Forward Guidance: Communication, Commitment, or Both?

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Unconventional Monetary Policy

- Interest rates at zero in USA, Eurozone, Japan, UK
- Alternative instrument: forward guidance, statements about future policy
Distinction between:

- “Odyssean” forward guidance: meant as a form of commitment
- “Delphic” forward guidance: central bank has superior information, reveals it to the public
Forward Guidance as Cheap Talk

- Forward guidance: a set of statements about likely future policy that:
  - does not *directly* constrain central bank actions
  - does not *directly* change future decision process
  - does not *directly* affect payoffs
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- Forward guidance: a set of statements about likely future policy that:
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  - does not directly change future decision process
  - does not directly affect payoffs

- Forward guidance is cheap talk (in the technical sense)
Goal of this Project

- When does forward guidance work?
- How does it work?
- What does it communicate?
Plan

- Set up a monetary policy game
- Study infinitely repeated interaction (credibility, “embarrassment,”...)
- Set a sequence of economies, discuss where cheap talk in the form of forward guidance emerges
The laboratory model

- Will start from the Barro-Gordon model (repeated game)
- Will add some tweaks as necessary to make relevant points
The shocks

- Potential output $y_t^*$
- Inflation target $\pi_t^*$
- Sunspot (public randomization device) $s_t$
- Will assume compact support
Timing

- At time 0: Nature draws \( \{ y^*_t, \pi^*_t, s_t \}_{t=0}^{\infty} \)
- At time \( t \):
  - Government, private sector receive information: filtration \( G_t \) and \( F_t \)
  - Government may send messages \( m_t \in M \)
  - Households set their expectations \( y^e_t, \pi^e_t \) (either no heterogeneity or aggregation through linearity).
  - Government sets inflation \( \pi_t \in [\pi, \bar{\pi}] \)
  - Output realized
  - Households observe gov’t information
The Phillips curve

\[ y_t = \theta y^*_t + (1 - \theta) y^e_t + \lambda (\pi_t - \pi^e_t). \]

- In Barro-Gordon, \( \theta = 1 \)
- \( \theta < 1 \) allows imperfect information about \( y^*_t \) to matter
Gov’t loss function, household behavior

\[
E \sum_{t=0}^{\infty} \beta^t \left\{ (y_t - y_t^* - k)^2 + \alpha [\pi_t - \pi_t^* - f(y_t^*)]^2 \right\}
\]

- As in Barro-Gordon, \( k \) distortion implies gov’t wants to overstimulate
- Allow for inflation-output interaction through \( f(y_t^*) \)
- \( f(y_t^*) \neq 0 \) will mean that optimal ex ante inflation is not constant wrt output
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- Households set

\[
y_t^e = E[y_t | F_t, m_t]
\]
\[
\pi_t^e = E[\pi_t | F_t, m_t]
\]
Set of equilibria

- Set of Equilibria is big (trigger strategies, tit-for-tat, repeated Nash,...)
- Can be computed using Abreu-Pierce-Stacchetti methods.
A Simple Model without Private Information

- Assume $\mathcal{F}_t = \mathcal{G}_t$
- Government has no information advantage over the private sector
An Equivalence Theorem

- Compare a case in which $|\mathcal{M}| = 1$ (no messages) and one where $|\mathcal{M}| > 1$
- In both games, equilibrium strategies induce a prob. distr. over sequences for $\left\{ \pi_s, y_s \right\}_{s=0}^{\infty}$.
- The set of equilibrium prob. distr. over sequences is the same in the two games.
What the theorem does and does not say

- Forward guidance is a redundant instrument, equilibria can be just as good (or bad) without it
- Pure Odyssean forward guidance may not be needed
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- Forward guidance is a redundant instrument, equilibria can be just as good (or bad) without it
- Pure Odyssean forward guidance may not be needed
- There may be equilibria based on forward guidance
- Forward guidance may affect equilibrium selection (silent on this)
Intuition

- Public announcement is supposed to cause “embarrassment” if policy deviates (Odyssean forward guidance)
- There may be equilibria of this type (announcement believed, trigger based on whether announcement was carried out)
- Same outcome achieved when high inflation carries embarrassment
- Trigger based directly on action
- No need to speak, but just to act!
Adding private information about the Economy

- Assume gov’t observes same info as households + advance signal about $y_t^*$
- Signal observed by private sector at the end of the period
Adding private information about the Economy

- Assume gov’t observes same info as households + advance signal about $y_t^*$
- Signal observed by private sector at the end of the period
- Start with $f(y_t^*) \equiv 0$
Optimal Policy under Commitment (before observing $y_0^*$)

- Announce truthfully $m_t = E[y_t^*|G_t]$;
- Set inflation to $\pi_t^*$.
- Note: announcement strictly improves welfare (cheap talk is essential)
Result under discretion

- When $\beta$ close to 1 or $y^\ell$ sufficiently low, sending messages expands set of equilibrium payoffs.
Result under discretion

- When $\beta$ close to 1 or $y_\ell$ sufficiently low, sending messages expands set of equilibrium payoffs
- When $\bar{\pi}$ sufficiently high and $\beta$ close to 1 (given $\bar{\pi}$), messages only expand towards high payoffs
Intuition

- Folk theorem (for $\beta$), standard cheap talk (for $y^\ell$)
- Why no expansion towards low payoffs? Announcements...
  - Improve best payoff, allow for better continuation promises after punishment stage of worst
  - Tighten incentive-compatibility constraint of worst, harder to punish gov’t (may both misreport and choose different inflation)
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  - For high $\beta, \bar{\pi}$, continuation of worst is not best, first element not present
Does this look like forward guidance?

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- In the example, policy (inflation) unaffected by information
- Reporting policy would not substitute for direct report of information
Announcements when $y_t^*$ affects optimal inflation

- Under commitment, $\pi_t = \pi_t^* + E[f(y_t^*)|G_t]$
- Announcement about $\pi_t$ would reveal information
- Still imperfect, households would want to know signal
- ... also more natural, when people really care about state
Delphic forward guidance: asy info over preferences

- Symmetric info about $y^*_t$; for simplicity, assume $f(y^*_t) \equiv 0$
- Asy info about $\pi^*_t$
Delphic forward guidance: asy info over preferences

- Symmetric info about $y_t^*$; for simplicity, assume $f(y_t^*) \equiv 0$
- Asy info about $\pi_t^*$
- Given policy, private sector has all the info needed to take decisions
- Asy. info only relevant for forecasting CB policy
Optimal Policy under Commitment (best equilibrium outcome for large $\beta$)

- Announce truthfully $\pi_t^*$;
- Set inflation to announced value $\pi_t^*$. 
Optimal Policy under Commitment (best equilibrium outcome for large $\beta$)

- Announce truthfully $\pi_t^*$;
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- As in the case of asy. info about potential output, cheap talk is essential.
- Forward guidance is directly about CB policy.
Delphic forward guidance: asy info over beliefs

- Assume symmetric info about $\pi_t^*$
- Households observe $y_t^*$ perfectly (only need better than gov’t)
- Gov’t observes imperfect signal $\tilde{y}_t$
Optimal Policy under Commitment (best equilibrium outcome for large $\beta$)

- Two options:
  - Announce truthfully $\tilde{y}_t$
  - Announce $\pi_t^* + E[f(y_t^*)|G_t]$
- Set inflation to $\pi_t^* + E[f(y_t^*)|G_t]$
Optimal Policy under Commitment (best equilibrium outcome for large $\beta$)

- Two options:
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- Could reveal signal directly, but people only care about $\pi_t$, might as well reveal $\pi_t$
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With $\beta$ sufficiently close to 1, cheap talk valuable under discretion, expands set of eq. payoffs
What Does this Suggest about Forward Guidance in Practice?

- Can communicate insights into decision process
- Can signal agreement, disagreement among policymakers
- Can signal models policymakers believe in
  (Krugman-Woodford-Eggertsson)
Back to Commitment

- Forward guidance naturally valuable when Delphic
- Role of pure Odyssean forward guidance at best indirect. CBs have long tradition of dealing with time inconsistency.
- Does this mean forward guidance useless for commitment?
Back to Commitment

- Forward guidance naturally valuable when Delphic
- Role of pure Odyssean forward guidance at best indirect. CBs have long tradition of dealing with time inconsistency.
- Does this mean forward guidance useless for commitment?
- Not necessarily.
- Forward guidance expands set of equilibria. When commitment outcome not attainable, can still help support better outcomes
Histories and Strategies

- A (public) history at the message stage is $h^t := \{m_s, \pi_s\}_{s=0}^{t-1}$.
- A (public) history at the expectations-setting stage $h^{et} := (\{m_s, \pi_s\}_{s=0}^{t-1}, m_t)$.
- Set of histories: $H^t, H^{et}$ (use Borel $\sigma$-algebra).
- Underlying state of nature: $\omega$.
- A CB strategy is a $G_t$-measurable mapping $\sigma^g$ from $(\omega, H^t)$ into a distribution over $\mathcal{M}$, and from $(\omega, H^{et}_t)$ into a distribution over $[\pi, \bar{\pi}]$.
- A (symmetric) household strategy is a $F_t$-measurable mapping $\sigma^p$ from $(\omega, H^{et})$ to $[\pi, \bar{\pi}] \times [y^\ell, y^h]$. 
From strategies to outcomes

- Given a pair \((\sigma^g, \sigma^p)\)...
- ... obtain a probability distribution over histories \((\omega, H^\infty)\)
Equilibrium (Sequential)

- A strategy profile \((\sigma^g, \sigma^p)\) such that:
- Given any \((\omega, h^t)\) and given that future play will occur according to \(\sigma^g, \sigma^p\), any message in the support of \(\sigma^g(\omega, h^t)\) is optimal for gov’t.
- Given any \((\omega, h^{et})\) and given that future play will occur according to \(\sigma^g, \sigma^p\), any inflation rate in the support of \(\sigma^g(\omega, h^{et})\) is optimal for gov’t.
- Given any \((\omega, h^{et})\) and \(\sigma^g\),

\[
y_t^e = E[y_t|\mathcal{F}_t, m_t; \sigma^g] \\
\pi_t^e = E[\pi_t|\mathcal{F}_t, m_t; \sigma^g]
\]
An example

- Set $\lambda = 40$, $y^* = 0.01$, $\beta = 0.96$, $\pi^* = 0.02$, $\alpha = 1$
- One equilibrium (trigger strategy):
  - CB offers “forward guidance” that inflation will be 2%;
  - Private sector believes announcement if and only if previous announcements were truthful
  - Otherwise, private sector disregards announcement, expects repeated Nash, 43%
- CB sets $\pi_t$ equal to announcement (2%) if truthful in the past, to 43% otherwise
Equilibrium without Cheap Talk

- Private sector expects 2% inflation, unless different inflation rate occurred in the past
- Otherwise, private sector expects 43%
- CB sets $\pi_t$ to 2% if it never deviated from 2% in the past, to 43% otherwise
Forward guidance further into the future

- Result extends to the case in which announcements concern subsequent periods
- Example of this forward guidance:
  - outstanding 2% announcement for period 0
  - Gov’t announces 2% for period $t + 1$ if no deviation in the past
  - Households believe announcement from previous period if no deviations in the past
  - Gov’t obeys announcement from previous period if no deviations in the past