A Pitfall of Cautiousness in Monetary Policy

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*The views expressed do not necessarily represent those of the Banque de France or the Eurosystem

Monetary Policy & Uncertainty: Crisis Times (March 2020)

Christine Lagarde @Lagarde · 19 mars

Extraordinary times require extraordinary action. There are no limits to our commitment to the euro. We are determined to use the full potential of our tools, within our mandate.

European Central Bank @ecb · 18 mars

Press release: ECB announces €750 billion Pandemic Emergency Purchase Programme (PEPP) ecb.europa.eu/press/pr/date/...

Monetary Policy & Uncertainty: Non-Crisis Times (March 2019)

European Central Bank @ecb · 7 mars 2019

Draghi: In a dark room you move with tiny steps. You don't run but you do move.

Uncertainty: A rationale for Attenuation and Gradualism

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  - On the economic outlook
  - On the effect of their policies

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  - Blinder (1999): *"In my view as both a citizen and a policymaker, a little stodginess at the central bank is entirely appropriate"*
  - In particular when new monetary tools (Williams, 2013)
- Rationalized by Brainard (1967)'s *attenuation principle*
  - Uncertainty *on the effects of policies* justifies attenuation
  - If unsure of the effect of a medicine, take a smaller dose

This Paper's Point: A Pitfall when Applied to Monetary Policy

- Dis-inflationary (say) shock hits; CB can push inflation up by cutting rates

The Brainard Principle Applied to MP

- *If uncertain of the effect of the rate cut on inflation, cut less*
- *Even if implies a higher risk that inflation will fall somewhat below target*

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The Cautiousness Bias

- *If the private sector foresees that the central bank will cut less, then:*
- *Lower inflation expectations → Lower inflation → Forces CB to cut rates further*
- *CB easily cuts rates as much, but with inflation further below target*

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- Parallel with Inflation Bias (Kydland Prescott 1977, Barro Gordon 1983)
- But not related to a desire to set output above potential

Outline

1. A simple model of the cautiousness bias
   - To capture the logic: with the NCPC as Phillips Curve
2. The cautiousness bias with the SIPC (Mankiw Reis 2002)
   - To capture the dynamics of the cautiousness bias
3. The cautiousness bias with the NKPC
   - Robust to forward-looking Phillips curve
4. Discussion
   - Unconventional policies

Literature

- **Brainard principle applied to MP**: Svensson (1999), Clarida Gali Gertler (1999), Estrella Mishkin (1999), Sack (2000), Sack Wieland (2000), Rudebusch (2001), Williams (2013)
- **Qualifications to Brainard principle, Bayesian approach**: Söderström (2002), Kimura Kirozumi (2007), Ferrero, Pietrunti Tiseno (2019)
- **Qualifications to Brainard principle, Robust control approach**: Giannoni (2002), Stock (1999), Onatski Stock (2002), Tetlow von zur Muehlen (2001), Söderström Leitemo (2008), Sargent (1999), Barlevy (2011)
- **Gradualism for better control of long-term rates**: Woodford (2003)
- **Gradualism for financial stability purposes**: Cukierman (1991), Stein Sunderam (2018)
- **Other costs of delaying action**: Acharya Bengui Dogra Wee (2019)

A Simple Model of the Cautiousness Bias

- Simple two-equation model

1. Euler equation:

$$x_t = -\sigma(i_t - E_t(\pi_{t+1})) + E_t(x_{t+1}) + v_t, \tag{1}$$

2. New-Classical Phillips curve:

$$\pi_t = \kappa x_t + E_{t-1}(\pi_t), \tag{2}$$

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Assumption (*Model Uncertainty, Bayesian*)

The CB does not perfectly know the value of σ. It entertains the beliefs:

$$\sigma \sim (\bar{\sigma}, V_\sigma)$$

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- Private sector knows σ and faces no model uncertainty
- Notations for expectations: E^* for CB; E for private sector
- No model uncertainty over κ

A Simple Model of the Cautiousness Bias

- CB's program: Chooses a path for $\pi_t, x_t, r_t = i_t - E_t(\pi_{t+1})$ to minimize:

$$\mathcal{L}_\infty = E_t^* \left(\sum_{k=0}^{\infty} \beta^k (\pi_{t+k} - \pi^*)^2 \right),$$

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Reductio ad Brainard

Brainard (1967)

Policy-maker picks policy P that min. departure of outcome y from target y^*:

$$\min_P \mathcal{L} = E^*((y - y^*)^2)$$

$$st. \; y = aP + u$$

where $a \sim (\bar{a}, \sigma_a^2)$.

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- Consider MP under discretion: Takes $E_{t-1}(\pi_t)$ as given.
- Define $\varepsilon_t \equiv \kappa v_t$ and $\phi \equiv \sigma\kappa$; $\phi \sim (\bar{\phi}, V_\phi) = (\kappa\bar{\sigma}, \kappa^2 V_\sigma)$.

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Lemma 1 (Reductio ad Brainard)

CB picks interest-rate r that min. departure of inflation π from target π^*:

$$\min_r \mathcal{L} = E^*((\pi - \pi^*)^2),$$

$$st. \; \pi = -\phi r + \varepsilon + E_{-1}(\pi)$$

where $\phi \sim (\bar{\phi}, \sigma_\phi^2)$.

Brainard's Attenuation Principle

- To recover the Brainard principle unchallenged, fix $E_{-1}(\pi)$, noted $e(\pi)$
- Decompose loss function into 2 conflicting objectives:

$$\mathcal{L} = (E^*(\pi) - \pi^*)^2 + Var^*(\pi)$$

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Lemma 2 (Brainard's Attenuation Principle)

Under discretion, the central bank sets the real interest rate as:

$$r = \alpha r^s + (1-\alpha) \times 0,$$

$$\textit{where} \begin{cases} r^s \equiv \bar{r}^n + \frac{e(\pi)-\pi^*}{\bar{\phi}} \text{ is the policy under certainty (tracks } \bar{r}^n\text{)}, \\ \alpha \equiv \frac{\bar{\phi}^2}{\bar{\phi}^2 + V_\phi} \text{ is the attenuation coefficient } \in [0,1]. \end{cases}$$

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- CB expects inflation to be likely off-target:

$$E^*(\pi) - \pi^* = (1-\alpha)(\bar{\phi}\bar{r}^n + e(\pi) - \pi^*) \neq 0,$$

- But cost worth paying to avoid the risks of uncertain policy outcomes

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- Conclusion of policy attenuation premature here: $E_{-1}(\pi)$ endogenous
- Solving for rational expectations:

$$E_{-1}(\pi) = \pi^* + \left(\frac{1}{\alpha} - 1\right) \bar{\phi} E_{-1}(\bar{r}^n)$$

- When shocks are foreseen $E_{-1}(\bar{r}^n) \neq 0$, $E_{-1}(\pi)$ departs from target

Proposition 1 (Brainard Principle Unraveled)

Under the optimal discretionary policy, the real interest rate is in equilibrium:

$$r = E_{-1}(\bar{r}^n) + \alpha(\bar{r}^n - E_{-1}(\bar{r}^n)).$$

- *If shocks not foreseen $E_{-1}(\bar{r}^n) = 0$, attenuation survives $r = \alpha \bar{r}^n$*
- *If shocks foreseen $E_{-1}(\bar{r}^n) = \bar{r}^n$, no attenuation $r = 1 \bar{r}^n$*

  $\rightarrow$ *Ends up moving rates as much as if did not try to attenuate policy*

The Cautiousness Bias: ...for Less Well Stabilized Inflation

- Equilibrium departure of inflation from target:

$$E^*(\pi) - \pi^* = (1-\alpha)\bar{\phi}\left((\bar{r}^n - E_{-1}(\bar{r}^n)) + \frac{1}{\alpha}E_{-1}(\bar{r}^n)\right)$$

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- For foreseen shocks departure larger than initially expected by CB

- Under optimal allocation under commitment, departure from target is only:

$$E^*(\pi) - \pi^* = (1-\alpha)\bar{\phi}\left(\bar{r}^n - E_{-1}(\bar{r}^n)\right).$$

Proposition 2 (The Cautiousness Bias)

- *The discretionary policy depart from the optimal commitment policy*
- *Discretionary policy is overly cautious*

Guarding Oneself Against Being Cautious

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  → Appoint a CB who discounts society's concerns over uncertainty:

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Proposition 3 (Optimal Discounting of Uncertainty Concerns)

- *Unless all shocks are unforeseen by the private sector, some discounting of uncertainty concerns is always recommendable,* $\delta < 1$.
- *The optimal value of* δ *decreases with the proportion of shocks that are foreseen by the private sector.*

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- Different possible interpretations of δ
  1. Central banker who trusts his model more
  2. Different degrees of risk-aversion
  3. Conscious decision to discount concerns (form of limited commitment)

The Cautiousness Bias with the SIPC

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- Sticky-Information Phillips Curve (SIPC, Mankiw Reis 2002):

$$\pi_t = \kappa x_t + \bar{E}_{t-1}(\pi_t + \zeta \Delta x_t), \tag{2'}$$

where $\bar{E}_{t-1}(\pi_t + \zeta \Delta x_t) = \sum_{j=0}^{\infty} \lambda (1-\lambda)^j E_{t-1-j}(\pi_t + \zeta \Delta x_t).$

The Attenuation Principle in a Dynamic Set-Up

- Still same trade-off:

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$$R_t = \alpha \times R_t^s,$$

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Proposition 4 (Dynamics under the Sticky-Information Phillips Curve)

The dynamics of inflation and the output gap is determined by the system:

$$x_t = \bar{\sigma} R_t^n - \frac{\alpha}{(1-\alpha)\kappa}(\pi_t - \pi^*),$$

$$\pi_t = \kappa x_t + \bar{E}_{t-1}(\pi_t + \zeta \Delta x_t).$$

Acting Tomorrow out of Not Acting Today

- Assume the shocks to the natural rate follow an AR(1):

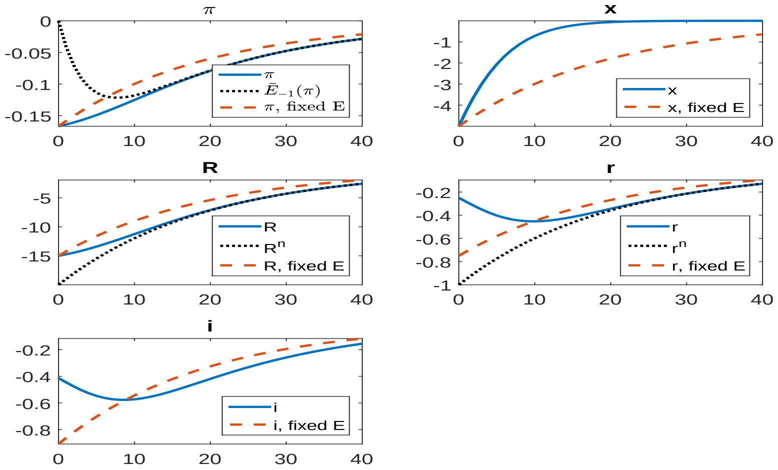
$$r_t^n = \rho r_{t-1}^n + \eta_t$$

- Calibration (quarterly):

ζ	λ	$\bar{\sigma}$	α	ρ
0.1	0.25	1	0.75	0.95

- Consider a 100bp fall in the natural rate

Acting Tomorrow out of Not Acting Today



The Cautiousness Bias with the NKPC

- New-Keynesian Phillips Curve (NKPC):

$$\pi_t = \kappa x_t + \beta E_t(\pi_{t+1}) \tag{2''}$$

Proposition 5 (The Cautiousness Bias under the NKPC)

Assume $r_t^n \sim AR(1)$. In equilibrium the long-term rate is:

$$R_t = \alpha \left(\frac{1}{1 - \beta(1-\alpha)\rho} \right) R_t^n.$$

- Brainard's attenuation principle: CB moves rates less by a factor $\alpha < 1$
- Reaction of $E(\pi)$: CB forced to move by a factor $1/(1 - \beta(1-\alpha)\rho) > 1$
- Both effects occur on impact (front-loaded dynamics of the NKPC)

Discussion: Unconventional Policies

- We focused on conventional interest rate policy for concreteness
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1. Unconventional policies are likely the ones whose effect is most uncertain
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2. Cautiousness bias can lead CB to move *nominal* rates more
   - Can make ELB binding when would not absent concerns over uncertainty
3. Other rationales for gradualism, e.g. Woodford (2003)
   - Adds "make-up" elements that approximate optimal commitment policy
   - But not a rationale for doing less if uncertain times/uncertain policies
   - Instead, very argument for doing FG "lower for longer" at ELB

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- Praet (2018) on monetary policy under uncertainty:

  "Following the seminal work of Brainard, a case for gradualism can be made in the context of the uncertainty inherent in economic data, models and parameters, notably in times of unconventional monetary policy [...]

  A more aggressive monetary policy response, however, is warranted when there is clear evidence of heightened risks to price stability, i.e. when it is established that the degree of inflation persistence is likely to be high and risks disanchoring inflation expectations."

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- This paper: Yes—but beware gradualism can precisely cause disanchoring

Additional Slides

Microfoundations of the Shocks to the Euler Equation

- The representation of the Euler equation we use:

$$x_t = -\sigma(i_t - E_t(\pi_{t+1})) + E_t(x_{t+1}) + v_t$$

- Customary to define $r_t^n \equiv \frac{1}{\sigma} v_t$ and write:

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

- Representations are not equivalent when model uncertainty

- Spuriously make the effect of shocks a function of σ

- The shock v_t originates from:

$$v_t \equiv -(y_t^n - E_t(y_{t+1}^n))$$

$$y_t^n \equiv \frac{\psi + 1}{1 + \psi + \left(\frac{1}{\sigma} - 1\right)\alpha} a_t$$

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Recursive Euler

Under recursive Euler, CB understands effect of policy best when $r_t = 0$

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$$Var^*(x_t) = Var(\sigma) r_t^2$$

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- Define long-term rate $R_t \equiv E_t\left(\sum_{k=0}^{\infty} r_{t+k}\right)$:

Iterated Euler

Under iterated Euler, CB understands effect of policy best when $R_t = 0$

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$$Var^*(x_t) = Var(\sigma) R_t^2 + ...$$

$\rightarrow$ Here, treat case of the iterated Euler (recursive Euler qualitatively similar)

Back

A Cautiousness Bias on Average Inflation

- Cautiousness bias can be an **average bias**, not just an **overreaction bias**
- Generalize the set-up (under NCPC):

$$\pi = -\phi(r - \underline{r}) - \bar{\phi}\underline{r} + \varepsilon + E_{-1}(\pi)$$

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- Generalize the set-up (under NCPC):

$$\pi = -\phi(r - \underline{r}) - \bar{\phi}\underline{r} + \varepsilon + E_{-1}(\pi)$$

- Policy that min. uncertainty is now $\underline{r}$, not necessarily steady-state $\underline{r} = 0$

$$Var(\pi) = V_\phi (r - \underline{r})^2$$

- Unconditional average inflation:

$$E(\pi) = \pi^* - \left(\frac{1}{\alpha} - 1\right)\bar{\phi}\underline{r} \neq \pi^* \text{whenever } \underline{r} \neq 0$$

Proposition 6 (A Cautiousness Bias on Average Inflation)

- *Regardless of the value of $\underline{r}$, the optimal average inflation rate is π^*.*
- *When $\underline{r} \neq 0$, uncertainty concerns make average π depart from π^*.*

Back