Managing Expectations without RE: Instruments versus Targets

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How to Manage Expectations?

- **Instruments**: “will maintain 0% interest rates for $\tau$ quarters”
- **Targets**: “will bring unemployment down to $Y\%$’
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**Instrument Communication**
August 2011: “The Committee [FOMC] currently anticipates ... exceptionally low levels for the federal funds rate at least through mid 2013.”
January 2012: horizon extended to “... at least through late 2014.”
September 2012: horizon extended to ” ... at least through mid 2015 .”

**Target Communication** (reserved?)
December 2012: “... as long as the unemployment rate remains above 6 1/2 percent, inflation between one and two years ahead is projected to be no more [than 2.5%], and longer-term inflation expectations continue to be well anchored.”
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**Target Communication** (resolute?)

“do whatever it takes” (and perhaps won’t bother to tell you how)
Instrument vs Target Communication

- Reason to prefer one over the other?

  - **NO** in benchmark with “Ramsey world”
    - (i) Full credibility
    - (ii) No future shocks (or policy contingent on them)
    - (iii) Rational Expectations + Common Knowledge
Instrument vs Target Communication

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“Ramsey world”

Our focus

Relax (iii) and explore role of bounded rationality
Main Lesson

<table>
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<th>Optimal Forward Guidance</th>
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<td>▶ Instrument communication when GE feedback is weak</td>
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<td>▶ Target communication when GE feedback is strong</td>
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Stop talking about $R$ and start talking about $u, Y$ when:

- ✓ long ZLB
- ✓ steep Keynesian cross
- ✓ strong financial accelerator

Rationale: help minimize

- ✓ agents' need to “reason about the economy”
- ✓ distortion due to bounded rationality
- ✓ lack of confidence
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Literature

- Instruments vs Targets
  Poole (1970), Weitzman (1974), Taylor rules

- Micro-foundations of Beauty Contests

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

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

\[ C = \int c_i \, di = \text{average action today} \]

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

\[ \tau = \text{instrument in the future} \]

\[ c_i = (1 - \gamma) \mathbb{E}_i[\tau] + \gamma \mathbb{E}_i[Y] \]

\[ \gamma \in (0, 1) \] parameterizes GE feedback
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Story (microfoundation in paper)

ZLB today, but not tomorrow

\[ C = \text{spending today}; \ Y = \text{income today plus tomorrow} \]
\[ \tau = \text{minus interest rate tomorrow (or for how long thereafter)} \]
\[ \gamma = \text{Keynesian multiplier} \]
Final outcome depends on realized behavior and policy

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

\( \alpha \in (0, 1) \) parameterizes direct policy effect

**Story (microfoundation in paper)**

Loose policy tomorrow \( \rightarrow \) higher output tomorrow
The Model (just 2 equations!)

\[ c_i = (1 - \gamma)E_i[\tau] + \gamma E_i[Y] \]  (1)

\[ Y = (1 - \alpha)T + \alpha C \]  (2)
The Model (just 2 equations!) and the Key Issue

\[ c_i = (1 - \gamma)E_i[\tau] + \gamma E_i[Y] \]  \hspace{1cm} (1)

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- **No guidance**: Agents have to forecast both \( \tau \) and \( Y \)
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- **Instrument communication**: know \( \tau \), have to think about \( Y \)
The Model (just 2 equations!) and the Key Issue

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

\( t = 0 \) (FOMC meeting): PM sees \( \theta \) (ideal point) and announces either \( \tau = \hat{\tau} \) (IC) or \( Y = \hat{Y} \) (TC)

\( t = 1 \) (liquidity trap): Agents form beliefs and choose \( c_i \)

\( t = 2 \) (exit): \( C, \tau \) and \( Y \) are realized
Timing

\[ t = 0 \text{ (FOMC meeting): PM sees } \theta \text{ (ideal point) and announces} \]
\[ \text{either } \tau = \hat{\tau} \text{ (IC) or } Y = \hat{Y} \text{ (TC)} \]

\[ t = 1 \text{ (liquidity trap): Agents form beliefs and choose } c_i \]

\[ t = 2 \text{ (exit): } C, \tau \text{ and } Y \text{ are realized} \]

The Policy Problem

\[
\min_{\theta \mapsto \text{message,}(\tau,Y)} \mathbb{E}[ (1 - \chi)(\tau - \theta)^2 + \chi(Y - \theta)^2 ]
\]
\[ \text{s.t. } (\tau, Y) \text{ is implementable in equil given} \]
\[ \text{eq. (1)-(2) and message } \tau = \hat{\tau} \text{ or } Y = \hat{Y} \]
Frictionless, REE Benchmark

Benchmark \equiv \text{representative, rational and attentive agent}

(CK of both announcement and rationality)

\implies \text{no error in predicting behavior of others:}

\[ E_i[C] = C \]

\implies \text{any equilibrium satisfies}

\[ c_i = C = Y = \tau \]

\implies \text{irrelevant whether PM announces } \tau \text{ or } Y

(\text{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:

$$E_i[X] = X \quad E_i[E[X]] = \lambda E_i[X]$$
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- **Convenient proxy for**
  - HOB in incomplete-info settings
  - **Level-C Thinking:** same essence, but a “bug”
  - **Cognitive discounting:** same for GE, but adds PE distortion
Friction: Lack of CK / Anchored Beliefs

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▶ Convenient proxy for
- HOB in incomplete-info settings
- Level-C Thinking: same essence, but a "bug"
- Cognitive discounting: same for GE, but adds PE distortion

▶ Key shared implication: Anchored Beliefs

$$\bar{E}[[C]] = \lambda C$$
Main Results
1. Friction *attenuates* power of FG under IC

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2. Friction *amplifies* power of FG under TC
Preview of Argument

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3. Role of GE: As $\gamma \uparrow$, first distortion $\uparrow$ and second $\downarrow$
Preview of Argument

1. Friction attenuates power of FG under IC

2. Friction amplifies power of FG under TC

3. Role of GE: As $\gamma \uparrow$, first distortion $\uparrow$ and second $\downarrow$

4. Optimality: TC $\succ$ IC if and only if $\gamma$ large enough
IC: Game after Announcing $\tau$

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

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

( reasoning by agents )

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

\[ = \tau \text{ (fixed by FG) } \]
IC: Game after Announcing $\tau$

( reasoned by agents)

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

$\gamma \in (0, 1)$

$C = (1 - \delta_{\tau})\tau + \delta_{\tau}\bar{E}[C]$
IC: Game after Announcing $\tau$

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

(reasoned by agents)

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

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

$$C = (1 - \delta_{\tau})\tau + \delta_{\tau}\bar{E}[C]$$

$\alpha \gamma \in (0, 1)$

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

- Friction **reduces** effectiveness of FG

TC: Game after Announcing $Y$

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

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

(reasoned by agents)

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

$= Y$ (fixed by FG)
TC: Game after Announcing $Y$

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

Reasoned by agents

\[ = Y \text{ (fixed by FG)} \]

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

\[ - \frac{(1-\gamma)\alpha}{1-\alpha} \leq 0 \]

- 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
Implementability

Proposition: implementable sets

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

Instrument communication

\[ \{ (\tau, Y) : \tau = \mu_Y(\gamma, \lambda) Y \} \]

Target communication

- Friction $\neq$ “everything is dampened”
- TC keeps powder dry
The Role of the GE Feedback

**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 from reasoning about what is not announced is very high when \( \gamma \) is large, but not as important for \( Y \), not so much for \( \tau \)"

"\( \mu \) changes as \( \gamma \) (GE) increases ⇒ distortion under IC increases, distortion under TC decreases"
The Role of the GE Feedback

**Proposition**

\[ \frac{\partial \mu_T}{\partial \gamma} > 0 \]
\[ \frac{\partial \mu_Y}{\partial \gamma} > 0 \]

**Quick intuition**

Distortion from reasoning about what is not announced

High \( \gamma \) → very important to figure out \( Y \), not so much \( \tau \)

As \( \gamma \) (GE) increases \( \Rightarrow \) distortion under IC increases
distortion under TC decreases

Can prove these slope up, *and* never cross

Recall: \( \mu = \frac{\partial \tau}{\partial Y} \)
Main Result

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

Additional results in paper: precise values of optimal message and attained \((\tau, Y)\)
Main Result

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precise values of optimal message and attained $(\tau, Y)$

variant with Level-k Thinking
Application: Forward Guidance at the Zero Lower Bound
Forward Guidance at ZLB

- Angeletos & Lian (AER 2018)
  - lack of CK attenuates GE effects of FG
  - longer horizon $\Rightarrow$ longer GE chains $\Rightarrow$ more distortion

- Farhi & Werning (2018)
  - similar attenuation with Level-k Thinking
  - inco markets $\Rightarrow$ steeper Keynesian cross $\Rightarrow$ more distortion

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Forward Guidance at ZLB

- Our paper: bypass friction with target communication
  - “stop talking about $R$, start talking about $Y$ or $U$”
  - preferable when longer ZLB or steeper Keynesian cross
- Reminiscent of Mario Draghi’s “do whatever it takes”
  - relies on strong GE feedback but not multiple equilibria
  - common logic: alleviate concerns about behavior of others
Broader Scope
Generalized Departure from RE

- Misspecified beliefs:

\[
\tilde{E}[C] = \lambda C + \sigma \epsilon
\]

where \( \lambda, \sigma > 0 \) and \( \epsilon \) is orthogonal to \( \theta \)

- Nests:
  - under-reaction \((\lambda < 1)\): FG literature
  - over-reaction \((\lambda > 1)\): Shleifer et al
  - noise or animal spirits \((\sigma > 0)\)
Generalized Departure from RE

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  - under-reaction \((\lambda < 1)\): FG literature
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- Optimal policy result goes through
  - intuition: all about limiting the role of \( \bar{E}[C] \)
  - i.e., “more thinking = more distortion” result extends
Policy Rules

- Announce a linear rule:

\[ \tau = \phi_0 - \phi_y Y \]

(e.g., state-contingent “intercept” and “slope” of Taylor rule)

- RE (\(\lambda = 1\)) \(\Rightarrow\) optimal (\(\phi_0, \phi_y\)) is indeterminate
Policy Rules

- Announce a linear rule:
  \[ \tau = \phi_0 - \phi_y Y \]
  (e.g., state-contingent “intercept” and “slope” of Taylor rule)
- RE \((\lambda = 1) \Rightarrow \) optimal \((\phi_0, \phi_y)\) is indeterminate

Optimal rule with bounded rationality \((\lambda < 1)\)

- Determinacy: unique optimal \((\phi_0^*, \phi_y^*)\)
- GE: optimal \(\phi_y^*\) increases with GE multiplier \((\gamma)\)

- I.e., smoothed version of earlier result:
  higher \(\gamma \rightarrow\) tilt toward target communication
Conclusion
Take-Home Lessons

How to communicate / manage expectations?

- Tilt focus from $R$ path to $u$, $Y$ targets when feedback loops are strong

New perspective on Taylor rules

- Traditional: demand vs supply shocks
- Here: arrest bounded rationality or nearly self-fulfilling traps

Extend logic from multiple equil (Mario Draghi) to unique equil

- large multipliers $\rightarrow$ HOB critical $\rightarrow$ “nearly” self-fulfilling $\rightarrow$
Supplementary Material
**Level-\(k\): Similar but Less Sharp**

- **Instrument comm** (games of complements): the same
  - others are less rational \(\approx\) others are less attentive
- **Target comm** (games of substitutes): a bug
  - distortion changes sign between even and odd \(k\)

- Our preferred formulation avoids the bug
- Cognitive discounting avoids it too (but confounds PE-GE)
**FG: Three GE Feedbacks**

1. Within Dynamic IS: Keynesian cross
2. Within NKPC: dynamic pricing complementarity
3. Across: inflation-spending feedback

- ▶ All three: intensify with length of ZLB / horizon of FG
FG: Numerical Illustration

- Textbook NK model, with modest friction \((\lambda = .75)\)

![Graph showing attenuation effect over horizon T in quarters]

- Attenuation by 90% when ZLB last 5 years
- Plus, discontinuity at infinite horizons