

Empirical Properties of Inflation Expectations and the Zero Lower Bound

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The views expressed here are my own and do not necessarily represent those of the Federal Reserve Bank of Boston or the Federal Reserve System.

Main message

At the ZLB, imperfect information is a blend of blessing and curse

- ▶ It stabilizes the economy and helps avoiding a deflation spiral
 - ▶ Great Recession would have been worse with perfect information
 - ▶ Helps explain the missing deflation
- ▶ It mitigates the impact of policies relying on expectations
 - ▶ Great Recession would have been less persistent with perfect info
 - ▶ Helps explain the forward guidance (FG) puzzle

Key building blocks

3-equation NK model with imperfect information

- ▶ Euler eq.: $c_{i,t} = E_t^i(c_{i,t+1}) - \gamma^{-1}[E_t^i(r_t - \pi_{t+1}) - \underbrace{E_t^i(\xi_{i,t+1} - \xi_{i,t})}_{\text{Preference shock}}]$
- ▶ Phillips' curve: $\pi_t = \beta \int_0^1 E_t^i(\pi_{t+1}) di + \kappa \int_0^1 c_{i,t} di$
- ▶ Taylor rule with ZLB: $r_t = \max[-\log R, \phi\pi_t]$
- ▶ Individual preference shock (see paper for a more general case)
 - ▶ $t = 0$: $\xi_{i,0} \in \{\xi_L, \xi_H\}$ with $\xi_H > \xi_L$
 - ▶ $t \geq 1$: $\begin{cases} \xi_{i,t} = \xi_{i,t-1}, & \text{with proba } \mu \\ \xi_{i,t} = 0, & \text{with proba } 1 - \mu \end{cases}$
- ▶ Macro shock: fraction λ_S of HHs gets ξ_H
 - ▶ $\lambda_S \in \{\lambda_{\text{bad}}, \lambda_{\text{good}}\}$ with $\lambda_{\text{good}} > \lambda_{\text{bad}}$
- ▶ Transfers ensuring no HHs heterogeneity at steady-state

Key building blocks

Higher order beliefs

- ▶ Given shock process, Euler equation and Phillips' curve rewrite:
 - ▶ $c_{i,t} = \mu c_{i,t} - \gamma^{-1} [E_t^i(r_t - \mu\pi_t) - (\mu - 1)\xi_{i,t}]$
 - ▶ $E_t^i(\pi_t) = \beta E_t^i \left[\int_0^1 \mu E_t^i(\pi_t) dj \right] + \kappa E_t^i \left[\int_0^1 c_{i,t} dj \right]$
 - ▶ HHs need to infer others HHs' beliefs on inflation
- ▶ Agents only need to estimate the fraction of HHs being optimistic
 - ▶ Amounts to the probability of being in a good state
 - ▶ Update common prior θ once and for all based on their idiosyncratic signal $\xi_{i,0}$ (see paper for a more general case)
 - ▶ $p_H^{\text{good}} = E_0(p_{\text{good}} | \xi_{i,0} = \xi_H)$; $p_L^{\text{good}} = E_0(p_{\text{good}} | \xi_{i,0} = \xi_L)$

Key building blocks

Effect of imperfect information on aggregate consumption

- ▶ Aggregating individual decisions $c_s = \int_0^1 c_{i,s} di$:
 - ▶ $c_s = \mu c_s - \gamma^{-1} [\int_0^1 E^i(r_s - \mu\pi_s) di - (\mu - 1)\bar{\xi}_s]$
 - ▶ $\bar{\xi}_s = \lambda_s \xi_H + (1 - \lambda_s) \xi_L$ (same under perfect & imperfect info)
 - ▶ $\int_0^1 E^i[r_s - \mu\pi_s] di = \bar{p}_s^{\text{good}}(r_{\text{good}} - \mu\pi_{\text{good}}) + \bar{p}_s^{\text{bad}}(r_{\text{bad}} - \mu\pi_{\text{bad}})$
 - ▶ drives the difference btw perfect and imperfect info: $c_s^{\text{per}} - c_s^{\text{imp}}$

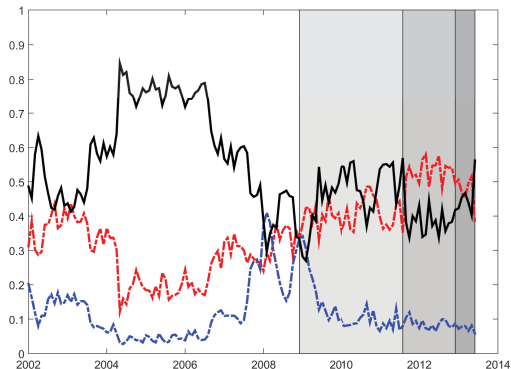
	$(c_s^{\text{per}} - c_s^{\text{imp}})$	
	$s = \text{bad}$	$s = \text{good}$
$r_s = \phi\pi_s$	> 0	< 0
$r_s = -\log R$	< 0	> 0

Imperfect info. as a source of infl. persistence

- ▶ Provides a story of missing deflation
 - ▶ HHs entered the trap with memory of the pre-ZLB which stabilized inflation expectations hence inflation
 - ▶ This is reinforced if HHs have to learn the persistence of the trap
- ▶ Potential story of why inflation remains low after end of trap
 - ▶ HHs exited the trap with memory of the ZLB which drags inflation expectations hence inflation down
- ▶ Better identify what is key to account for the missing deflation
 - ▶ Reaction of inflation when simulating same model under perfect information
 - ▶ Reaction of inflation when simulating same model under imperfect information but knowledge of persistence of the shock

Challenges in CB communication

- ▶ Do HHs react to communication (despite imperfect information)?
 - ▶ Andrade-Gaballo-Mengus-Mojon (2015): yes (SPF, HHs' survey)



Fraction of HHs expecting interest rate will **stay constant**, **increase** or **decline** in the Survey of Consumers—University of Michigan

Challenges in CB communication

- ▶ Trade-off: revealing bad state is good outside the ZLB but detrimental at the ZLB
- ▶ State-contingent communication?
 - ▶ Limiting communication at the ZLB would be detrimental as it would signal bad state
 - ▶ Changing the nature of communication by moving to Odyssean FG (commit to future accommodation) as opposed to Delphic FG (reveal information on the outlook) would be effective (Eggertsson-Woodford, 2003)
- ▶ However, implementing Odyssean FG is challenging because commitment is time inconsistent
 - ▶ Andrade-Gaballo-Mengus-Mojon (2015): interest rates announcements aiming at being Odyssean can be interpreted as Delphic hence make people more pessimistic
- ▶ Less discussed trade-off: revealing good state is bad outside the ZLB but improving at the ZLB

Effect of inflation expectations on consumption

- ▶ Euler equation holds at individual level:
 - ▶ Consumption perfectly adjusts to imperfect inflation expectations
 - ▶ No financial constraints, no limits in cognitive abilities / understanding of GE effects
- ▶ Empirical debate on whether this is true
 - ▶ Bachmann-Berg-Sims (2015): inflation expectations have no or a negative effect on durable consumption decisions
 - ▶ D'Acunto-Huang-Weber (2018): announcing large inflationary VAT shocks has a positive effect on durable consumption decisions
 - ▶ Crump-Eusepi-Tambalotti-Topa (2018): inflation expectations have a negative impact on expected consumption growth
 - ▶ Vellekoop-Wiederholt (2018): inflation expectations have a negative impact on savings
 - ▶ D'Acunto-Hoang-Paloviita-Weber (2018): inflation expectations have a positive impact on consumption only for high-IQ men

Effect of inflation expectations on consumption

Andrade-Gautier-Mengus (2019)

Table: Effects of 12M Inflation Expectations on Durables Consumption Outlook

	(1)	(2)
π^e Quantitative		
All	-0.000** (0.011)	
π^e Qualitative		
By intervals:		
go up		0.000 (0.935)
same/go up		0.010*** (0.005)
same/no infl		Ref.
go down		-0.037*** (0.000)
Observations	189,078	200,456
controls	Yes	Yes

Survey of Consumers—University of Michigan

Effect of inflation expectations on consumption

Andrade-Gautier-Mengus (2019)

- ▶ Emphasize interaction of imperfect information and lumpy consumption decisions
 - ▶ Evidence that individual consumption reacts to imperfect inflation expectations (consistent with Mirko's paper)
 - ▶ But only for large changes in expected inflation
 - ▶ Consistent with costs of adjusting consumption
 - ▶ Reis (2006), Alvarez-Guiso-Lippi (2015)
 - ▶ Another way of making the expectation channel less powerful

To recap

- ▶ Very elegant model
- ▶ Illustrates how imperfect information can help explain recent empirical puzzles
- ▶ Helps thinking about important and topical policy questions
- ▶ Very nice paper!