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*: \( y^e_t - y^n_t = 0 \)

*Identical optimal policy asymptotically if* \( y^e_t - y^n_t = \text{const.} \)

*Alternative*: time-varying \( y^e_t - y^n_t \) gap

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

where \( x_t \equiv y_t - y^e_t \) and \( u_t \equiv \kappa(y^e_t - y^n_t) \)
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 \( t = 0, 1, 2, \ldots \) where \( \{u_t\} \) evolves exogenously according to

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

In addition:

\[
x_t = -\frac{1}{\sigma} (i_t - E_t \{ \pi_{t+1} \} - r_t^e) + E_t \{ x_{t+1} \}
\]  \hspace{1cm} (1)

*Note*: utility based criterion requires \( \vartheta = \frac{\kappa}{\varepsilon} \)
Optimal Discretionary Policy

Each period the monetary authority chooses \((x_t, \pi_t)\) to minimize
\[
\pi_t^2 + \vartheta x_t^2
\]
subject to
\[
\pi_t = \kappa x_t + \nu_t
\]
with \(\nu_t \equiv \beta E_t\{\pi_{t+1}\} + u_t\) 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

Output gap

Inflation

Price level

Cost-push shock
Implementation:

\[ i_t = r_t^e + \frac{\vartheta \rho_u + \sigma \kappa (1 - \rho_u)}{\kappa^2 + \vartheta (1 - \beta \rho_u)} u_t + \phi_\pi \left( \pi_t - \frac{\vartheta}{\kappa^2 + \vartheta (1 - \beta \rho_u)} u_t \right) \]

\[ = r_t^e + \Theta_i u_t + \phi_\pi \pi_t \]

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

\[
E_0 \sum_{t=0}^{\infty} \beta^t \left( \pi_t^2 + \vartheta x_t^2 \right)
\]

subject to the sequence of constraints

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

Lagrangean:

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

Optimality conditions:

\[
\vartheta x_t - \kappa \xi_t = 0
\]

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

for \( t = 0, 1, 2, \ldots \) with \( \xi_{-1} = 0 \).
Eliminating multipliers:

\[ x_0 = -\frac{\kappa}{\hat{\eta}} \pi_0 \]

\[ x_t = x_{t-1} - \frac{\kappa}{\hat{\eta}} \pi_t \]

for \( t = 1, 2, 3, \ldots \)

Alternative representation:

\[ x_t = -\frac{\kappa}{\hat{\eta}} \hat{p}_t \]

for \( t = 0, 1, 2, \ldots \) where \( \hat{p}_t \equiv p_t - p_{-1} \)
Equilibrium
\[ \hat{p}_t = \gamma \hat{p}_{t-1} + \gamma \beta E_t \{ \hat{p}_{t+1} \} + \gamma u_t \]
for \( t = 0, 1, 2, \ldots \) where \( \gamma \equiv \frac{\theta}{\theta(1+\beta)+\kappa^2} \)

Stationary solution:
\[ \hat{p}_t = \delta \hat{p}_{t-1} + \frac{\delta}{1 - \delta \beta \rho_u} u_t \]
for \( t = 0, 1, 2, \ldots \) where \( \delta \equiv \frac{1 - \sqrt{1 - 4 \beta \gamma^2}}{2 \gamma \beta} \in (0, 1) \).

\( \rightarrow \) price level targeting!

\[ x_t = \delta x_{t-1} - \frac{\kappa \delta}{\theta(1 - \delta \beta \rho_u)} u_t \]
for \( t = 1, 2, 3, \ldots \), and
\[ x_0 = -\frac{\kappa \delta}{\theta(1 - \delta \beta \rho_u)} u_0 \]
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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

\[ i_t = r_t^e - (1 - \delta) \left( 1 - \frac{\sigma \kappa}{\vartheta} \right) \hat{p}_t \]

\[ = r_t^e - (1 - \delta) \left( 1 - \frac{\sigma \kappa}{\vartheta} \right) \sum_{k=0}^{t} \delta^{k+1} u_{t-k} \]

Rule:

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

for any \( \phi_p > 0 \).