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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  (ii) No future shocks (or policy contingent on them)

  (iii) Rational Expectations + Common Knowledge

"Ramsey world"

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Our focus

Relax (iii) and explore role of bounded rationality

Set Up

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

Main Lesson: What to do and why

What to do

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

stop talking about R and start talking about Y or U when

✓ long ZLB ✓ steep Keynesian cross ✓ strong financial accelerator

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Why

- Minimize agents' need to "reason about the economy"
  (i.e., about the behavior of others/equilibrium effects)

Literature

- Instruments vs Targets

  Poole (1970), Weitzman (1974)

- Micro-foundations of Beauty Contests

  RBC: Angeletos & La'O (2010, 2013), Huo & Takayama (2015)

  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

  Morris & Shin (2002, 2007), Angeletos & Pavan (2007)

  Kamenica & Gentzkow (2011), Bergemann & Morris (2013, 2018)

Model

Notation and Behavior

$K = \int_i k_i \, \mathrm{d}i =$ average action today

$Y =$ outcome (target) in the future

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Story (microfoundation in paper)

ZLB today, but not tomorrow

K = spending today; Y = income today plus tomorrow

τ = (negative of) interest rate tomorrow

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

Outcome

Final outcome depends on realized behavior and policy

$$Y = (1 - \alpha)\tau + \alpha K$$

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Story (microfoundation in paper)

Loose policy tomorrow $\rightarrow$ higher output tomorrow

The Key Equations, and the Key Issue

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

$$Y = (1-\alpha)\tau + \alpha K \tag{2}$$

- **No guidance**: Agents have to forecast both τ and Y

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- No guidance: Agents have to forecast both τ and Y
- Instrument communication: know τ, have to think about Y
- **Target communication**: know Y, have to think about τ

Timing

$t = 0$ (FOMC meeting): PM sees θ, announces $\tau = \hat{\tau}$ or $Y = \hat{Y}$

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

$t = 2$ (exit): K, τ and Y are realized

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The Policy Problem

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

s.t. (τ, Y) is implementable in equil given

eq. (1)-(2) and message $\tau = \hat{\tau}$ or $Y = \hat{Y}$

Frictionless, REE Benchmark

Benchmark $\equiv$ representative, rational and attentive agent

(CK of both announcement and rationality)

$\Longrightarrow$ no error in predicting behavior of others:

$$\mathbb{E}_i[K] = K$$

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$\Longrightarrow$ no error in predicting behavior of others:

$$\mathbb{E}_i[K] = K$$

$\Longrightarrow$ any equilibrium satisfies

$$k_i = K = Y = \tau$$

$\Longrightarrow$ irrelevant whether PM announces τ 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:

$$\mathbb{E}_i[X] = X \qquad \mathbb{E}_i[\bar{\mathbb{E}}[X]] = \lambda \mathbb{E}_i[X]$$

- Mimics role of HOB in incomplete-info settings

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- 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 τ

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

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(reasoned by agents)

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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

  Stylizes Angeletos & Lian (2018), Farhi & Werning (2018), Gabaix (2018), Garcia-Schmidt & Woodford (2018)

Game after Announcing Y

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

Game after Announcing Y

(reasoned by agents)

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

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

$= Y$ (fixed by FG)

Game after Announcing Y

(reasoned by agents)

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

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

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

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

Game after Announcing Y

(reasoned by agents)

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$$K = (1-\delta_Y)Y + \underbrace{\delta_Y}_{-\frac{(1-\gamma)\alpha}{1-\alpha} \leq 0}\bar{\mathbb{E}}[K]$$

- 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

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

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

Instrument communication

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

Target communication

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

attenuation $\leftarrow$ $\mu_\tau(\gamma, \lambda) > 1 > \mu_Y(\gamma, \lambda)$ $\rightarrow$ amplification

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Instrument communication — Target communication

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attenuation $\mu_\tau(\gamma, \lambda) > 1 > \mu_Y(\gamma, \lambda)$ amplification

Remarks

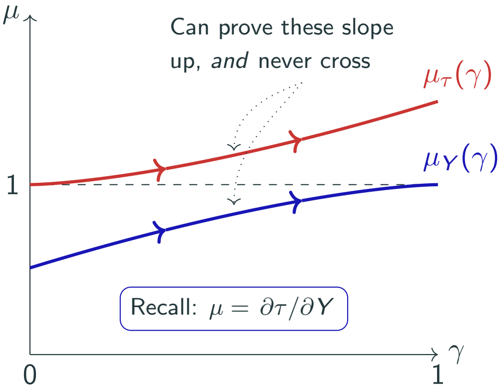
- Friction $\neq$ "everything is dampened"
- TC keeps powder dry: what about forward guidance puzzle?

Distortion and GE Feedback

Proposition

$\partial \mu_\tau / \partial \gamma > 0$

$\partial \mu_Y / \partial \gamma > 0$



Distortion and GE Feedback

Proposition

$\partial \mu_\tau / \partial \gamma > 0$

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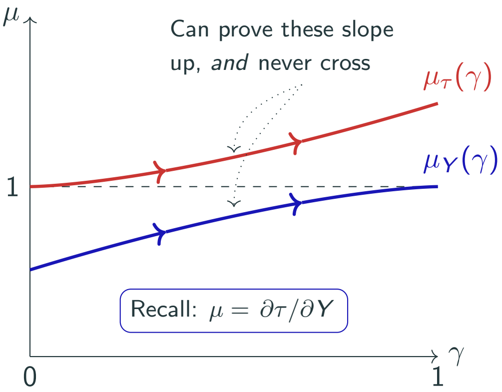
Quick intuition

Distortion from reasoning about what is not announced

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



$$\text{as } \gamma \text{ (GE) increases} \Rightarrow \begin{cases} \text{distortion under IC increases} \\ \text{distortion under TC decreases} \end{cases}$$

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

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Additional results in paper:

precise values of optimal message and attained (τ, Y)

variant with Level-k Thinking Level-k

Application: Forward Guidance at the Zero Lower Bound

Forward Guidance at ZLB

- Angeletos & Lian (AER, 2018)
  - lack of CK attenuates GE effects of FG details
  - longer horizon ⇒ longer GE chains ⇒ more distortion

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  - lack of CK attenuates GE effects of FG details
  - longer horizon ⇒ longer GE chains ⇒ more distortion
- Farhi & Werning (2018)
  - similar point replacing lack of CK with Level-k Thinking
  - inco markets ⇒ steeper Keynesian cross ⇒ more distortion
- See also Garcia & Woodford (2018), Gabaix (2018), Iovino & Sergeyev (2018), Andrade, Gaballo, Mengus & Mojon (2018)

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 Form of Incorrect Reasoning

Assumption: generalized form of incorrect reasoning

Let ϵ be noise orthogonal to θ.

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

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 $\bar{\mathbb{E}}[K]$
  - 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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Proposition: optimal linear policy with distorted beliefs

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

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

Conclusion

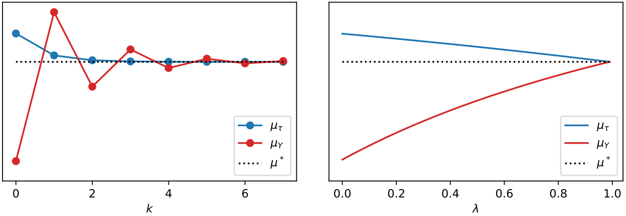
Managing (Distorted) Expectations

- *Goal:* policy with 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

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



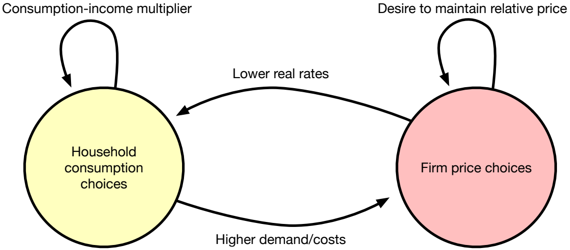
- Our preferred formulation avoids the bug

go back

- Cognitive discounting avoids it too (but confounds PE-GE)

FG: Three GE Feedbacks

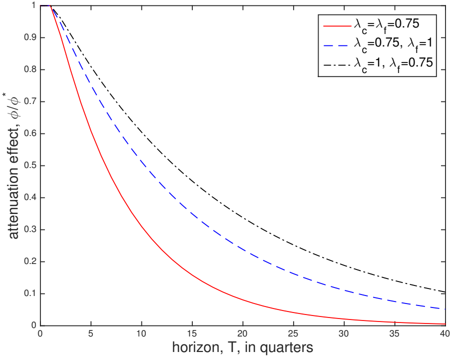
1. Within Dynamic IS: Keynesian cross
2. Within NKPC: dynamic pricing complementarity
3. Across: inflation-spending feedback



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

FG: Numerical Illustration

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



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

go back