Optimal Monetary Policy

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Outline

- Monetary Policy Framework and Macroeconomic Model.
- Optimal Monetary Policy
  - Derive from a Macroeconomic Model.
  - Use Empirical Macroeconometric Analysis.
- Usefulness of Optimal Monetary Policy Rule.

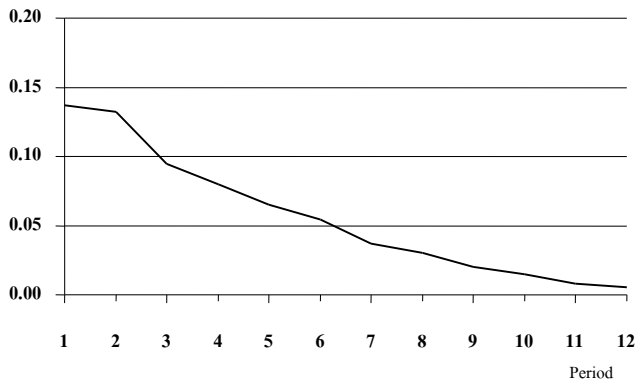
Monetary Policy Framework and Macroeconomic Model

Macroeconomic Model

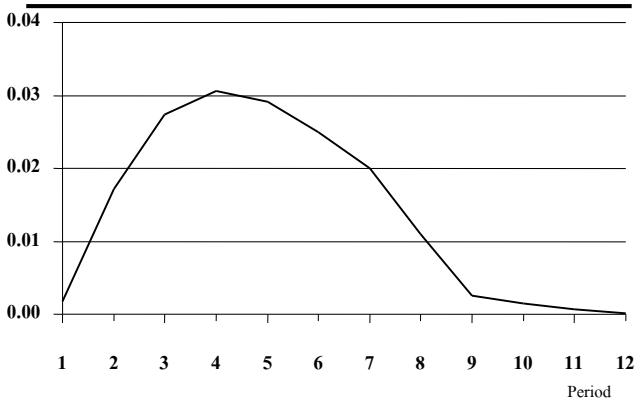
- Assists in forecasting macroeconomic picture.
- Assists in evaluating effects of policies and external factors on the economy.
- Assists in obtaining the optimal policy solution.

Monetary Policy Affects Macroeconomy With Lags

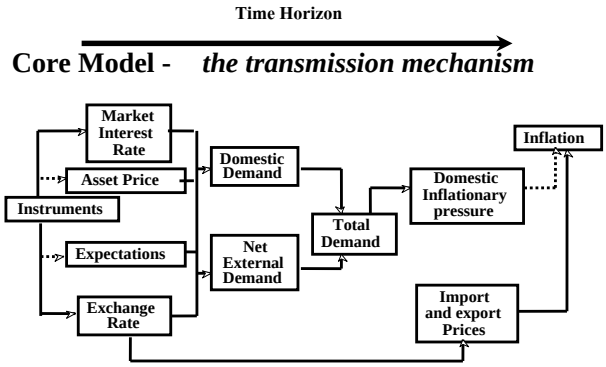
Impact of 1 percentage point interest rate cut on GDP growth (%)



Impact of 1 percentage point interest rate cut on core inflation (%)



Transmission Mechanism of the Core Model

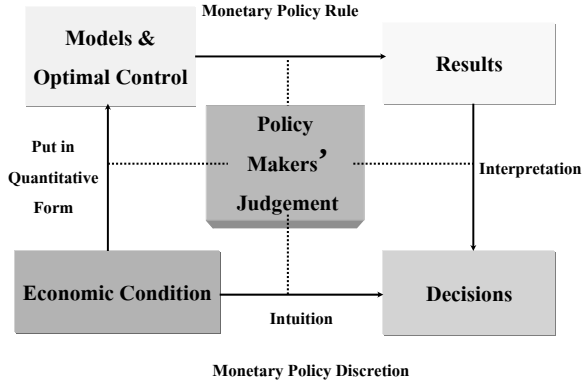


Decisions Involved in Formulating Monetary Policy

- When to tighten/loosen?
- How much to tighten/loosen?

Optimal Monetary Policy

Using Optimal Control to Assist Decision-Making



Benefits of Policy Rule Methodology

- Helps overcome the **Lucas Critique**.
- Assists in building **credibility** for monetary policy decision- making process:

  1. Easier and clearer for the public to understand monetary policy.

  2. Making the direction of monetary policy more predictable to the market.

  3. Can be used to promote transparency and accountability.

Benefits of Policy Rule Methodology (cont.)

– Eliminates short-sightedness and time inconsistency problems associated with discretionary methodology.

Policy Rule Can Be Obtained by Two Methods

1. Derive from a Macroeconomic Model.
2. Use Empirical Macroeconometric Analysis.

Derive from a Macroeconomic Model (Example)

$$i_t = r^{eq} + \pi_t + 0.5\{y_t + (\pi_t - \pi^{ob})\}$$

where i_t = policy interest rate

r^{eq} = equilibrium real interest rate

π_t = inflation at time t

π^{ob} = targeted inflation

y_t = output gap

Empirical Macroeconometric Analysis

Macroeconomic Model: Policy Optimization

Minimize Loss Function :

$$L(\pi_t, Y_t) = (1/2)[\gamma (\pi t - \pi^*)^2 + \rho (Yt - Y^*)^2]$$

where $\pi_t - \pi^*$ = The difference between forecasted inflation and targeted inflation at time t.

$Yt - Y^*$ = The difference between forecasted output and potential output at time t

γ, ρ = Weights given to inflation and output targets

Minimize Loss Function

(Over the period affected by a change in monetary policy)

$$L(\pi_t, Y_t) = (1/2)[\gamma (\pi_t - \pi^*)^2 + \rho (Yt - Y^*)^2]$$

$$\text{Min} \sum_{i=o}^{n} L(\pi_{t+I}, y_{t+I})$$

Subject to Macroeconomic Model

Minimize Loss Function

(Over the period affected by a change in monetary policy)

$$L(\pi_t, Y_t, r_t) = (1/2)[\gamma (\pi t - \pi^*)^2 + \rho (Yt - Y^*)^2 + \upsilon (r_t - r_{t-1})^2]$$

where υ = Weight given to policy rate changes

$$\text{Min} \sum_{i=o}^{n} L (\pi_{t+i}\, y_{t+i}, r_{t+i})$$

Subject to Macroeconomic Model

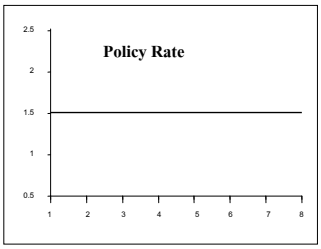
Issues to be Considered

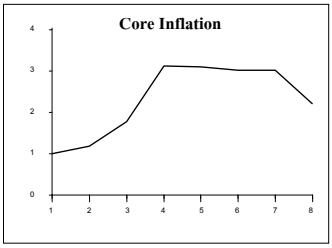
- **Forecasting Ability**
- **Time Horizon**
- **Type of Target (Point or Range)**
- **Weight Given to Targets**

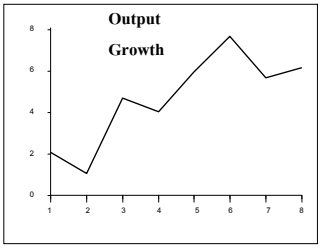
Usefulness of Optimal Policy Rule

- **Assists in recommending monetary policy decision**

Forecasted Output Growth and Core Inflation
(assuming the interest rate does not change)

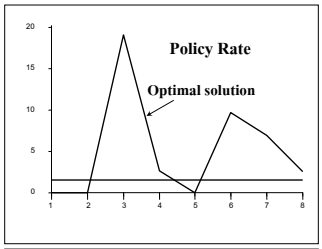


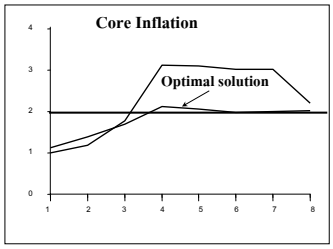


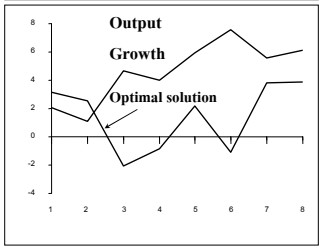


Case 1: Optimal Monetary Policy, Forecasted Output Growth and Core Inflation

$\gamma = 1.0$, $\rho = 0$, $\upsilon = 0$, $c = 0$
(Targeted core inflation = 2 %)

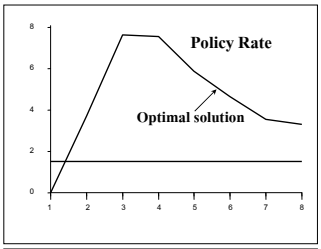


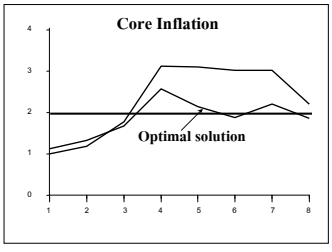


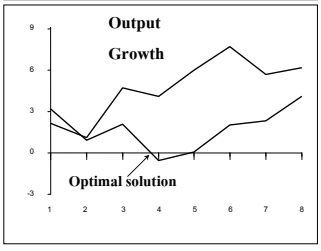


Case 2: Optimal Monetary Policy, Forecasted Output Growth and Core Inflation

$\gamma = 1$, $\rho = 0$, $\upsilon = 0.1$, $c = 0$
(Targeted core inflation = 2% and taking targeted interest rate level into consideration)







Policy Recommendation from the Model

Minimize Loss Function :

$L(\pi t, Y_t) = (1/2)[\gamma (\pi t - \pi^*), R, c)^2 + \rho (Yt - Y^*)^2]$

where

$(\pi t - \pi^*), R, c) = (\pi t - \pi^*) - (1/2) \sqrt{c + ((\pi t - \pi^*) - R/2)^2}$

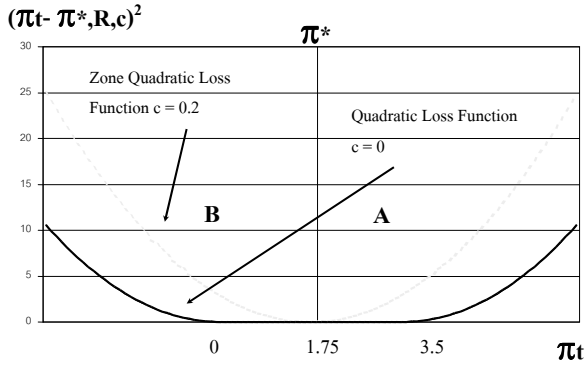
$+ (1/2) \sqrt{c + (-(\pi t - \pi^*) + R/2)^2}$

π^* = Zone mid-point

R = Zone width

c = Smoothness parameter

Quadratic and Zone Quadratic Loss Function



Minimize Loss Function

(Over the period affected by a change in monetary policy)

$L(\pi t, Y_t) = (1/2)[\gamma (\pi t - \pi^*, R, c)^2 + \rho (Yt - Y^*)^2]$

$\text{Min} \sum_{i=o}^{n} L(\pi_{t+i}\, y_{t+i})$

Subject to Macroeconomic Model

Policy Recommendation from the Model

Minimize Loss Function :

$L(\pi t, Y_t) = (1/2)[\gamma ((\pi t - \pi^*)R, c)^2 + \rho (Yt - Y^*)^2]$

where

$(\pi t - \pi^*), 3.5, 0) = 0$ **if** $0 < \pi t < 3.5$

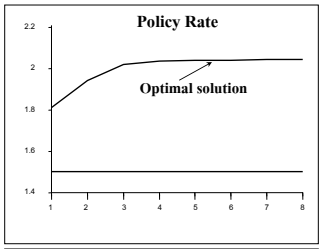
$= \pi t - 3.5$ **if** $\pi t > 3.5$

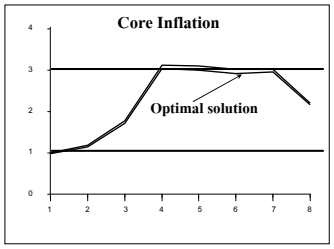
$= \pi t - 0$ **if** $\pi t < 0$

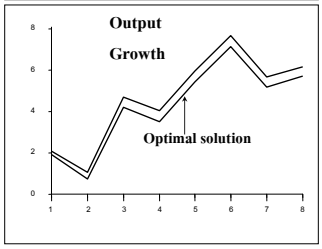
Case 3: Optimal Monetary Policy, Forecasted Output Growth and Core Inflation

$\gamma = 1.0$, $\rho = 0$, $\upsilon = 0.1$, $c = 0$

(Targeted core inflation = 1-3% and taking targeted interest rate level into consideration)



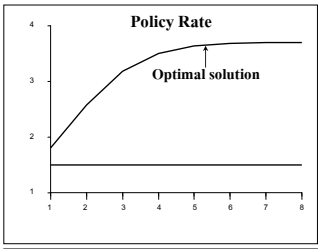


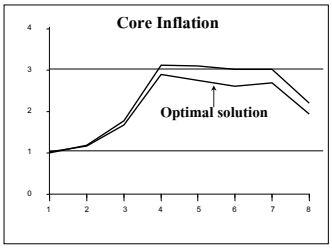


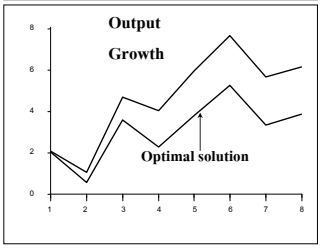
Case 4: Optimal Monetary Policy, Forecasted Output Growth and Core Inflation

$\gamma = 1.0$, $\rho = 0$, $\upsilon = 0.1$, $c = 0.1$

(Targeted core inflation = 1-3% and taking targeted interest rate level into consideration)



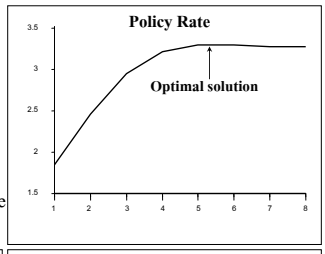


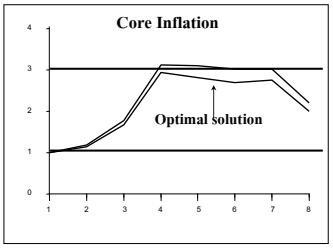


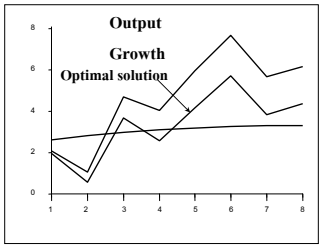
Case 5: Optimal Monetary Policy, Forecasted Output Growth and Core inflation

$\gamma = 0.6,\ \rho = 0.4,\ \upsilon = 0.1,\ c = 0.1$

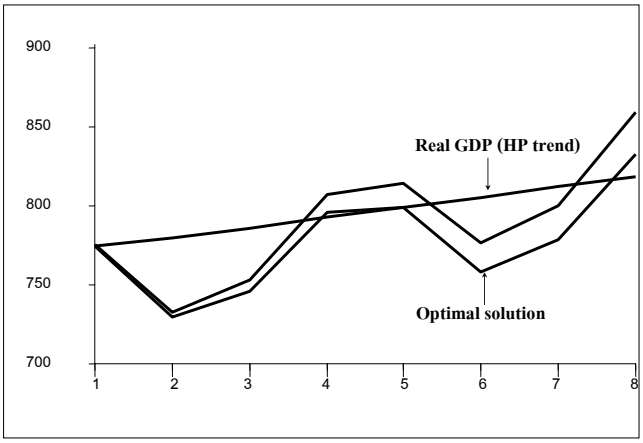
(Targeted core inflation = 1-3% taking potential output and targeted interest rate level into consideration)







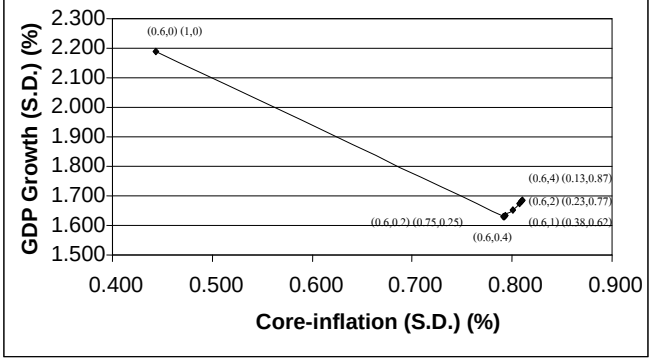
GDP and Potential GDP (HP Trend)



Usefulness of Optimal Policy Rule

- **Assists in recommending monetary policy decision.**
- **Assists in determining appropriate weight for each objective.**

Inflation-output Variability



Taylor Rule

$$i_t = r^{eq} + \pi_t + 0.5\{y_t + (\pi_t - \pi^{ob})\}$$

where i_t = policy interest rate

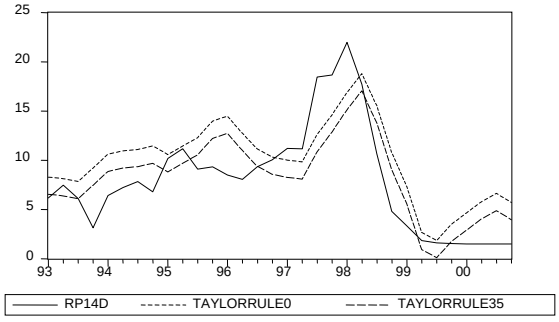
r^{eq} = equilibrium real interest rate

π_t = inflation at time t

π^{ob} = targeted inflation

y_t = output gap

Forecasted (Taylor Rule) and Actual 14-Day RP



Conclusion: Policy Rule Methodology

- Makes use of macroeconomic model.
- Assists in building credibility.
- Creates better understanding in monetary policy decision.
- Eliminates short-sightedness problem.
- Eliminates time inconsistency problem.
- Assists in determining appropriate weight for each objective.

Limitations and Further Study

- Performance of Monetary Policy Transmission Mechanism.
- Forecasting Ability.
- Should be used with policymakers' judgment.