Optimal policy in the New Keynesian model

Instrument rules:

Specify a rule for the interest rate setting

- Simple instrument rules
- Optimal instrument rules

Common to use simple instrument rules

Example: The Taylor rule

(1.1) $$i_t = r_t^* + \pi^* + 1.5(\pi_t - \pi^*) + 0.5y_t$$

Why does the coefficient on inflation have to be greater than one?

The Taylor principle

Generalised Taylor rule:

(1.2)
$$i_t = \rho i_{t-1} + (1-\rho)(r_t^* + \pi^* + a(E_t\pi_{t+m} - \pi^*) + bE_t y_{t+n})$$

Advantages of simple instrument rules:

- Intuitive
- Easy to implement in models
- Reasonable description of actual monetary policy
- Robust (?)

Disadvantages:

- Too simple
  - central banks take more information into account
- Not optimal
  - Why don't CBs optimise if private agents do?

Targeting rules (targeting regimes)

Interest rate set to minimise a loss function

Standard loss function:

(1.3) $$E_t \sum_{k=0}^{\infty} \beta^k (\pi_{t+k}^2 + \lambda y_{t+k}^2)$$

Advantages:

- Optimal (the interest rate is set to minimise the loss)
- Realistic to assume the central banks optimise
- Take all relevant information into account

Disadvantages:

- More complicated (to solve)
- Less robust (optimal interest rate model dependent)
- Tend to give aggressive monetary policy (unless "smoothing" enters the loss function)
- Difficult to specify the relevant loss function

Model:

(1.4) $$y_t = E_t y_{t+1} - \frac{1}{\sigma}(i_t - E_t \pi_{t+1}) + u_t$$

(1.5) $$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + e_t$$

Discretionary policy

- The CB re-optimises each period.
- Takes private sector expectations as given.

⇨ In our model: Can treat each period separately.

Thus:

$$\min_{i_t} [\pi_t^2 + \lambda y_t^2]$$

Subject to (1.4) and (1.5).

First-order condition:

$$\kappa \pi_t + \lambda y_t = 0$$

=>

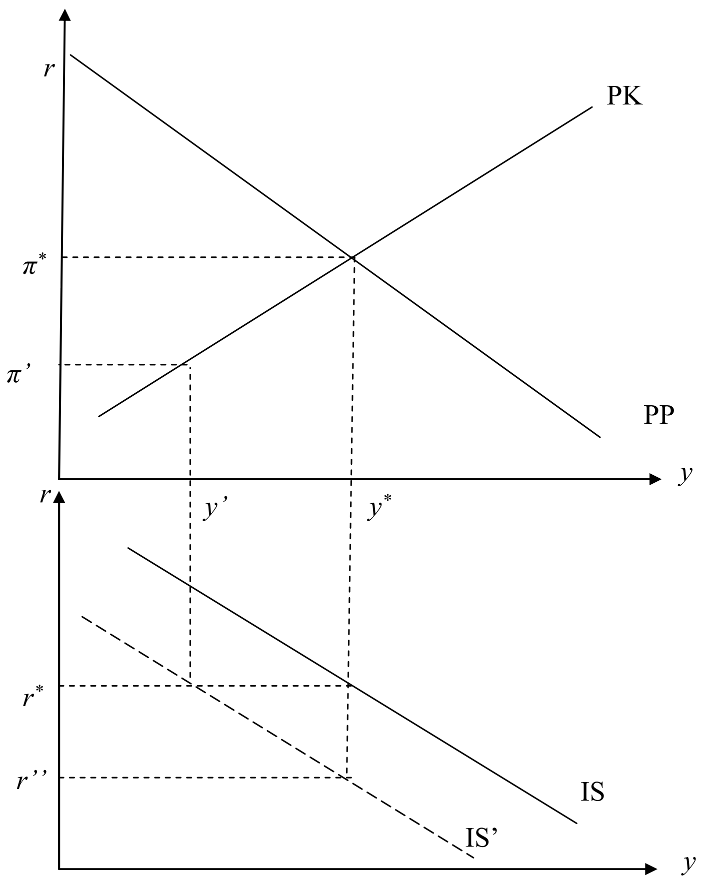
$$\pi_t = \frac{\lambda}{\lambda + \kappa^2} e_t$$

$$y_t = -\frac{\kappa}{\lambda + \kappa^2} e_t$$

Q: Why are output and inflation not affected by demand shocks (u_t)?

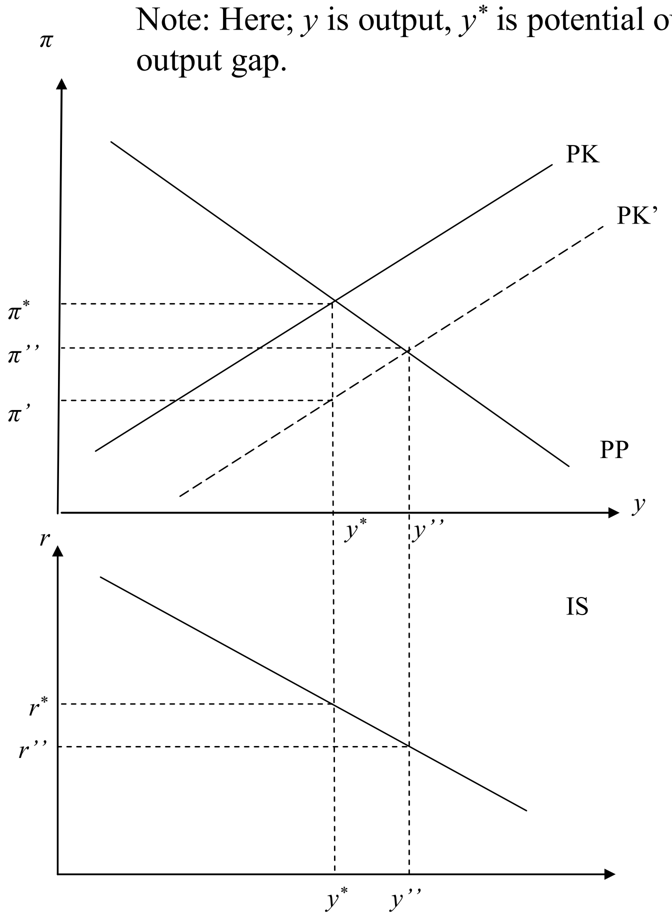
Negative demand shock

Note: Here; y is output, y^* is potential output (both in logs), so that $y - y^*$ is the output gap.



Negative cost-push shock

Note: Here; y is output, y^* is potential output (both in logs), so that y
output gap.



Commitment

Set up the following Lagrangian:

$$E_t \sum_{k=0}^{\infty} \beta^k [(\pi_{t+k}^2 + \lambda y_{t+k}^2) + \varphi_{t+k}(\pi_{t+k} - \beta\pi_{t+k+1} - \kappa y_{t+k} - e_{t+k})]$$

First-order conditions:

$$\pi_t + \varphi_t = 0$$

$$E_t(\pi_{t+k} + \varphi_{t+k} - \varphi_{t+k-1}) = 0 \quad for\, k \geq 1$$

$$E_t(\lambda y_{t+k} - \kappa\varphi_{t+k}) = 0 \quad for\, k \geq 0$$

=>

$$Period\, t: \ \pi_t = -\frac{\lambda}{\kappa} y_t$$

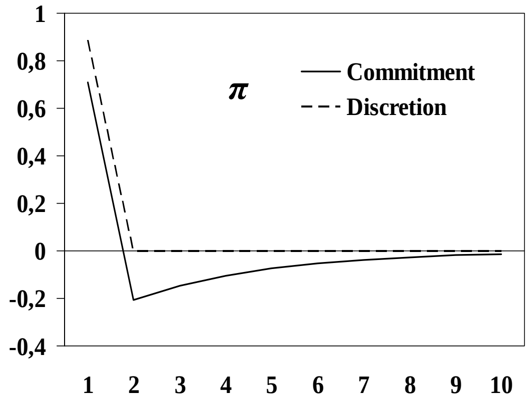
$$Period\, t+k: \pi_{t+k} = -\frac{\lambda}{\kappa}(y_{t+k} - y_{t+k-1}) \ \ for\, k \geq 1$$

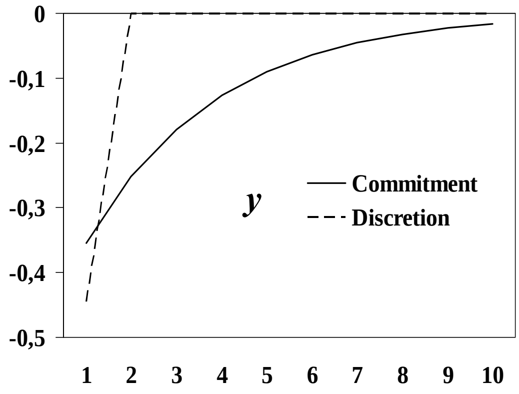
Implies a stationary price level!

“Time-less perspective” (Woodford)

Act as if you made the commitment long time ago, that is, treat all periods equal.

Gain from commitment. Standard NK model





How to improve the discretionary solution

Woodford (1999): Interest rate smoothing:

$$L = (\pi - \pi^*)^2 + \lambda y^2 + \gamma(\Delta i)^2$$

Jensen (2002): Nominal income targeting:

$$L = (\pi - \pi^*)^2 + \lambda y^2 + \gamma(\pi + \Delta y)^2$$

Walsh (2003): Speed limit policies:

$$L = (\pi - \pi^*)^2 + \lambda (\Delta y)^2$$

Vestin (2005): Price-level targeting:

$$L = p^2 + \lambda y^2$$