

# Monetary Policy Tradeoffs: Discretion vs. Commitment

*by*

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## Policy Tradeoffs and the New Keynesian Phillips Curve

$$\pi_t = \beta E_t\{\pi_{t+1}\} + \kappa(y_t - y_t^n)$$

*Criticism:* optimality of strict inflation targeting, no policy tradeoffs,

*Implicit assumption:*  $y_t^e - y_t^n = 0$

*Identical optimal policy asymptotically if  $y_t^e - y_t^n = \text{const.}$*

*Alternative:* time-varying  $y_t^e - y_t^n$  gap

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

where  $x_t \equiv y_t - y_t^e$  and  $u_t \equiv \kappa(y_t^e - y_t^n)$

## The Monetary Policy Problem

$$\min E_0 \sum_{t=0}^{\infty} \beta^t (\pi_t^2 + \vartheta x_t^2)$$

subject to

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

for  $t = 0, 1, 2, \dots$  where  $\{u_t\}$  evolves exogenously according to

$$u_t = \rho_u u_{t-1} + \varepsilon_t$$

In addition:

$$x_t = -\frac{1}{\sigma} (i_t - E_t \{ \pi_{t+1} \} - r_t^e) + E_t \{ x_{t+1} \} \quad (1)$$

*Note:* utility based criterion requires  $\vartheta = \frac{\kappa}{\epsilon}$

## Optimal Discretionary Policy

Each period the monetary authority chooses  $(x_t, \pi_t)$  to minimize

$$\pi_t^2 + \vartheta x_t^2$$

subject to

$$\pi_t = \kappa x_t + v_t$$

with  $v_t \equiv \beta E_t\{\pi_{t+1}\} + u_t$  taken as given.

*Optimality condition:*

$$x_t = -\frac{\kappa}{\vartheta}\pi_t$$

*Equilibrium*

$$\pi_t = \frac{\vartheta}{\kappa^2 + \vartheta(1 - \beta\rho_u)} u_t$$

$$x_t = -\frac{\kappa}{\kappa^2 + \vartheta(1 - \beta\rho_u)} u_t$$

$$i_t = r_t^e + \frac{\vartheta\rho_u + \sigma\kappa(1 - \rho_u)}{\kappa^2 + \vartheta(1 - \beta\rho_u)} u_t$$

Figure 5.1  
Discretion vs. Commitment: Responses to a Transitory Cost-Push Shock

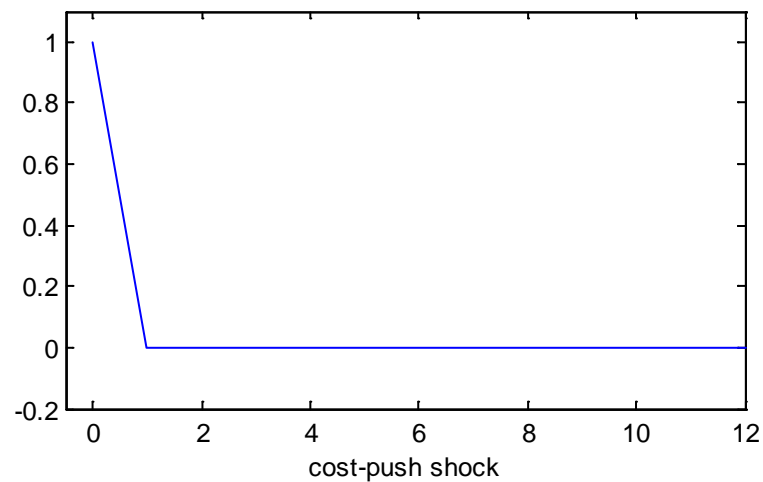
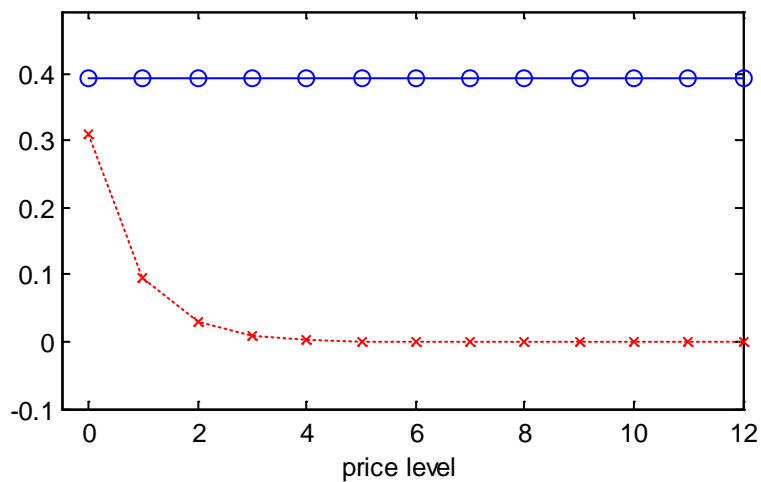
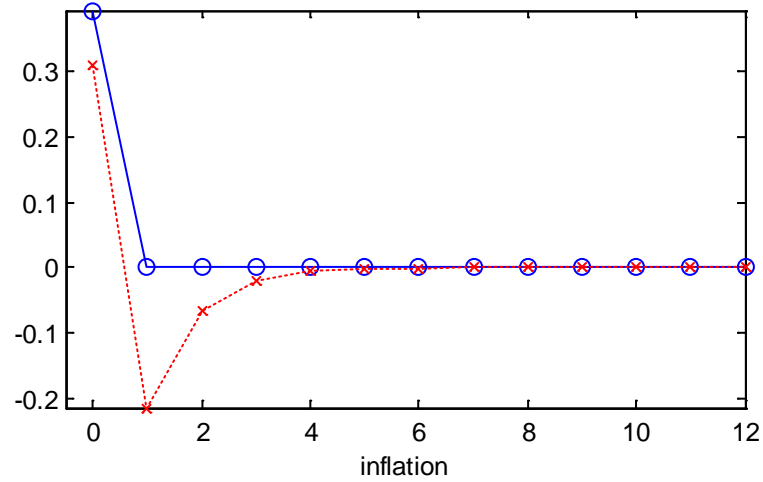
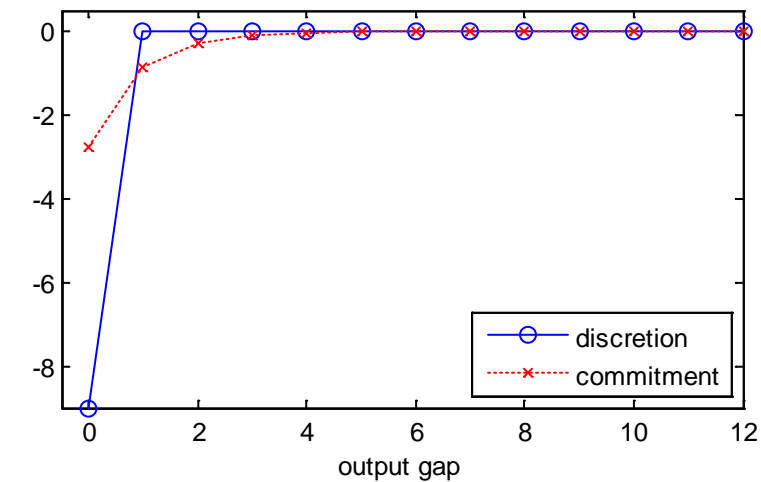
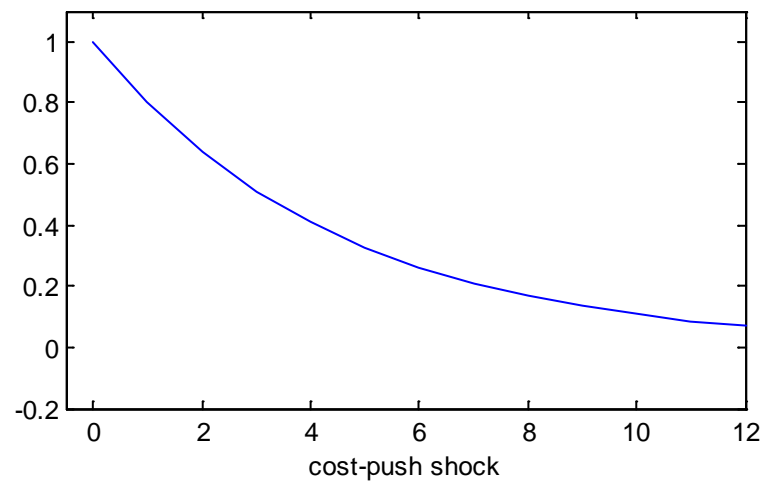
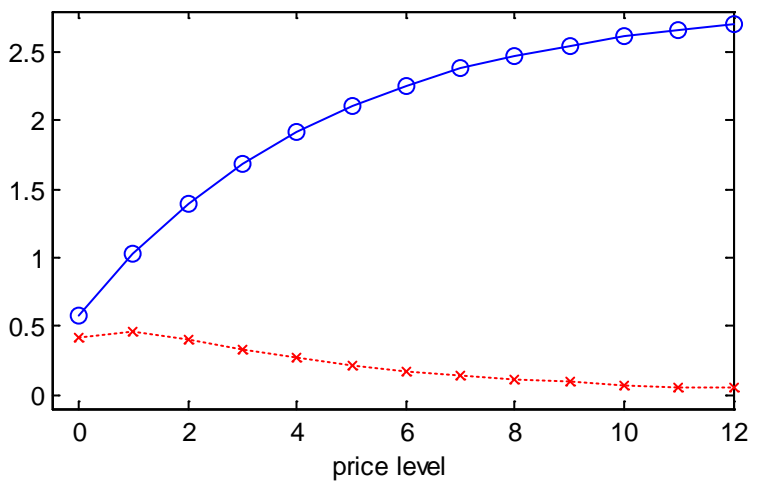
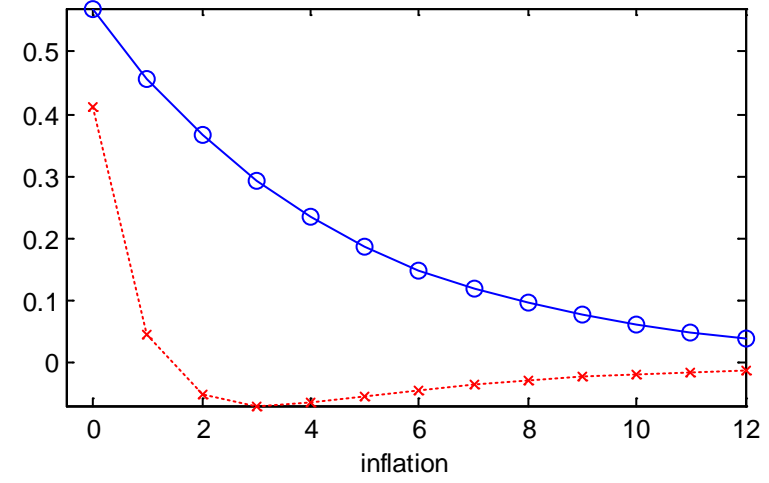
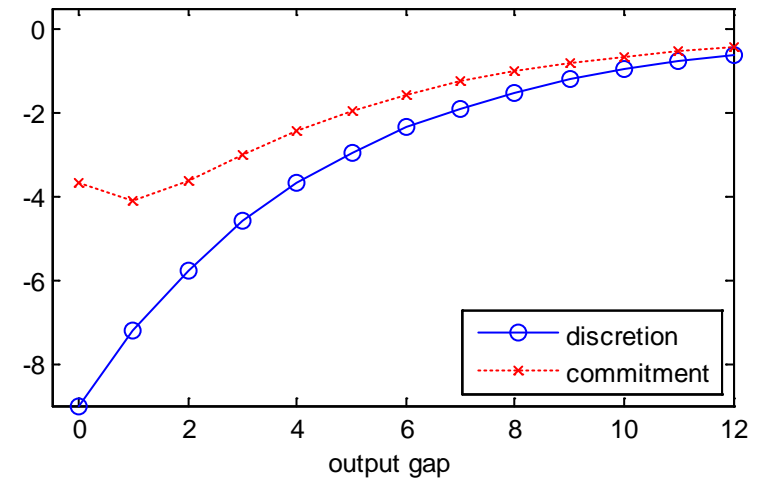


Figure 5.2  
 Discretion vs. Commitment: Responses to a Persistent Cost-Push Shock



*Implementation:*

$$\begin{aligned} i_t &= r_t^e + \frac{\vartheta\rho_u + \sigma\kappa(1 - \rho_u)}{\kappa^2 + \vartheta(1 - \beta\rho_u)}u_t + \phi_\pi \left( \pi_t - \frac{\vartheta}{\kappa^2 + \vartheta(1 - \beta\rho_u)} u_t \right) \\ &= r_t^e + \Theta_i u_t + \phi_\pi \pi_t \end{aligned}$$

where  $\Theta_i \equiv \frac{\sigma\kappa(1-\rho_u)-\vartheta(\phi_\pi-\rho_u)}{\kappa^2+\vartheta(1-\beta\rho_u)}$  and  $\phi_\pi > 1$ .

## Optimal Policy with Commitment

State-contingent policy  $\{x_t, \pi_t\}_{t=0}^{\infty}$  that minimizes

$$E_0 \sum_{t=0}^{\infty} \beta^t (\pi_t^2 + \vartheta x_t^2)$$

subject to the sequence of constraints

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

Lagrangian:

$$\mathcal{L} = E_0 \sum_{t=0}^{\infty} \beta^t \left[ \frac{1}{2} (\pi_t^2 + \vartheta x_t^2) + \xi_t (\pi_t - \kappa x_t - \beta \pi_{t+1}) \right] + t.i.p.$$

Optimality conditions:

$$\vartheta x_t - \kappa \xi_t = 0$$

$$\pi_t + \xi_t - \xi_{t-1} = 0$$

for  $t = 0, 1, 2, \dots$  with  $\xi_{-1} = 0$ ,



Eliminating multipliers:

$$x_0 = -\frac{\kappa}{\vartheta}\pi_0$$

$$x_t = x_{t-1} - \frac{\kappa}{\vartheta}\pi_t$$

for  $t = 1, 2, 3, \dots$

Alternative representation:

$$x_t = -\frac{\kappa}{\vartheta}\hat{p}_t$$

for  $t = 0, 1, 2, \dots$  where  $\hat{p}_t \equiv p_t - p_{-1}$

*Equilibrium*

$$\widehat{p}_t = \gamma \widehat{p}_{t-1} + \gamma \beta E_t \{ \widehat{p}_{t+1} \} + \gamma u_t$$

for  $t = 0, 1, 2, \dots$  where  $\gamma \equiv \frac{\vartheta}{\vartheta(1+\beta)+\kappa^2}$

Stationary solution:

$$\widehat{p}_t = \delta \widehat{p}_{t-1} + \frac{\delta}{1 - \delta \beta \rho_u} u_t$$

for  $t = 0, 1, 2, \dots$  where  $\delta \equiv \frac{1 - \sqrt{1 - 4\beta\gamma^2}}{2\gamma\beta} \in (0, 1)$ .

$\rightarrow$  *price level targeting !*

$$x_t = \delta x_{t-1} - \frac{\kappa \delta}{\vartheta(1 - \delta \beta \rho_u)} u_t$$

for  $t = 1, 2, 3, \dots$ , and

$$x_0 = -\frac{\kappa \delta}{\vartheta(1 - \delta \beta \rho_u)} u_0$$

Figure 5.1  
Discretion vs. Commitment: Responses to a Transitory Cost-Push Shock

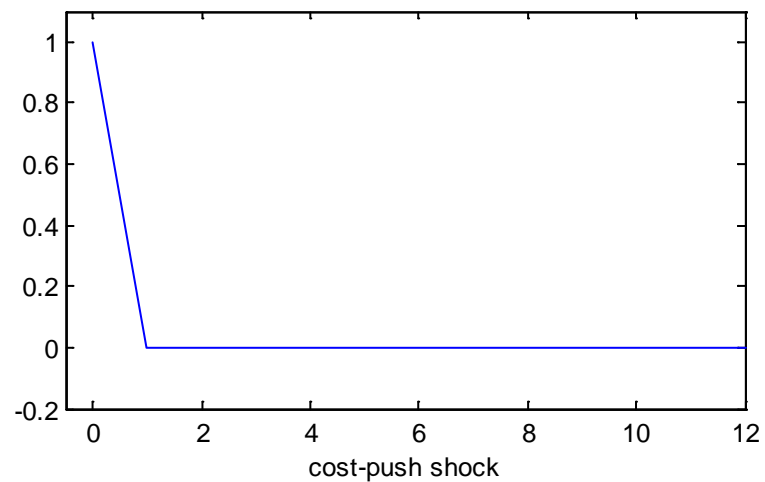
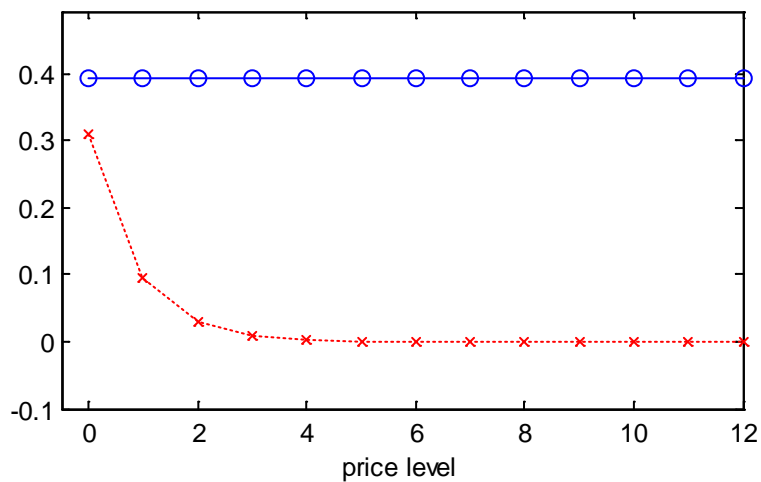
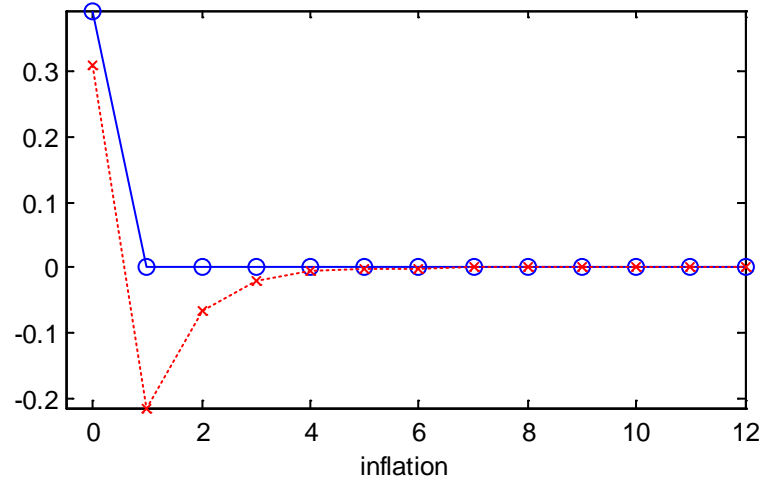
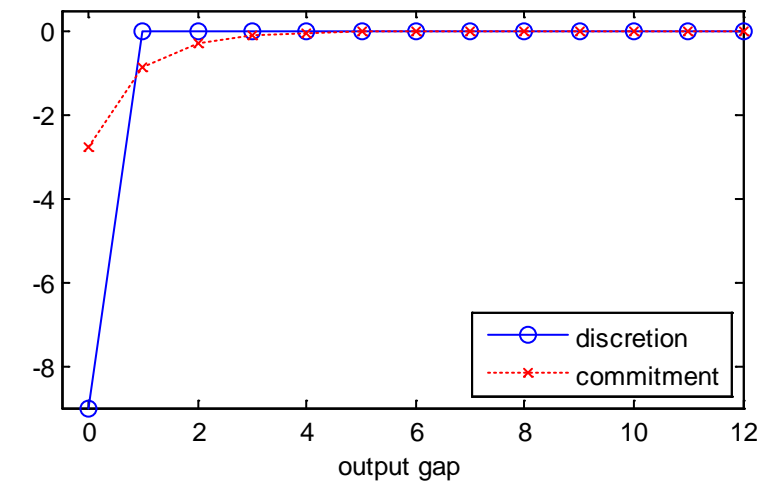
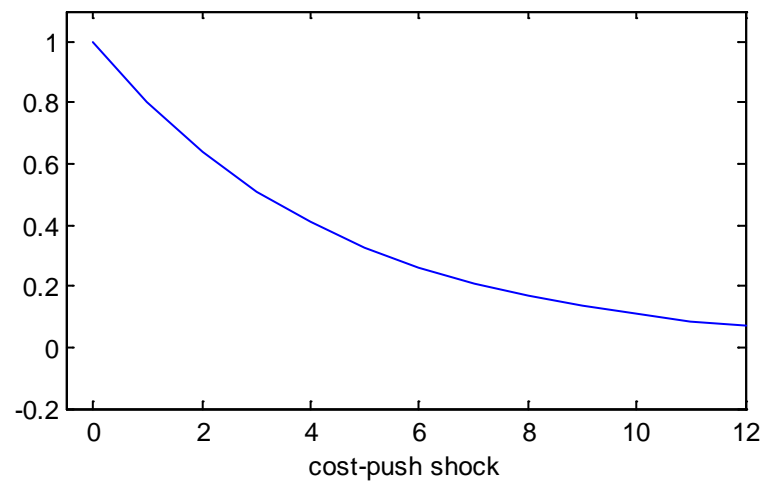
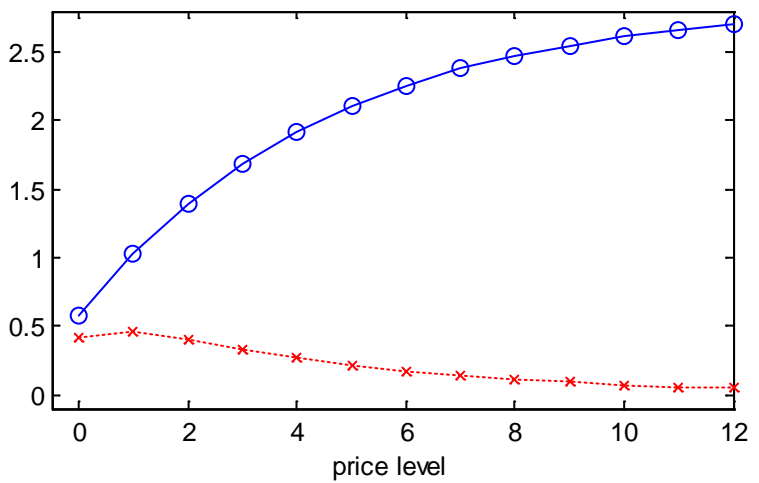
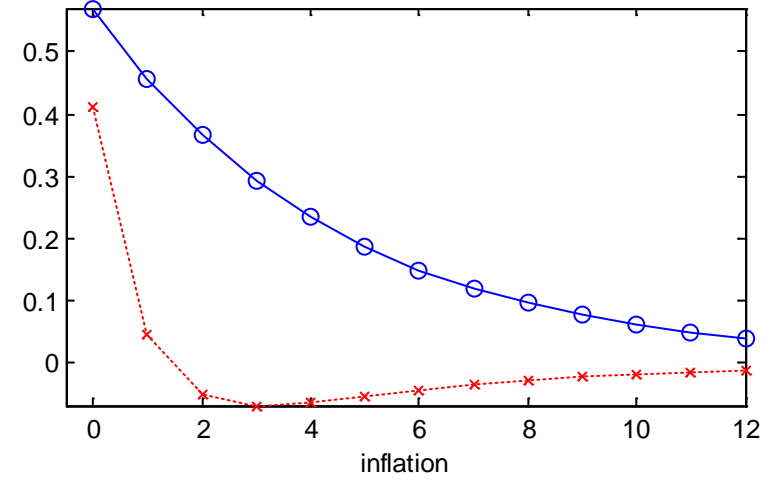
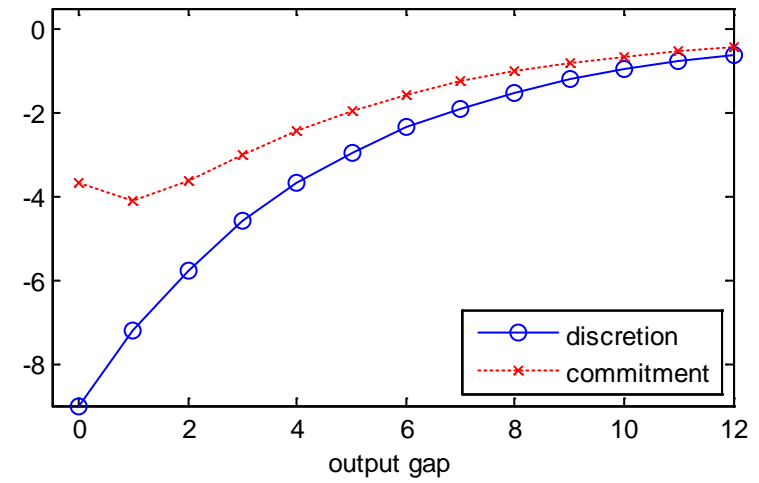


Figure 5.2  
Discretion vs. Commitment: Responses to a Persistent Cost-Push Shock



*Discussion: Gains from Commitment*

$$\pi_t = \kappa x_t + \kappa \sum_{k=1}^{\infty} \beta^k E_t \{x_{t+k}\} + \frac{1}{1 - \beta \rho_u} u_t$$

*Implementation* ( $\rho_u = 0$  case)

Equilibrium nominal rate under the optimal policy with commitment

$$\begin{aligned} i_t &= r_t^e - (1 - \delta) \left(1 - \frac{\sigma \kappa}{\vartheta}\right) \widehat{p}_t \\ &= r_t^e - (1 - \delta) \left(1 - \frac{\sigma \kappa}{\vartheta}\right) \sum_{k=0}^t \delta^{k+1} u_{t-k} \end{aligned}$$

Rule:

$$i_t = r_t^e - \left( \phi_p + (1 - \delta) \left(1 - \frac{\sigma \kappa}{\alpha_x}\right) \right) \sum_{k=0}^t \delta^{k+1} u_{t-k} + \phi_p \widehat{p}_t$$

for any  $\phi_p > 0$ .