Passive Monetary Policy Under Asymmetric Information

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Introduction

- Central Bank may have superior information (Berkelmans 2007)
  - Private sector cannot distinguish between types of shocks
- Optimal monetary policy
  - Actions reveal information
    - Policy stabilizes shocks
    - Policy reveals information and may destabilize expectations
  - Optimal policy may be 'passive'

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Fed's Action Stems Sell-Off in World Markets

By EDMUND L. ANDREWS

WASHINGTON — The Federal Reserve, confronted by deepening panic in global financial markets about a possible recession in the United States, struck back on Tuesday morning with the biggest one-day reduction of interest rates on record and at least temporarily stopped a vertigo-inducing plunge in stock prices....

...Fed officials clearly hoped that a bold and decisive act would calm investors and restore confidence in credit markets, where fears about soaring defaults on subprime mortgages have increasingly forced banks to curtail their lending in other areas.

...But while investors did react with relief, the Fed's move also seemed to validate the fears that the economy is closer to a recession than policy makers had thought...

Introduction

- Central Bank may have superior information (Berkelmans 2007)
  - Private sector cannot distinguish between types of shocks
- Optimal monetary policy
  - Actions reveal information
    - Policy stabilizes shocks
    - Policy reveals information and may destabilize expectations
  - Optimal policy may be ‘passive’
- Today we show you:
  - Toy model (static)
  - Dynamic model (Clarida, Gali and Gertler 1999) $\longrightarrow$ 2 periods
  - A ‘calibration’

Toy model

- Monetary economy
  - Central Bank chooses output
  - Loss function

$$L = \pi^2 + \alpha y^2$$

- Two key ingredients
  - Asymmetric information: only bank knows shock
  - Expectations matter ($0 < \beta < 1$)

$$\pi = \beta \pi^e + \kappa y + u$$

- No time inconsistency
  - Policy set before expectations are formed
  - Full commitment

Bank announces policy	Shock Realized	Bank implments policy	Private sector forms expectations	Inflation Realized

Toy model

Full information

- Bank understands $\pi^e = \pi$

$$\begin{aligned} \min_y L &= \pi^2 + \alpha y^2 \\ \pi &= \beta \pi^e + \kappa y + u \quad \Rightarrow \quad \pi = \frac{\kappa y + u}{1-\beta} \end{aligned}$$

- Optimal policy

$$y = -\frac{\kappa}{\kappa^2 + \alpha (1-\beta)^2} u \quad \Rightarrow \quad \pi = \frac{\alpha (1-\beta)}{\kappa^2 + \alpha (1-\beta)^2} u < \frac{u}{1-\beta}$$

- Less inflation volatility if
  - Policy is more effective (κ high)
  - Policy is less costly (α low)

Toy model

Asymmetric information

- Bank can choose
  - Active policy $\rightarrow$ reveals shock $\rightarrow$ full information solution
  - Passive policy $\rightarrow$ private sector forms expectations without knowing u

Bank announces policy	Shock Realized	Bank implments policy	Private sector forms expectations	Inflation Realized

- Passive policy
  - Act as if do not observe shock

$$\pi = \beta \pi^e + \kappa y + u \quad \Rightarrow \quad \pi^e = \frac{\kappa}{1-\beta} y$$

  - Maximize expected loss function

$$y = 0 \quad \Rightarrow \quad \pi = u$$

- The trade-off: Under passive policy
  - Output volatility is lower $(+)$
  - Inflation volatility is
    - higher: full impact of shock $(-)$
    - lower: expectations do not respond to shock $(+)$
- Passive policy is optimal if

$$L^{\text{passive}} < L^{\text{active}} \quad \Leftrightarrow \quad \frac{\kappa^2}{\alpha} < \beta\,(2-\beta)$$

  - Policy ineffective (low κ) or costly (high α)
  - Expectations important (high β)
- [Inflation volatility may be lower under passive policy]

Dynamic model

- New-Keynesian model with inflation-output trade-off (CGG 1999)
  - RBC model without capital
  - Monopolistic competition
  - Staggered price setting (Calvo 1983)

$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + u_t \qquad \text{(NKPC)}$$

  - $\beta =$ discount factor, $\kappa(\beta, \theta, \sigma, \phi, \varepsilon, \hat{\alpha}) \simeq 0.1$
  - Cost-push shock $u_t = \rho u_{t-1} + \eta_t$, $\eta_t \sim i.i.d.$
- Optimal monetary policy under commitment

$$\min L = E_0 \sum_{t=0}^{\infty} \beta^t \left(\pi_t^2 + \alpha y_t^2\right)$$

Dynamic model

- New-Keynesian model with inflation-output trade-off (CGG 1999)

$$\pi_t = \beta E_t \pi_{t+1} + \kappa y_t + u_t \qquad \text{(NKPC)}$$

- Optimal monetary policy under commitment

$$\min L = E_0 \sum_{t=0}^{\infty} \beta^t \left(\pi_t^2 + \alpha y_t^2 \right)$$

- This paper: private sector learns u_t with one-period lag, $\tilde{E}_t \neq E_t$
- Trade-off as in static model
    - Shocks are persistent $\Rightarrow$ information about u_t affects $\tilde{E}_t \pi_{t+1}$
    - $\tilde{E}_t \pi_{t+1}$ affects π_t

Dynamic model

Two periods

- Central Bank's problem

$$
\begin{aligned}
\min_{y_0, y_1} L &= E_0 \left[\pi_0^2 + \beta \pi_1^2 + \alpha y_0^2 + \alpha \beta y_1^2 \right] \\
\pi_0 &= \beta \tilde{E}_0 \pi_1 + \kappa y_0 + u_0 \\
\pi_1 &= \kappa y_1 + \rho u_0
\end{aligned}
$$

  - World ends in period 2, $\tilde{E}_1 \pi_2 = 0$
  - $u_1 = \rho u_0 + \eta_1$, wlog let $\eta_1 = 0$
- Bank can choose
  - Active policy (y_0 conditional on u_0) $\rightarrow \tilde{E}_0 \pi_1 = E_0 \pi_1$
  - Passive policy (y_0 not conditional on u_0) $\rightarrow \tilde{E}_0 \pi_1 = E_{-1} \pi_1$

Active policy	Passive policy
$y_0 = \frac{\beta\rho\kappa^2 - (1+\beta\rho)\left(\alpha+\kappa^2\right)}{\alpha\beta\kappa^2 + (\alpha+\kappa^2)^2}\kappa u_0$	$y_0 = 0$
$y_1 = -\frac{\alpha(1+\beta\rho) + \left(\alpha+\kappa^2\right)\rho}{\alpha\beta\kappa^2 + (\alpha+\kappa^2)^2}\kappa u_0$	$y_1 = -\frac{\rho}{\alpha+\kappa^2}\kappa u_0$
$\pi_0 = \frac{\alpha\left(\alpha+\kappa^2+\alpha\beta\rho\right)}{\alpha\beta\kappa^2 + (\alpha+\kappa^2)^2} u_0$	$\pi_0 = u_0$
$\pi_1 = \frac{\alpha\kappa^2(\rho-1) + \rho\alpha^2}{\alpha\beta\kappa^2 + (\alpha+\kappa^2)^2} u_0$	$\pi_1 = \frac{\alpha}{\alpha+\kappa^2}\rho u_0$

- Passive policy is optimal if

$$L^{\text{passive}} < L^{\text{active}}$$

$$0 < \alpha^3\beta^2\rho^2 + 2\alpha^3\beta\rho + 2\alpha^2\kappa^2\beta\rho - \alpha^2\kappa^2\beta - \alpha^2\kappa^2 - \alpha\kappa^4\beta - 2\alpha\kappa^4 - \kappa^6$$

- New in the dynamic model
  - Cost-push shocks need to be persistent enough (ρ high enough)
  - Agents/Bank need to be patient enough (β high enough)
- As in the static model
  - Policy cannot be too effective (κ low enough)
  - Policy cannot be too costly (α high enough)

- Passive policy is optimal if

$$L^{\text{passive}} < L^{\text{active}}$$

$$0 < \alpha^3\beta^2\rho^2 + 2\alpha^3\beta\rho + 2\alpha^2\kappa^2\beta\rho - \alpha^2\kappa^2\beta - \alpha^2\kappa^2 - \alpha\kappa^4\beta - 2\alpha\kappa^4 - \kappa^6$$

- ‘Calibration’

$\beta = 0.99$	discount factor
$\varepsilon = 6$	EOS between goods
$\kappa = 0.05 \quad [0.1]$	$\theta = 2/3,\ \sigma = \phi = 1,\ \hat{\alpha} = 1/3$
$\alpha = \kappa/\varepsilon = 0.0083 \quad [0.0167]$	$\alpha = 0.0083$

- Passive policy is optimal if $\rho > 0.31 \quad [0.65]$