Managing Expectations: Instruments versus Targets

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Motivation: How to Offer Forward Guidance

- To manage expectations, can talk about...
  - **Instruments**: “will maintain 0% interest rates”
  - **Targets**: “will do whatever it takes for 4% unemployment”
- Reason to prefer one **type** of forward guidance over the other?
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  1. Full commitment
  2. No future shocks (or policy contingent on them)
  3. Rational Expectations + Common Knowledge

“Ramsey world”
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Our focus

Relax (iii) and explore role of bounded rationality
Our Approach

Set-up

- Formalize question in simple “beauty contest” game
  - stylizes NK at ZLB
- Add “bounded rationality”
  - belief inertia (lack of CK, level-k thinking)
  - other forms (belief over-reaction, animal spirits)
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Form of forward guidance

- REE = knife-edge case of instrument/target irrelevance
- Otherwise, choice determines bite of bounded rationality
Main Result

What to do and why

Minimize agents’ need to “reason about the economy” (i.e., about the behavior of others/equilibrium effects) with

- Instrument communication when GE feedback is weak
- Target communication when GE feedback is strong

e.g., talk about $Y$ rather than $R$ when faced with
  - steep Keynesian cross
  - long liquidity trap
**Literature**

- **Instruments vs Targets**
  Poole (1970), Weitzman (1974)

- **Micro-foundations of Beauty Contests**
  **NK**: Angeletos & Lian (2018), Farhi & Werning (2018)

- **Forward Guidance, GE Attenuation and Myopia**
  Angeletos & Lian (2016, 2018): *HOB*
  Farhi & Werning (2018), Garcia-Schmidt & Woodford (2018): *Level k*
  Gabaix (2018): *cognitive discounting*

- **Communication in Beauty Contests, Information Design**
Model
Notation and Behavior

\[ K = \int_i k_i \, di = \text{average action today} \]

\[ Y = \text{outcome (target) in the future} \]

\[ \tau = \text{instrument in the future} \]
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\[ \gamma \in (0, 1) \text{ parameterizes GE feedback} \]
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Story (microfoundation in paper)

ZLB today, but not tomorrow

\[ K = \text{spending today; } Y = \text{income today plus tomorrow} \]

\[ \tau = \text{(negative of) interest rate tomorrow} \]

Forward guidance via substitution (PE) or income (GE) effect
Outcomes

Policy also has direct effect

\[ Y = (1 - \alpha)\tau + \alpha K \]

\[ \alpha \in (0, 1) \]
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Story (microfoundation in paper)

Loose policy tomorrow → higher output tomorrow
The Key Equations, and the Key Issue

\[ k_i = (1 - \gamma)E_i[\tau] + \gamma E_i[Y] \]
\[ Y = (1 - \alpha)\tau + \alpha K \]

- **No guidance**: Agents have to forecast both \( \tau \) and \( Y \)
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- Instrument communication: know \( \tau \), have to think about \( Y \)
- Target communication: know \( Y \), have to think about \( \tau \)
Putting it Together

$$\min_{\theta \mapsto (\tau, Y)} \mathbb{E}[(1 - \chi)(\tau - \theta)^2 + \chi (Y - \theta)^2]$$

s.t. $(\tau, Y)$ is implementable in equil, given eq. (1)-(2) and announcement of $\tau$ or $Y$

Timing

$t = 0$ (FOMC meeting): Policymaker sees $\theta$, makes announcement

$t = 1$ (liquidity trap): Agents form beliefs and choose $k_i$

$t = 2$ (exit): $\tau$ and $Y$ are realized
Frictionless, REE Benchmark

Benchmark ≡ representative, rational and attentive agent
    (CK of both announcement and rationality)

⇒ no error in predicting behavior of others:

\[ E_i[K] = K \]

⇒ any equilibrium satisfies

\[ k_i = K = Y = \tau \]

⇒ irrelevant whether PM announces \( \tau \) or \( Y \)

(equivalence of primal and dual problems)
Friction: Lack of CK / Anchored Beliefs

- **Assumption:** Lack of CK of announcement
  
  Let $X \in \{\tau, Y\}$ be the announcement. Agents are rational and attentive but think only fraction $\lambda \in [0, 1]$ of others is attentive:

  $E_i[X] = X \quad E_i[E[X]] = \lambda E_i[X]$  

- Mimics role of HOB in incomplete-info settings
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- **Implication:** Anchored Beliefs
  
  $$\bar{E}[K] = \lambda K$$
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• **Mimics role of HOB in incomplete-info settings**

• **Implication:** Anchored Beliefs

$$\bar{E}[K] = \lambda K$$

• **Level-K Thinking:**
  • similar flavor: relaxing CK of rationality
  • identical results except for one “bug”

• **Cognitive discounting:** same, minus PE
Main Results
Game after Announcing $\tau$

\[ K = (1 - \gamma)\bar{E}[\tau] + \gamma\bar{E}[Y] \]
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(reasoned by agents)

$$= (1 - \alpha)\bar{E}[\tau] + \alpha\bar{E}[K]$$

$$= \tau \text{ (fixed by FG)}$$

• Game of complements
  
  "I expect less spending and income, so I spend less"

• Friction reduces effectiveness of FG

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\[ \alpha \gamma \in (0, 1) \]

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- Game of **complements**
  
  “I expect less spending and income, so I spend less”

- Friction **reduces** effectiveness of FG

Game after Announcing $Y$

$$K = (1 - \gamma)\bar{E}[\tau] + \gamma\bar{E}[Y]$$
Game after Announcing \( Y \)

\[
K = (1 - \gamma)\bar{E}[\tau] + \gamma\bar{E}[Y]
\]

(reasoned by agents)

\[
= \frac{1}{1-\alpha}\bar{E}[Y] - \frac{\alpha}{1-\alpha}\bar{E}[K]
\]

\[
= Y \quad \text{(fixed by FG)}
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Game after Announcing $Y$

$K = (1 - \gamma) \bar{E}[\tau] + \gamma \bar{E}[Y]$

(reasoned by agents)

$= \frac{1}{1-\alpha} \bar{E}[Y] - \frac{\alpha}{1-\alpha} \bar{E}[K]$

$= Y$ (fixed by FG)

$K = (1 - \delta_Y) Y + \delta_Y \bar{E}[K]$

$- \frac{(1-\gamma)\alpha}{1-\alpha} \leq 0$
Game after Announcing $Y$

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- Game of **substitutes**
  
  “I expect less spending, so I expect looser policy and spend *more*”

- Friction **increases** effectiveness of FG
  
  Turns FG literature upside down
Proposition: implementable sets

The implementable sets of \((\tau, Y)\) pairs for each strategy are

\[
\{(\tau, Y) : \tau = \mu_{\tau}(\gamma, \lambda)Y\} \quad \text{and} \quad \{(\tau, Y) : \tau = \mu_{Y}(\gamma, \lambda)Y\}
\]

- Instrument communication
- Target communication

For any \(\gamma \in (0, 1)\) and \(\lambda \in (0, 1)\),

\[\mu_{\tau}(\gamma, \lambda) > 1 > \mu_{Y}(\gamma, \lambda)\]

Remarks

- Friction \(\neq \) "everything is dampened"
- TC keeps powder dry: what about forward guidance puzzle?
Implementability

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Instrument communication \hspace{2cm} Target communication

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**Instrument communication**

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Proposition

\[ \frac{\partial \mu_\tau}{\partial \gamma} > 0 \]
\[ \frac{\partial \mu_Y}{\partial \gamma} > 0 \]

Can prove these slope up, *and* never cross

Recall: \( \mu = \frac{\partial \tau}{\partial Y} \)
**Distortion and GE Feedback**

**Proposition**

\[
\frac{\partial \mu_{\tau}}{\partial \gamma} > 0 \\
\frac{\partial \mu_{Y}}{\partial \gamma} > 0
\]

**Quick intuition**

Distortion from reasoning about what is not announced

High $\gamma \rightarrow$ very important to figure out $Y$, not so much $\tau$

Recall: $\mu = \frac{\partial \tau}{\partial Y}$

Can prove these slope up, *and* never cross

as $\gamma$ (GE) increases $\Rightarrow$ 

- distortion under IC increases
- distortion under TC decreases
Theorem: optimal communication

There exists a $\hat{\gamma} \in (0, 1)$ ("critical GE feedback") such that

- $\gamma < \hat{\gamma}$: optimal to communicate instrument
- $\gamma \geq \hat{\gamma}$: optimal to communicate target
Main Result

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Additional result in paper:

precise value of announced $\tau$ or $\mathcal{Y}$
Broader Scope
Other Frictions

Assumption: generalized form of incorrect reasoning

Let $\epsilon$ be noise orthogonal to $\theta$.

$$\bar{E}[K] = \lambda K + \sigma \epsilon \quad \lambda, \sigma > 0$$

nests: under-reaction ($\lambda < 1$), over-reaction ($\lambda > 1$), and noise or animal spirits ($\sigma > 0$)

- Optimal policy result goes through
- Intuition: all about limiting the role of $\bar{E}[K]$
  - i.e., the “more thinking $=$ more distortion” result extends
Policy Rules

Announce a linear policy rule: \( \tau = A - BY \)

Optimal \((A, B)\) indeterminate in RE benchmark

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Announce a linear policy rule: $\tau = A - BY$

Optimal $(A, B)$ indeterminate in RE benchmark

Proposition: optimal linear policy with distorted beliefs

For each $\gamma$, there exists $(A^*(\gamma), B^*(\gamma))$ that uniquely solves the policy problem for all $(\lambda, \sigma)$. $B^*(\gamma)$ increases in $\gamma$.

- High $\gamma \rightarrow$ tilt toward TC ("smoothed result")
- New perspective on policy rules
  - Optimal $\Rightarrow$ reduces bite of bounded rationality
  - Uniqueness in tiny deviations from frictionless case
Conclusion
Managing (Distorted) Expectations

- **Goal**: optimal policy rules and communication given frictional coordination or bounded rationality
- **Lesson**: ease the burden of reasoning about the economy
- **More in the paper**: unobserved shocks; relation to Poole/Weitzman; more policy options; other settings