

    Optimization under discretion results in optimal targeting rule
  - Commitment to "continuity and predictability" (Svensson-Woodford)

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

    $\Xi_{t,t-1}$ 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