Average Inflation Targeting: Time Inconsistency and Intentional Ambiguity

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Ambiguous Communication

Chair Powell announced a new operating framework of average inflation targeting at 2020 Jackson Hole Symposium

> *"In seeking to achieve inflation that averages 2% over time, we are not tying ourselves to a particular mathematical formula that defines the average."*

BoC Kozicki at Fed Listens

> *"Average inflation... need to choose average period for inflation..."*

Brunnermeier at 2021 Jackson Hole Symposium

> *"Average inflation targeting over how many periods?"*

Research Question

Q: Is there any benefit to ambiguous communication?

A: Potentially yes!

Contribution

We focus on two key issues

- Time inconsistency
  - AIT improves the trade-off in Phillips curve
  - Central bank has an incentive to deviate ex post
- Ambiguous communication
  - Flexibility motive:
    optimal horizon of AIT announcement is time dependent
  - Credibility motive:
    ambiguous communication improves central bank's credibility

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Outline

1. Full-Information Rational Expectations & Phillips Curve

2. Time Inconsistency & Flexibility Motive of Ambiguous Communication

3. Social Learning & Credibility Motive of Ambiguous Communication

Central Bank's Problem

- Central bank's objective function

$$\mathbb{L}_t^{cb}(L) = \frac{1}{2}\left(\left(\frac{\pi_t + \pi_{t-1} + \dots \pi_{t-L+1}}{L}\right)^2 + \lambda^{cb}(L)\hat{y}_t^2\right) + \beta\,\mathbb{E}_t\,\mathbb{L}_{t+1}^{cb}(L) \quad (1)$$

- Period loss of social welfare

$$\mathcal{L}_t = \frac{1}{2}\left(\pi_t^2 + \lambda\hat{y}_t^2\right).$$

which corresponds to $L = 1, \lambda^{cb} = \lambda$ in (1)

- Central bank minimizes (1) subject to the forward-looking Phillips curve

$$\pi_t = \beta\,\mathbb{E}_t\,\pi_{t+1} + \kappa\hat{y}_t + u_t.$$

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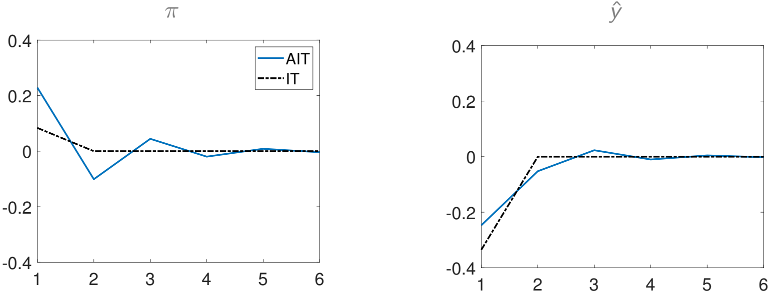
Equilibrium

We start with 2-period AIT to gain some intuition

$$\begin{aligned} \pi_t &= a_\pi \pi_{t-1} + b_\pi u_t \\ \hat{y}_t &= a_y \pi_{t-1} + b_y u_t \end{aligned}$$

$a_\pi < 0 \Rightarrow$ inflation oscillates.

IRFs to a one-unit iid cost-push shock



The Expectations Channel

The Expectations Channel implies lower positive inflation

- Forward-looking Phillips curve

$$\pi_t = \beta\,\mathbb{E}_t\,\pi_{t+1} + \kappa\hat{y}_t + u_t.$$

For AIT

$$\mathbb{E}_t\,\pi_{t+1} = \underbrace{a_\pi}_{<0}\,\pi_t$$

- Reduced-form Phillips curve for AIT

$$\pi_t = \frac{\kappa}{1-\beta a_\pi}\hat{y}_t + \frac{1}{1-\beta a_\pi}u_t$$

Reduced-form Phillips curves for IT

$$\pi_t = \kappa\hat{y}_t + u_t.$$

$a_\pi < 0 \Rightarrow 1-\beta a_\pi > 1 \Rightarrow$ AIT has smaller intercept and slope.

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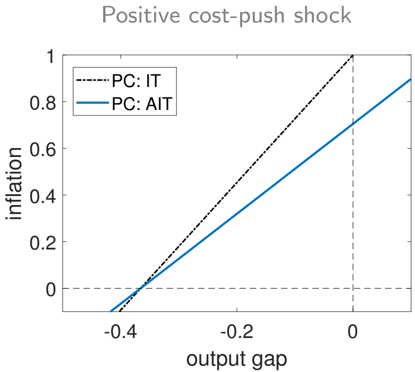
Reduced-Form Phillips Curves



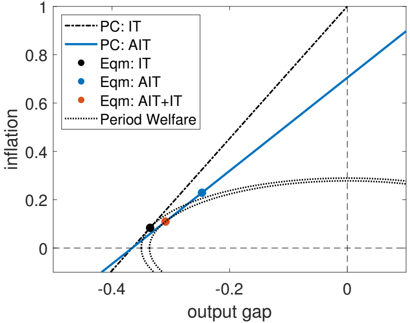
AIT

- has a smaller intercept and slope
- closer to the origin ⇒ better trade-off (only quadrant II is relevant)

▸ lagged inflation

Time Inconsistency

- AIT has a more favorable Phillips curve, but doesn't guarantee higher welfare
- Time inconsistency: announce AIT but implements IT (red dot)



- Time inconsistency leads to two motives for ambiguous communication

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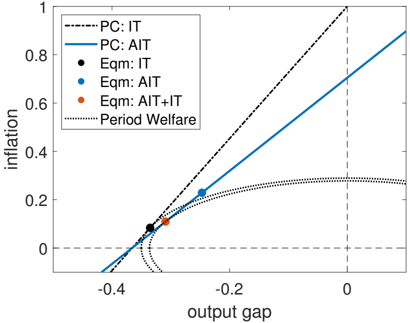

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Optimal Multi-Period AIT Announcements

We have discussed $L = 2$.

What's the optimal strategy for any L?

- Suppose a shock hits at t
- One optimal strategy is to announce $L = 2$ from $t + 1$ onward
- Why? At $t + h$,

$$\pi_{t+h} = \frac{\kappa}{1 - \beta a_{\pi,1}^{(L)}} \hat{y}_{t+h} + \sum_{l=1}^{L-2} \frac{\beta a_{\pi,l+1}^{(L)}}{1 - \beta a_{\pi,1}^{(L)}} \pi_{t+h-l} + \frac{1}{1 - \beta a_{\pi,1}^{(L)}} u_{t+h}.$$

intercept is zero for $L = 2 \Rightarrow$ dual stability

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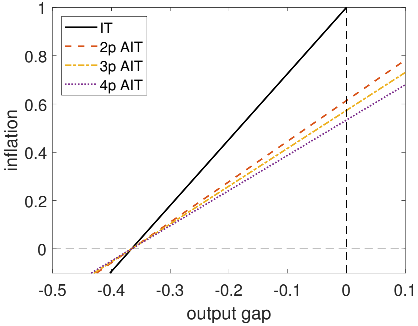
Flexibility Motive of Ambiguous Communication

- What's optimal at t?
- CB implements IT ex post $\Rightarrow$ compare equilibria $\leftrightarrow$ compare Phillips curves



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- Ambiguous communication can accommodate such flexibility ▸ λ^* ▸ Welfare

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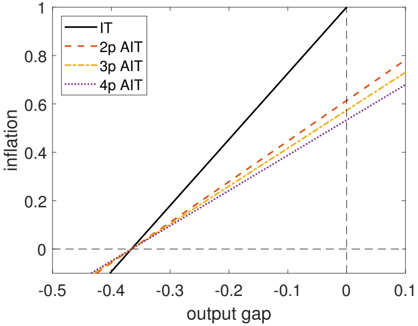

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Social Learning

- So far, we have assumed the central bank has full credibility.
- We assess this assumption with social learning e.g. Hachem and Wu (2017)
- Sequence of events

$t-1$: [L_t^i formed]
↓
t: [u_t realized, u_t^i observed, nowcast formed] → [forecast formed, π_t and $\hat{y}_t$ realized] → [Social learning, L_{t+1}^i updated]

- The central bank minimizes the welfare loss subject to

$$\pi_t = \beta \bar{\mathbb{E}}_t \pi_{t+1} + \kappa \hat{y}_t + u_t.$$

where

$$\bar{\mathbb{E}}_t \pi_{t+1} = \frac{1}{N} \sum_i \mathbb{E}_t^i \pi_{t+1}$$

Details

- Agents meet in pairs and compare nowcast errors

$$\varepsilon_t^i = |\mathbb{E}(\pi_t | \mathcal{I}_{t-1}, L_t^i, u_t^i) - \pi_t| + w|\mathbb{E}(\hat{y}_t | \mathcal{I}_{t-1}, L_t^i, u_t^i) - \hat{y}_t|.$$

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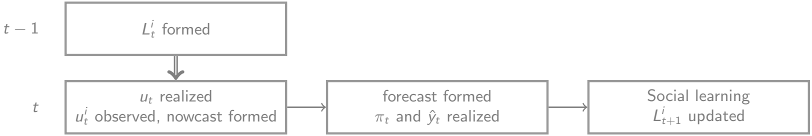

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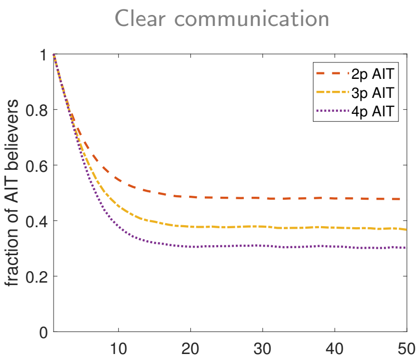
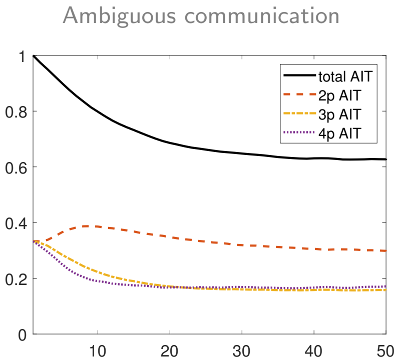
Credibility Motive of Ambiguous Communication



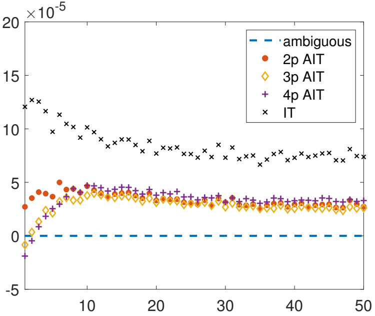


- Simulation: random shock each period, average over 1000 draws
- Clear communication: 2-period AIT has most believers
- Ambiguous communication improves credibility

Welfare

Welfare

Relative loss to ambiguous communication

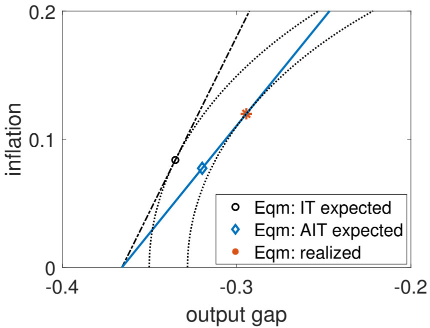


Clear communication:

- IT is universally the worst
- 4-period is best initially: best Phillips curve ▸ PC
- But loses credibility quickly ▸ Cred

Ambiguous communication is associated with the smallest loss

Why Can AIT Perform Better When the Truth is IT?



AIT believers

- have a smaller error on the output gap ▸ λ^*
- hence a smaller overall error if w is large

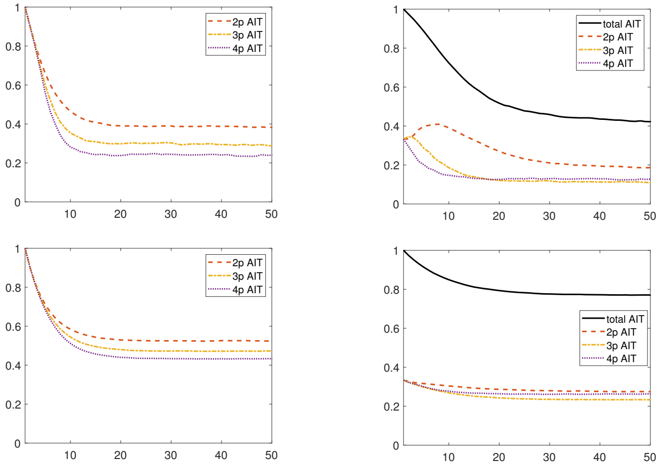
$$\varepsilon_t^i = |\,\mathbb{E}_t^i\,\pi_t - \pi_t| + w|\,\mathbb{E}_t^i\,\hat{y}_t - \hat{y}_t|.$$

Different weights in the nowcast error

clear communication | ambiguous communication

$w = 0$

$w \to \infty$

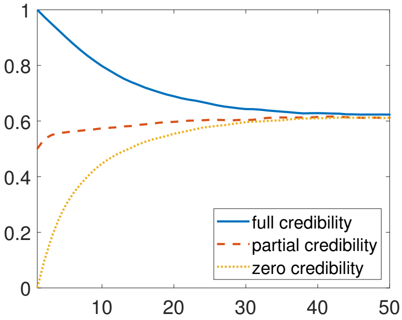


- AIT has a larger following with larger w.
- Ambiguous communication is always better

Initial Credibility

- We have assumed the central bank starts with full credibility
- Coibion et al.(2020) use survey data to show little public understanding

Total fraction of AIT believers with ambiguous communication

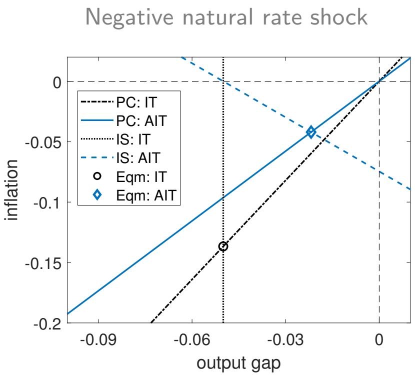


- Initial credibility does not affect long-run credibility

Conclusion

- AIT improves the trade-off in Phillips curve
- Central bank has the incentive to deviate and implement IT
- Optimal horizon of AIT varies over time
- Ambiguous communication helps the central bank gain credibility

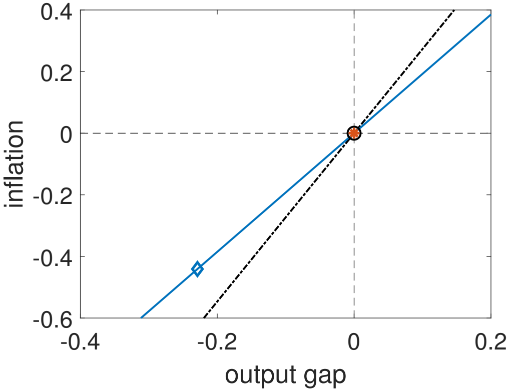
Zero Lower Bound



AIT has

- flatter PC
- downward sloping IS
- an equilibrium with negative inflation and negative output gap (so does IT)
- a better equilibrium

Positive lagged inflation



- Dual stability is achievable
- AIT has flatter PC
- IT = AIT + IT > AIT

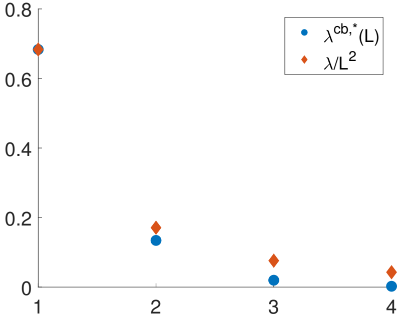
Back

Optimal $\lambda^{cb}(L)$

Minimize the unconditional welfare loss

$$\mathbb{E}_0\, \mathcal{L}_t = \frac{1}{2}\left(var[\pi_t] + \lambda var[\hat{y}_t]\right)$$

where the unconditional variances are calculated using the AIT equilibrium



▸ PC ▸ Predict ▸ CB obj

Social Learning

- FIRE equilibrium

$$\begin{aligned} \pi_t &= a_{\pi,1}^{(L)}\pi_{t-1} + \ldots + a_{\pi,L-1}^{(L)}\pi_{t-L+1} + b_{\pi}^{(L)}u_t \\ \hat{y}_t &= a_{y,1}^{(L)}\pi_{t-1} + \ldots + a_{y,L-1}^{(L)}\pi_{t-L+1} + b_{y}^{(L)}u_t. \end{aligned}$$

- Nowcast

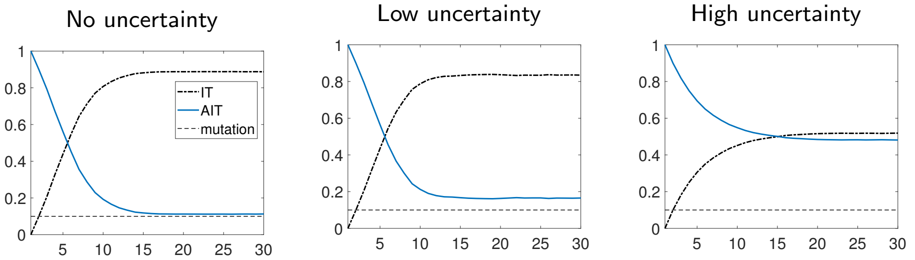
$$\begin{aligned} \mathbb{E}(\pi_t|\mathcal{I}_{t-1}, L_t^i, u_t^i) &= a_{\pi,1}^{(L_t^i)}\pi_{t-1} + \ldots + a_{\pi,L_t^i-1}^{(L_t^i)}\pi_{t-L_t^i+1} + b_{\pi}^{(L_t^i)}u_t^i \\ \mathbb{E}(\hat{y}_t|\mathcal{I}_{t-1}, L_t^i, u_t^i) &= a_{y,1}^{(L_t^i)}\pi_{t-1} + \ldots + a_{y,L_t^i-1}^{(L_t^i)}\pi_{t-L_t^i+1} + b_{y}^{(L_t^i)}u_t^i. \end{aligned}$$

- Forecast

$$\mathbb{E}_t^i\,\pi_{t+1} = a_{\pi,1}^{(L_t^i)}\pi_t + \ldots + a_{\pi,L_t^i-1}^{(L_t^i)}\pi_{t-L_t^i+2}.$$

Back

Uncertainty



- Uncertainty does not change results qualitatively but quantitatively
- Uncertainty increases, more AIT believers
- But AIT has followers even with no uncertainty
- Ambiguous communication has more credibility (not shown)

Back