Monetary Policy: Rules versus discretion..

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March 17, 2008

1 Introduction

- Current view of monetary policy: NNS consensus.

- Basic ideas:

  - Determinacy: monetary policy should be designed so as to provide a determinate solution. Eliminate *extrinisic* uncertainty. No sunspots etc. (no of unstable roots equals the number of forward looking variables).

  - Commitment: discretion vs commitment. How to commit.

  - Taylor rules.

2 Basic model.

- Define $x_t = y_t - y_t^f$. The output gap relative to the flex price output. We have two basic equations

$$\begin{aligned} x_t &= E_t x_{t+1} - \phi\left(i_t - E_t \pi_{t+1}\right) + g_t \\ \pi_t &= \beta E_t \pi_{t+1} + \lambda x_t + e_t \end{aligned}$$

  - $g_t =$ preference/demand shock (U_c is stochastic): $g_t = \mu g_{t-1} + \hat{g}_t$
  - $u_t =$ inflation or cost shock (productivity shock...).$u_t = \rho u_{t-1} + \hat{u}_t$

- Objective function for government (see Walsh Chapter 11, appendix).

$$E_t \sum_{i=1}^{\infty} \beta^i V \approx -\frac{1}{2} E_t \sum_{i=1}^{\infty} \beta^i \left[\pi_{t+i}^2 + \alpha\left(x_{t+i} - x^*\right)^2\right]$$

Woodford: this is a quadratic approximation. Inflation is bad because it increases price dispersion (sticky prices).

- $x^* > 0$. The initial flex-price equilibrium is too low (imperfect competition). Some argue that should set it at 0 by tax policy (Dixit and Lambertini).

- Monetary policy: CB sets interest rate, money supply accommodates to hit rate.

3 Optimal Policy without commitment.

- "Discretion". The CB chooses i_t each period to maximize utility from t onwards. Treats expectations as given. Effectively, chooses (π_t, x_t) to satisfy $NKPC$ and given that i_t to satisfy Euler and choice of (π_t, x_t).

- Period by period, solve

$$\max \ -\frac{1}{2}\left[\alpha x_t^2 + \pi_t^2\right] + \text{Future}$$

Subject to

$$\pi_t = \lambda x_t + \left[\overset{\text{future}}{E_t \pi_{t+1}}\right] + u_t$$

Solution

$$x_t = -\frac{\lambda}{\alpha}\pi_t$$

Lean into the wind: if inflation higher, output lower.

- Substitute constraint into objective function:

$$\frac{1}{2}\left[\frac{\alpha}{\lambda^2}\left(\pi_t - E_t\pi_{t+1} - u_t\right)_t^2 + \pi_t^2\right]$$

FOC:

$$\begin{aligned} \frac{\alpha}{\lambda^2}\left(\pi_t - E_t\pi_{t+1}\right) + \pi_t &= 0 \\ \frac{\alpha}{\lambda}x_t + \pi_t &= 0 \\ x_t &= -\frac{\lambda}{\alpha}\pi_t \end{aligned}$$

- If private sector has RE : put optimal solution into $NKPC$ and solve for

RE using undetermined coefficients:

$$
\begin{aligned}
x_t &= -\lambda q u_t \\
\pi_t &= \alpha q u_t \\
E_t \pi_{t+1} &= \rho \alpha q u_t
\end{aligned}
$$

where

$$
q = \left[\lambda^2 + \alpha(1 - \beta\rho)\right]^{-1}
$$

Put into Euler (IS) equation

$$
\begin{aligned}
i_t^* &= \gamma_\pi E_t \pi_{t+1} + \phi^{-1} g_t \\
\gamma_\pi &= 1 + \frac{(1-\rho)\lambda}{\rho\phi\alpha}
\end{aligned}
$$

- Note: cost push makes the model interesting: if $u_t = 0$ for all t, $x_t = \pi_t = 0$, and interest rate exactly offsets any demand shock g_t.

– If $\sigma_u > 0$, then there is a trade-off between the variance of output and the variance of inflation.

– if $\sigma_u > 0$, optimal discretionary policy involves gradual convergence to target inflation.

$$\underset{i \to \infty}{Lim} E_t \pi_{t+i} = E_t \pi_{t+1} \underset{i \to \infty}{Lim} \rho^i = 0$$

– can hit target $\pi_t = 0$, but not optimal unless $\alpha = 0$.

– Taylor Principle: $\gamma_\pi > 1$. If expected inflation rises, nominal interest rate rises by more (real interest rate rises).

– Interest rate offsets demand shocks $\left(\phi^{-1} g_t\right)$: g causes x and π to move in the same direction, so no conflict. If $g > 0$, rising interest rates reduces both x and π. "Demand management": in this model, perfect demand management is possible using interest rates.

– u_t : a rise in u_t causes a rise in π, but a fall in x: there is a trade-off - to cut inflation you need to move the output gap further away from target.

– In this model, so long as $\gamma_\pi > 1$, there is a dete3rminate solution. Automatically avoids "extrinsic uncertainty" problem.

4 Commitment.

Two ways it can work: reducing or eliminating the inflationary bias; improving the trade-off between the variances of output and inflation (shifting the efficient frontier).

4.1 Inflationary bias.

- Choose policy ex ante. Must do better: can always choose the discretionary policy, but have lots of others to choose from! Inflationary bias. Suppose that the target output gap is $x^* > 0$: optimal rule becomes

$$x_t = x^* - \frac{\lambda}{\alpha}\pi_t$$

  The rational expectations solution is

$$\begin{aligned} x_t &= -\lambda q u_t \\ \pi_t &= \alpha q u_t + \frac{\alpha}{\lambda} x^* \end{aligned}$$

- By trying to hit higher target, you fail but end up with more inflation. This is because agents have RE and they anticipate inflation. The only output consistent with RE is $x = 0$.

- Delegate to as conservative central banker: $\alpha^B < \alpha$, reduces inflationary bias.

- If there is only one output level consistent with fully anticipated inflation (the natural rate) then trying to target a higher output does not work and under RE will lead to inflationary bias. Delegation can overcome this.

4.2 Efficiency gain from commitment.

- Even with no inflationary bias, can get a better policy through commitment. The monetary policy ties down expectations, and so can improve the output/inflation short-run trade-off

$$\pi_t = \lambda x_t + \left[\overset{\text{future}}{E_t \pi_{t+1}} \right] + u_t$$

- the Bank can choose ω where

$$x_t^c = -\omega u_t$$

Discretionary $\omega^d = \lambda q$. Can choose this, or do even better.....

- Under commitment, start from $NKPC$

$$\pi_t^c = \lambda x_t^c + \beta E_t \pi_{t+1}^c + u_t$$

solving forward to eliminate $E_t \pi_{t+1}^c$

$$\pi_t^c = E_t \sum_{i=0}^{\infty} \beta^i \left[\lambda x_{t+i}^c + u_{t+i} \right]$$

since $x_t^c = -\omega u_t$

$$\begin{aligned} \pi_t^c &= E_t \sum_{i=0}^{\infty} \beta^i \left[u_{t+i} \left(1 - \lambda\omega\right)\right] \\ &= \left(1 - \lambda\omega\right) \sum_{i=0}^{\infty} \beta^i \rho^i u_t \\ &= \frac{1 - \lambda\omega}{1 - \beta\rho} u_t \end{aligned}$$

Hence higher ω means expectations come down

$$E_t \pi_{t+i}^c = \frac{1 - \lambda\omega}{1 - \beta\rho} \rho^i u_t$$

- Hence

$$-\frac{1}{2}\left[-\alpha\left(\omega u_t\right)^2+\left(\frac{1-\lambda\omega}{1-\beta\rho}u_t\right)^2\right]$$

FOC with respect to ω

$$\alpha\omega u_t^2-\frac{-\lambda}{(1-\beta\rho)}\left(\frac{1-\lambda\omega}{1-\beta\rho}u_t^2\right)=0$$

re-arranging and using $x_t^c=-\omega u_t$ and $\pi_t^c=\frac{1-\lambda\omega}{1-\beta\rho}u_t$

$$\begin{aligned}\alpha x_t^c &= \frac{-\lambda}{(1-\beta\rho)}\pi_t^c \\ x_t^c &= \frac{-\lambda}{\alpha(1-\beta\rho)}\pi_t^c\end{aligned}$$

  – Hence with commitment, the optimal policy is to be more aggressive against inflation than with discretion. This drives down inflationary expectations.

– can manage expectations: makes the (short-run) inflation-output trade off better, so can improve welfare. Moves in "efficiency frontier" in (σ_π, σ_x) space.

– the commitment solution mimics the discretionary case with a lower $a^c \equiv \alpha (1 - \beta\rho)$.

– optimal Taylor rule

$$\begin{aligned} i_t^c &= \gamma_\pi^c E_t \pi_{t+1} + \frac{1}{\phi} g_t \\ \gamma_\pi^c &= 1 + \frac{(1-\rho)\lambda}{\rho\phi(\alpha(1-\beta\rho))} \end{aligned}$$

The coefficient γ_π^c is bigger than in the discretionary case.

- What if you have "unconstrained commitment", i.e. can have any function: gets into a mess!

5 Interest Rate or money supply?

- With certainty, no difference. Choosing price or quantity simply picks out a point on the demand curve.

- With uncertainty

  - Choose price i then quantity m fluctuates.

– Choose money supply m, then i fluctuates.

- Poole (1970). Choosing interest rates probably best: i varies causes y to vary through Euler/IS equation.

- US, Volcker 1979-1982: monetarist experiment, abandoned because it caused very large fluctuations in i.

6 Taylor Rules.

- Taylor (1993). Proposed simple rule of the following form

$$i_t^T = \bar{r} + \bar{\pi} + \gamma_\pi (\pi_t - \bar{\pi}) + \gamma_x x_t$$

where $\gamma_\pi > 1$, $\gamma_x > 0$; $\bar{r}$ =long-run real interest rate; $\bar{\pi}$ = target inflation rate.

- Can estimate it: US data use

$$i_t = \rho i_{t-1} + (1-\rho)\, i_t^T$$

to capture serial correlation....

  - Pre-Volcker (pre-1979) $\gamma_\pi = 0.83$; $\gamma_x = 0.27$; $\rho = 0.68$.

  - Volcker-Greenspan: $\gamma_\pi = 2.15$; $\gamma_x \simeq 0$; $\rho = 0.79$.

- Note: this is not a structural equation: all variables are endogenous. To estimate the underlying monetary policy rule, would need to estimate structurally identified model.

1696 *Journal of Economic Literature, Vol. XXXVII (December 1999)*

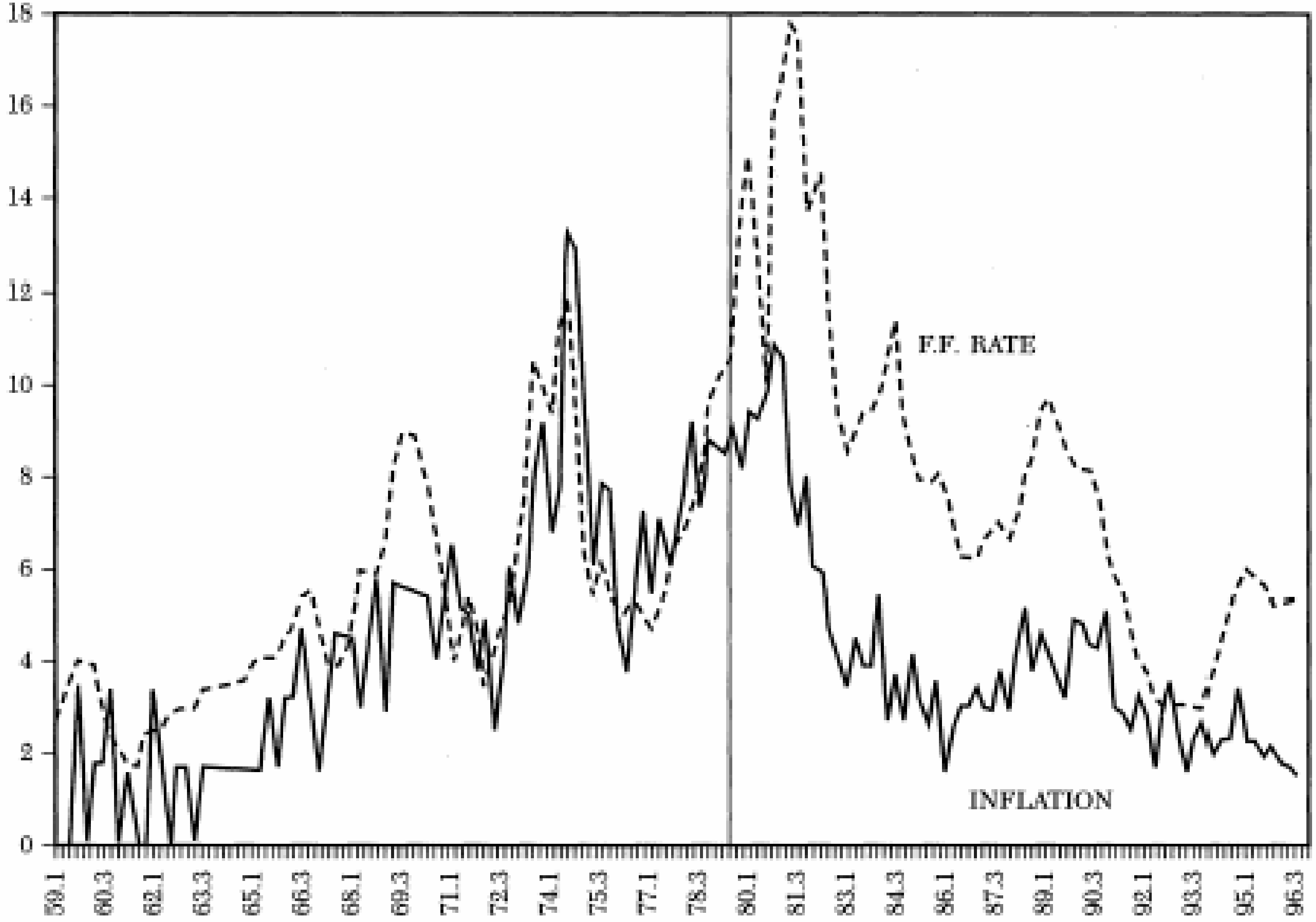

Figure 4. The Federal Funds Rate and the Inflation Rate

1698 *Journal of Economic Literature, Vol. XXXVII (December 1999)*

Figure 5. Target Based On Estimated Post-October '79 Rule vs. Actual Funds Rate

- Other rules: nominal national income, the price-level, specific price index, asset prices (stock market, housing).

7 General comments.

- Private sector behaviour is influenced by monetary policy: Monetary policy is affected by private sector behaviour.

- Lucas critique: changes in monetary policy may induce changes in private sector behaviour.

- Example: higher inflation implies less nominal rigidity. Less nominal rigidity implies a bigger effect of x_t on inflation. So, the short-run trade-off between inflation and output worsens.

- Empirical features of the economy will vary with different policy regimes: e.g.compare the 1970s with post 1980 (the great moderation since 1990). Output has become very stable in big economies in 90s, despite some big shocks (dot com bubble, oil prices, war etc.). Due to inflation targeting and central bank independence?

- many empirical and theoretical issues to pursue.