

# Heterogenous Beliefs and Forward Guidance

Philippe Andrade  
(Banque de France)

Gaetano Gaballo  
(Banque de France)

Eric Mengus  
(HEC Paris)

Benoit Mojon  
(Banque de France)

November 13, 2014

The views expressed here are the authors' and are not representative of the views of the Banque de France or of the Eurosystem.

# Forward Guidance Policy

- Implemented by several CBs during the crisis.
  - Communication as policy instrument at the ZLB.
  - Need agents trusting & understanding policy (Woodford, 2012).
- Recent FG had strong impact on future interest rates.
  - Consistent with *delphic* or *odyssean* policy (Campbell et al., 2012).
  - FG announcements potentially ambiguous on nature of policy.

*The FOMC has not been clear about the purpose of its forward guidance. Is it purely a **transparency device**, or is it a **way to commit** to a more accommodating future policy stance to add more accommodation today?*

Charles I. Plosser (March 6, 2014).

# Questions

- 1 Did agents interpret FG announcements differently?
- 2 Can heterogeneity of beliefs lower macroeconomic impact of FG?

# This Paper

- 1 New facts using survey forecasts.
  - FG announcements coordinated opinions about future interest rates.
  - Much less so for future inflation and demand.
- 2 Rationalize facts in a simple New Keynesian model.
  - Heterogenous beliefs about the end of the trap / commitment ability.
  - Agents agree on policy rate path but interpret FG differently.
- 3 Use setup to investigate effects of heterogeneous beliefs.
  - Can dampen macroeconomic impact of FG.
  - FG can even be detrimental (odyssean interpreted as bad news).

# Literature

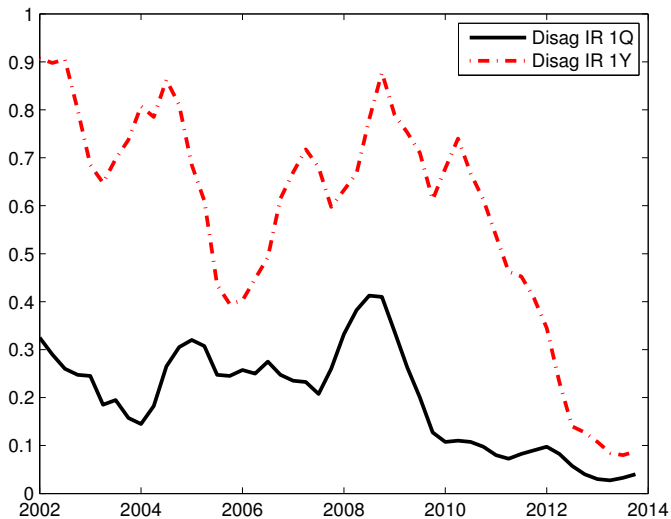
- Campbell et al. (2012): FOMC stat. impact macro expectations.
- Del Negro et al. (2013): Odyssean FG extremely efficient in DSGE.
- Bodenstein et al. (2012): FG under imperfect credibility.
- Nakamura et al. (2014): FG & imperfect credit markets.
- Wiederholt (2014): ZLB & information frictions.

# Data

- US SPF (also Consensus Forecasts for CA, EA, UK).
- Real consumption growth ( $\Delta c$ ), CPI inflation ( $\pi$ ), 3M-Tbills ( $r$ ).
- Sample: 1982:Q1-2014:Q1.
- Forecast horizons: 1Q & 1Y.
- Individual forecasts (cross-section dispersion).
- Disagreement: 75th – 25th quantiles.

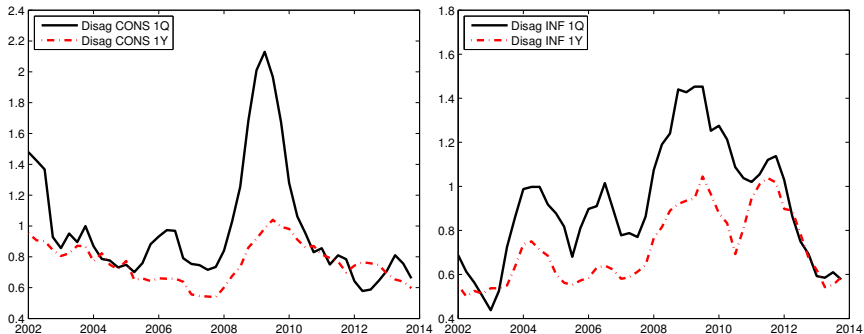
# Fact 1

## FG coordinated opinions about future US monetary policy



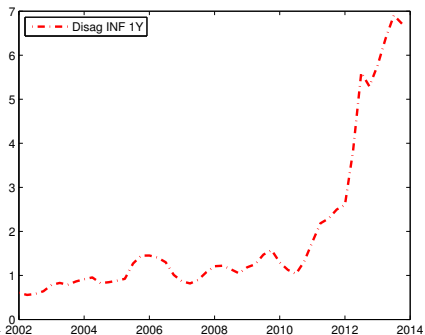
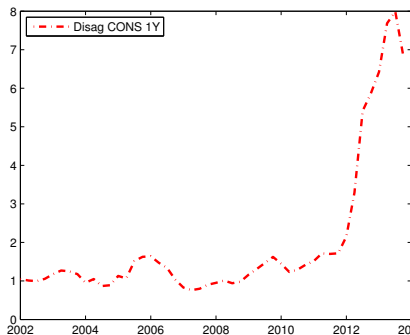
## Fact 2

FG reduced disagreement about future consumption / inflation



# Fact 3

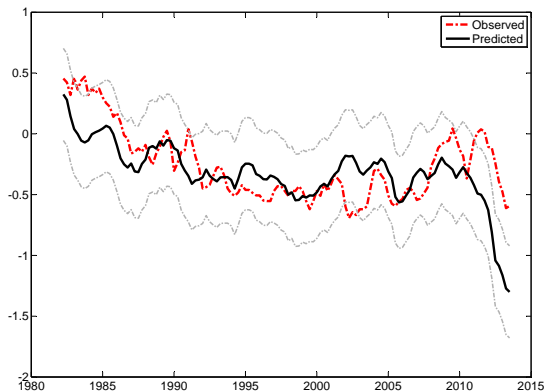
But much less than for future IR



# Further Evidence

Disagreement about inflation should have been lower

Inflation disagreement (1Y, log)



# Further Evidence

## Other countries

- Find similar evidence for Canada, the euro-area, the UK.

# Take Away

FG increased disagreement about future monetary policy

- Simple monetary policy rule:

$$r = \phi_{\pi}\pi + \phi_c\Delta c + \epsilon.$$

- Future interest rate expected by individual  $i$ :

$$E_t^i(r) = \phi_{\pi}E_t^i(\pi) + \phi_cE_t^i(\Delta c) + E_t^i(\epsilon).$$

- Drop in heterogeneity of  $E_t^i(r)$  not in line with drop in  $E_t^i(\pi)$ ,  $E_t^i(\Delta c)$ .
  - Off-setting heterogeneity about future deviations:  $E_t^i(\epsilon)$ .
  - $\{E_t^i(\pi) < 0; E_t^i(\epsilon) > 0\}$  ;  $\{E_t^j(\pi) > 0; E_t^j(\epsilon) < 0\}$ .

# A Simple NK Model with Heterogenous Beliefs

## Firms

- Final good production:

$$Y_t = \left( \int Y_{j,t}^{\frac{\theta-1}{\theta}} dj \right)^{\frac{\theta}{\theta-1}}.$$

- Intermediate goods production:

$$Y_{j,t} = L_{j,t}.$$

- Intermediate goods producers subject to Calvo pricing (proba  $1 - \chi$ ).

# A Simple NK Model with Heterogenous Beliefs

## Households' family

- Continuum of agents  $i \in [0, 1]$  maximizing family's welfare:

$$U_0 = \int_0^1 \sum_{t=0}^{\infty} \beta^t e^{\xi_t} \left( \frac{C_{i,t}^{1-\gamma} - 1}{1-\gamma} - \frac{L_{i,t}^{1+\psi}}{1+\psi} \right) di.$$

- Preference shocks:

$$\xi_t = 0 \text{ (normal times); } \quad \xi_t = -\xi_{ZLB} \text{ (crisis times).}$$

- Individual budget constraint:

$$P_t C_{i,t} + B_{i,t} = R_{t-1} B_{i,t-1} + W_t L_{i,t} + D_t + Z_{i,t}.$$

- At each  $t$ , intra-household transfers (agreed if improve  $U_t$  or zero):

$$\int_0^1 Z_{i,t} di = 0.$$

# A Simple NK Model with Heterogenous Beliefs

## Monetary policy

- Monetary policy constrained by the ZLB:

$$R_t = \max\{R\Delta_t\Pi_t^\phi, 1\}.$$

# A Simple NK Model with Heterogenous Beliefs

FG policy

- Sequence of shocks  $\{\xi_t\}_{t \geq 0}$  such that ZLB binds up to  $T$ .
- Policy announcement  $T^{CB}$ :

$$R_t = \begin{cases} 1 & \text{for } t \leq T^{CB}, \\ R\Pi_t^\phi & \text{for } t > T^{CB}. \end{cases}$$

- Two types of announcements:
  - *Delphic* FG: CB cannot commit to  $\{\Delta_t\}_{t \geq 0} \Rightarrow T^{CB} = T$ .
  - *Odyssean* FG: CB can commit to  $\{\Delta_t\}_{t \geq 0} \Rightarrow T^{CB} > T$ .

# A Simple NK Model with Heterogenous Beliefs

## Information

- Central bank cannot credibly communicate:
  - its ability to commit to  $\{\Delta_t\}_{t \geq 0}$ ,
  - (hence) its views about fundamentals  $\{\xi_t\}_{t \geq 0}$  / length of the trap  $T$ .
- Private agents:
  - observe current shock  $\xi_0$  and announcement  $T^{CB}$ ,
  - don't know future shocks hence length of the trap  $T$ ,
  - believe the CB knows (better)  $T$ ,
  - uncertain about commitment ability of central bank  $\{\Delta_t\}_{t \geq 0}$ .

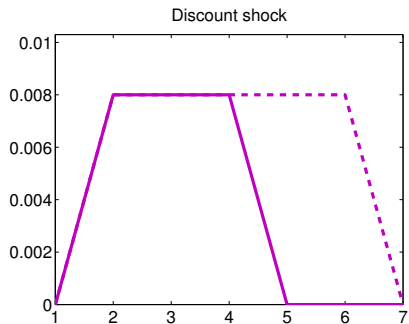
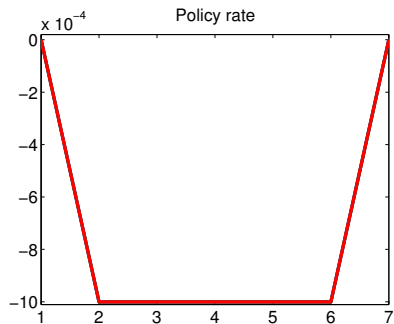
# A Simple NK Model with Heterogenous Beliefs

## Private agents' beliefs

- Private agents form beliefs on whether policy is *delphic* or *odyssean*.
  - $\lambda_i$ :  $i$ 's subjective probability that policy is *odyssean*.
  - $\bar{\lambda}$  the average of this distribution.
- Optimistic and pessimistic agents:
  - Optimists expect an *odyssean* policy more than the average:  $\lambda^i > \bar{\lambda}$ .
- Private agents agree to disagree:
  - Agree on sequence of policy rate  $\{R_t\}_{t \geq 0}$ .
  - Compatible with different views on  $\{\Delta_t\}_{t \geq 0}$  therefore  $\{\xi_t\}_{t > 0}$ .

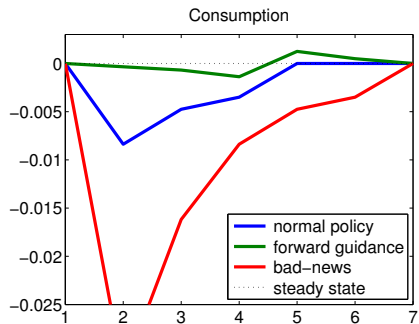
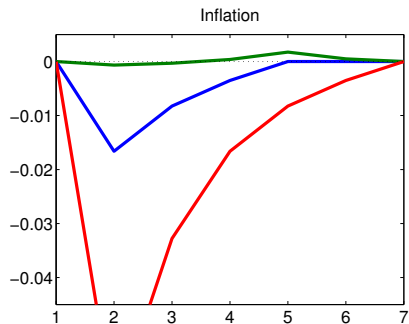
# The effect of FG

## A numerical example



# The effect of FG

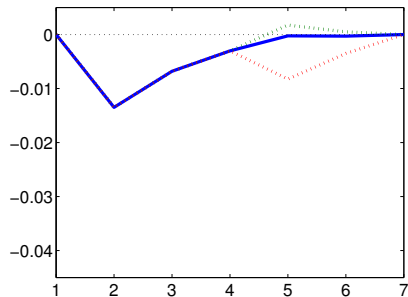
Homogeneous beliefs



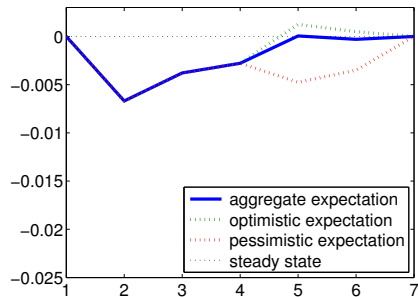
# The effect of FG

Heterogenous beliefs

Aggregate Inflation



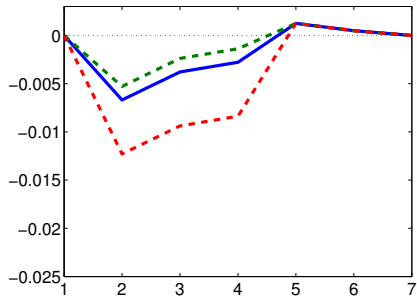
Aggregate Consumption



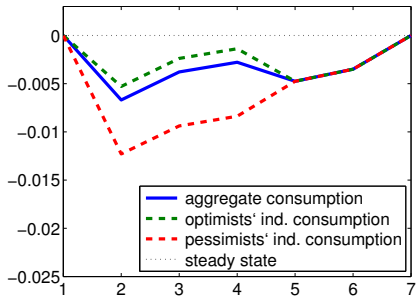
# The effect of FG

Expected consumption of optimists and pessimists

Optimistic Consumption Expectations



Pessimistic Consumption Expectations



# The effect of FG

## Analytical results

- Heterogeneous beliefs has an impact on FG efficiency.
  - Pessimists tame current effects of *odyssean* announcements.
- *Odyssean* announcement can be arbitrarily inefficient.
  - Up to *delphic* announcement revealing longer liquidity trap.
  - So *odyssean* can be detrimental (overestimate length of ZLB).
- This holds with agents agreeing on extended period of low IR.

## Conclusion

- Produce facts suggesting agents disagreed on FG interpretation.
- Introduce heterogenous beliefs in std NK model of the ZLB.
- Show heterogenous beliefs:
  - hampers odyssean FG.
  - potentially make odyssean announcements worsens things.
- Underline limits of looking at (expected) IR to assess impact of FG.

# Work in Progress

- ① *Heterogeneity of beliefs hampers odyssean FG.*
  - Quantitatively?
  - Map heterogenous agents into representative one uncertain about announcements (delphic vs. odyssean).
  - Estimate fully-fledged NK model using realizations / surveys.
  - Quantify impact of uncertain future MP on FG efficiency.
- ② *Heterogeneity of beliefs potentially makes odyssean FG detrimental.*
  - Under heterogeneity, odyssean FG not always best response.
  - Trade-off: reaction of optimists / pessimists to announcement.
  - Optimal communication?