



EUROPEAN CENTRAL BANK

EUROSYSTEM

**Michael Ehrmann**  
European Central Bank

**Gaetano Gaballo**  
Banque de France

**Peter Hoffmann**  
European Central Bank

**Georg Strasser**  
European Central Bank

# **Can more public information raise uncertainty? The international evidence on forward guidance**

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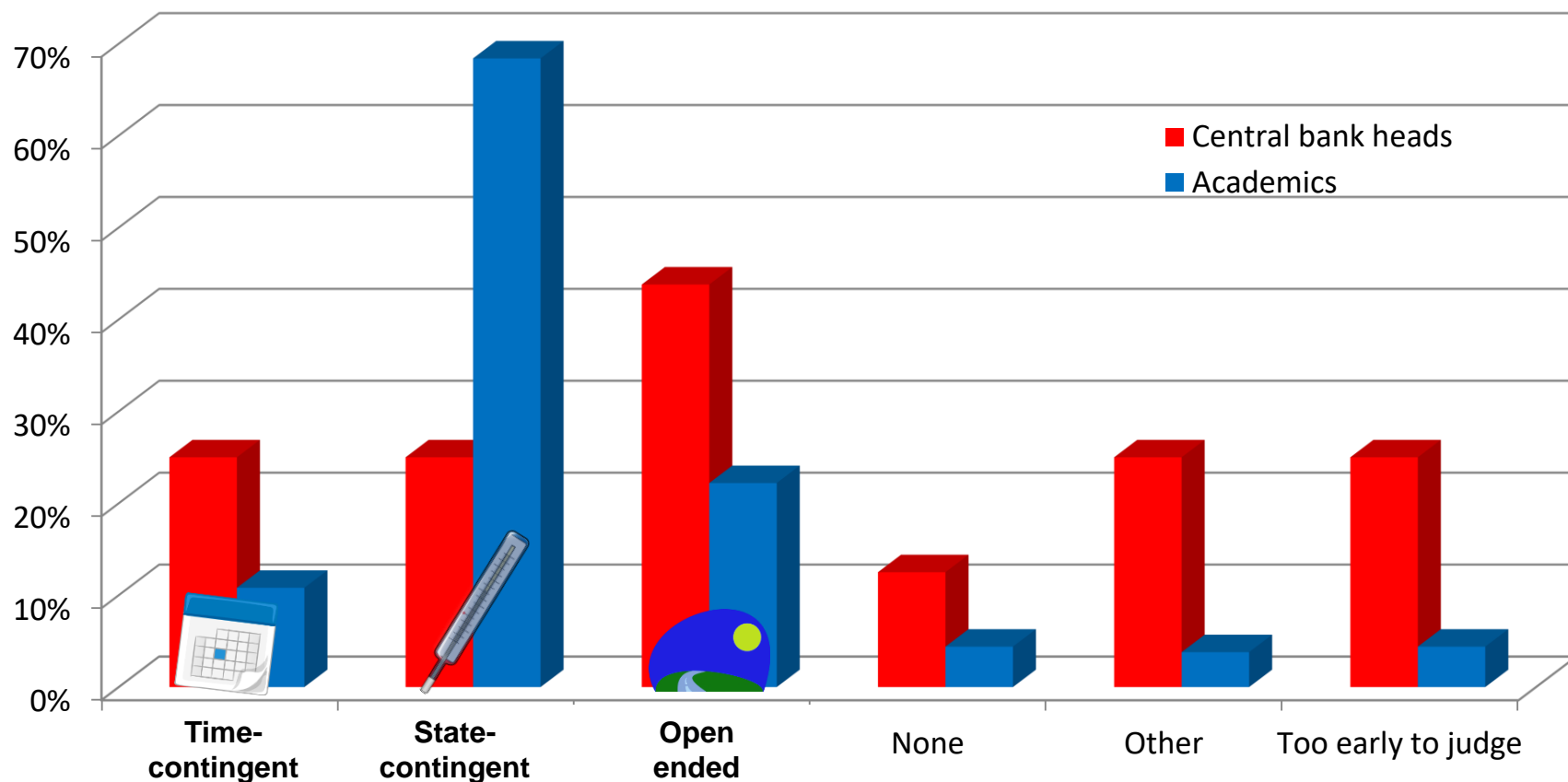
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# Forward guidance has been more widespread since the crisis.

- Forward guidance (FG) as policy tool to
  - Provide additional accommodation (at the lower bound)
  - Anchor **expectations**, e.g. about policy rates
  - Reduce **uncertainty**, e.g. about policy rates
- Ongoing discussions:
  - “FG puzzle” (Del Negro, Giannoni, and Patterson 2015)
  - Critical views (Poloz 2014)
  - **Does the form of FG matter?**

# Views on the preferable type of forward guidance vary widely

## Preferred types of forward guidance in the future



Source: Blinder et al. (2017) survey among central bank governors (55 responses) and academic economists (159 responses).

“In the future, which type(s) of forward guidance do you believe would be most effective for your central bank?”

**Does the form of forward guidance (FG) matter**

E.g. its strength (or horizon)



Can more **public information** be **detrimental**

(Amador and Weill, JEP 2010)



Cross-country FG experience allows **studying how the effect of a public announcement depends on implementation**

## 1) Effect of FG is nonlinear in the strength of guidance.

- Short-horizon time-contingent FG can elevate uncertainty (relative to no FG),
- But long-horizon time-contingent FG cements expectations

## 2) Rational expectations with noisy market information explain how “weak” FG can raise responsiveness to news.

- Public and private signals on fundamentals become relatively more informative
- Agents react less to market prices

- **Effect of FG**

Campbell et al. BREA 2012, Swanson and Williams 2014, Feroli et al. 2017

- **Learning from prices**

Vives 1997, Veldkamp 2011, Amador and Weill 2012, Vives 2017

- **Welfare loss by more precise public information due to coordination**

Morris and Shin 2002, Hellwig 2005, Angeletos and Pavan 2007, Paciello and Wiederholt 2013, Angeletos et al. 2016

- **Welfare loss by more precise public information due to externalities in the information structure**

Morris and Shin 2005, Amador and Weill 2010

- 1** News-sensitivity of bond yields and disagreement
- 2** Rational expectations model with noisy market information
- 3** Summary

# Does the form of FG change the responsiveness of bond yields to news?

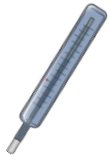
- FG affects expectations about future policy rates  
(Swanson and Williams 2014, Feroli et al. 2017)
- Test whether the **form of FG** matters for the responsiveness of bond yields to surprises in macroeconomic indicators.
- **Hypothesis:**  
No responsiveness if FG credible and covering entire time to maturity; lower responsiveness for weaker forms of FG



- **Classify by FG regime**



Open-ended FG (e.g. “for an extended period”):  
Euro Area, Japan, UK, USA



State-contingent FG:  
Japan, UK, USA



Time-contingent FG:  
Canada, Euro area, Sweden, USA  
Split into short and long horizon (1.5 years)

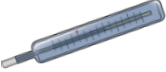


- Canada, euro area (Germany, Italy), Japan, Sweden, UK, USA

- Periods with policy **rates at or below 1%**

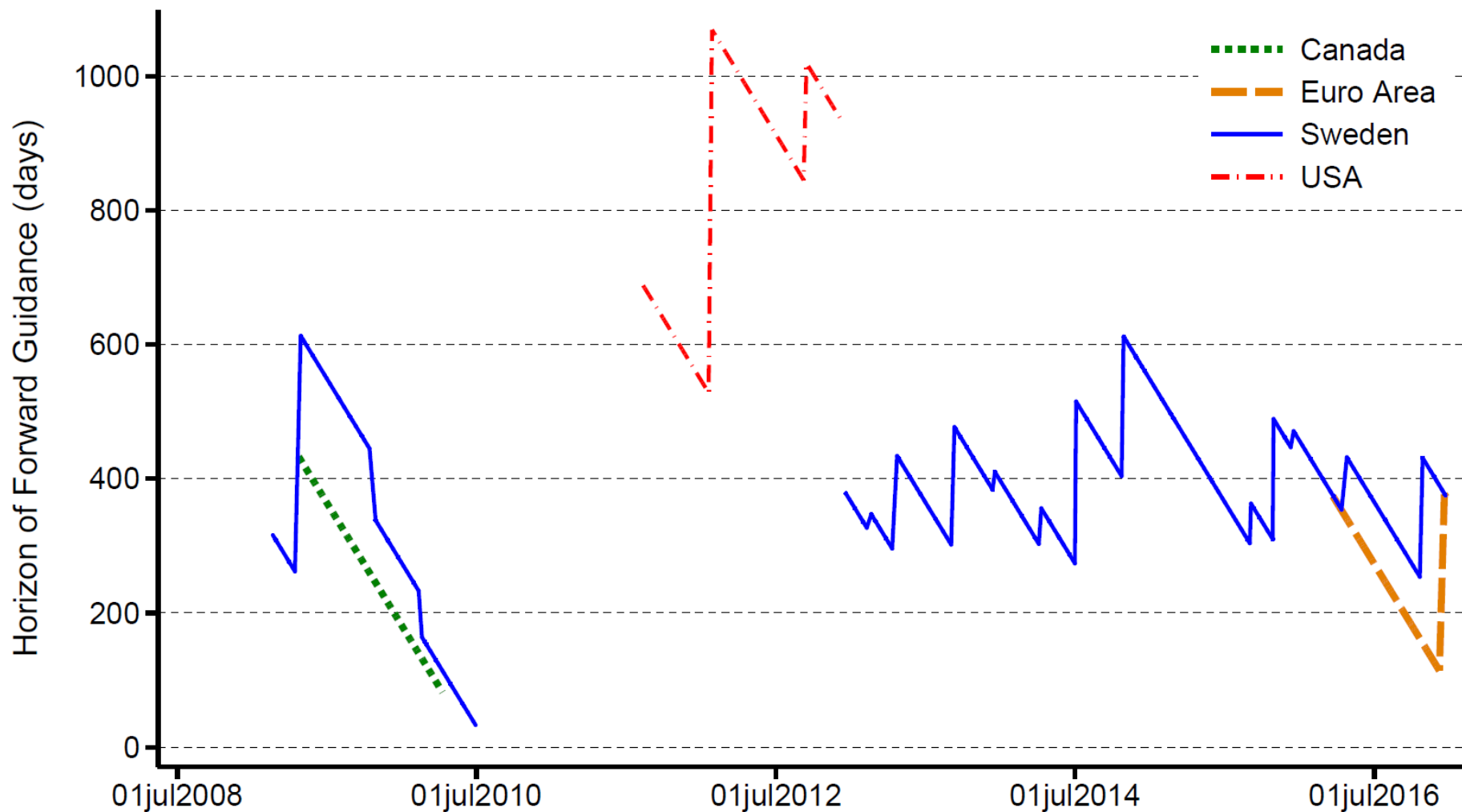
Reduced responsiveness at ELB (Swanson & Williams 2014)

- 1999/2000 until December 2016

# Effective lower bound and forward guidance episodes, 1995-2016

	Effective lower bound periods	 State-contingent FG periods	 Open-ended FG periods	 Time-contingent FG periods	∅ horizon (days)
Canada	20.01.09 –	-	-	21.04.09 – 19.04.10	258
Euro area	07.05.09 – 06.04.11 08.12.11 –	-	04.07.13 – 09.03.16	10.03.16 –	247
Japan	01.04.95 –	05.10.10 – 03.04.13 29.01.16 –	12.02.99 – 10.08.00	-	-
Sweden	11.02.09 – 14.12.10 18.12.12 –	-	-	30.10.07 – 30.06.10 20.12.11 –	383
UK	05.02.09 –	07.08.13 – 11.02.14	12.02.14 – 12.08.14	-	-
USA	25.06.03 – 29.06.04 29.10.08 –	12.12.12 – 18.03.14	06.12.08 – 08.08.11 19.03.14 –	09.08.11 – 11.12.12	843

# Horizon of time-contingent FG was revised often








# Responsiveness of bond yields to macroeconomic surprises

- Macroeconomic surprises  $s_t^{c,i,r} = \frac{a_t^{c,i,r} - e_t^{c,i,r}}{\sigma^{c,i,r}}$ 
  - Expectations from Bloomberg surveys
  - Business confidence, consumer confidence, CPI, GDP, industrial production, non-farm payroll employment, purchasing manager indices, retail sales, unemployment
  - Sign-adjusted (positive surprise implies a tightening of monetary policy, if anything)
- 120 min window returns of 2-year government bonds

$$\Delta R_t^{c,i} = \alpha^{c,i} + \alpha_{FG} FG_t^c + \beta s_t^{c,i} + \beta_{FG} FG_t^c s_t^{c,i} + \varepsilon_t^{c,i}$$

$$\Delta R_t^{c,i} = \alpha^{c,i} + \alpha_{SG} SG_t^c + \alpha_{OG} OG_t^c + \alpha_{LTG} STG_t^c + \alpha_{STG} LTG_t^c + \beta s_t^{c,i} + \beta_{SG} SG_t^c s_t^{c,i} + \beta_{OG} OG_t^c s_t^{c,i} + \beta_{LTG} STG_t^c s_t^{c,i} + \beta_{STG} LTG_t^c s_t^{c,i} + \varepsilon_t^{c,i}$$

# Differential effect of FG types on responsiveness of bond yields

	(1)	(2)	(3)	(4)
No FG ( $\beta$ )	0.443*** (0.097)	0.443*** (0.097)	0.443*** (0.097)	0.443*** (0.097)
FG ( $\beta_{FG}$ )	<b>0.042</b> (0.116)			
 SG ( $\beta_{SG}$ )		<b>-0.340***</b> (0.108)	-0.341*** (0.108)	-0.342*** (0.108)
 OG ( $\beta_{OG}$ )		<b>0.049</b> (0.141)	<b>0.047</b> (0.141)	<b>0.047</b> (0.141)
 TG ( $\beta_{TG}$ )		<b>0.304**</b> (0.153)	-0.383 (0.632)	
$g$ ( $\gamma$ )			3.624* (2.091)	
$g^2$ ( $\gamma_2$ )			-3.607** (1.556)	
 STG ( $\beta_{STG}$ )				<b>0.496***</b> (0.189)
 LTG ( $\beta_{LTG}$ )				-0.317** (0.131)

# Does the form of FG change disagreement across forecasters?






- FG reduces disagreement across forecasters  
(Andrade et al. 2015)
- Test whether the **form of FG** matters for disagreement
- **Hypothesis:** Lower disagreement across forecasters if FG credible

$$\Omega_t^c = \alpha^c + \alpha_t + \alpha_{FG} FG_t^c + \varepsilon_t^c$$

$$\Omega_t^c = \alpha^c + \alpha_t + \alpha_{SG} SG_t^c + \alpha_{OG} OG_t^c + \alpha_{LTG} STG_t^c + \alpha_{STG} LTG_t^c + \varepsilon_t^c$$

- Disagreement across 1-year ahead forecasts of 3-month rates (euro area instead of DE and IT)
  - Monthly forecasts from Consensus Economics
  - Interdecile range per country and month

# Differential effect of FG types on disagreement across forecasters

	(1)	(2)	(3)
FG ( $\alpha_{FG}$ )	-0.062* (0.037)		
 SG ( $\alpha_{SG}$ )		-0.067* (0.036)	-0.070** (0.033)
 OG ( $\alpha_{OG}$ )		-0.026 (0.051)	-0.029 (0.048)
 TG ( $\alpha_{TG}$ )		-0.097** (0.047)	
 STG ( $\alpha_{STG}$ )			-0.090 (0.056)
 LTG ( $\alpha_{LTG}$ )			-0.116** (0.049)
# observations	669	669	669
$R^2$	0.63	0.64	0.64
$\Omega^*$	0.226	0.226	0.226

- 1 News-sensitivity of bond yields and disagreement
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## Financial markets

- Agents invest in bonds with payoff  $\tilde{\theta} \sim N(\bar{\theta}, \tau_{\theta}^{-1})$   
(in fixed net supply  $\bar{\kappa}$ )
- Agents' optimisation problem

$$\max_{Q_i} \left[ (E[\tilde{\theta}|\Omega_i] - P) Q_i - \frac{1}{2} Q_i^2 \right]$$

- Market clearing  $p = \int E[\theta|\Omega_i] di$   
(where  $p = P - \bar{\theta} + \bar{\kappa}$ ,  $\theta = \tilde{\theta} - \bar{\theta}$ ,  $\kappa = \bar{\kappa} - \tilde{\kappa}$ )

## Central bank and forward guidance

- Central bank (CB) mandate related to fundamental

$$\tilde{\pi} \sim N(\bar{\pi}, \tau_{\pi}^{-1})$$

- CB observes  $\pi = \tilde{\pi} - \bar{\pi}$  without noise,  
is credible and time-consistent.
- FG commits to a reduced policy response to surprises in  
fundamental (in deviation from pre-announced default path).

## Central bank without FG

- No-FG Taylor rule:  $\tilde{\theta}_t - \theta_t^* = \alpha^{TR} (\tilde{\pi}_t - \pi_t^*)$ ,  
with  $\alpha^{TR} > 0$  common knowledge

## Central bank providing FG

- FG: **CB announces**  $\alpha_t$  with  $0 \leq \alpha_t < \alpha^{TR}$  at time  $t-1$   
(possibly also  $\bar{\theta}_t \neq \theta_t^*$  and  $\bar{\pi}_t \neq \pi_t^*$ )
- Systematic policy response under FG:  $\tilde{\theta}_t - \bar{\theta}_t = \alpha_t (\tilde{\pi}_t - \bar{\pi}_t)$
- In deviations from pre-announced path (single period):  $\theta = \alpha \pi$
- **Stronger FG lowers  $\alpha$ .**

## Agents' information

### 1) Noisy **public signal**

$$y = \pi + \varepsilon$$

$$\varepsilon \sim N(0, \tau_\varepsilon^{-1})$$

### 2) Noisy **private signal**

$$s_i = \pi + \eta_i$$

$$\eta_i \sim N(0, \tau_\eta^{-1})$$

### 3) Heterogeneous interpretation of **market prices** (Vives and Yang 2017)

$$x_i = p + \xi_i = \int E[\theta | \Omega_i] di + \xi_i \quad \xi_i \sim N(0, \tau_\xi^{-1})$$

Agents form **expectations** according to

$$E[\theta|\Omega_i] = a\alpha s_i + b\alpha y + cx_i$$

Aggregating and substituting the signals yields...

$$\int E[\theta|\Omega_i] di = \frac{a}{1-c}\alpha\pi + \frac{b}{1-c}\alpha(\pi + \varepsilon)$$

... and **market price**

$$p = \frac{a\alpha}{1-c}\pi + \underbrace{\frac{b\alpha}{1-c}}_{\phi} y$$

**news sensitivity**

**News sensitivity**  $\phi = \frac{\alpha \tau_{\varepsilon}}{\frac{1}{1-c} \tau_{\eta} + \tau_{\varepsilon} + \tau_{\pi}}$

**Disagreement**

$$Var(E[\theta|x_i, s_i, y] - \int E[\theta|x_i, s_i, y] di) = a^2 \alpha^2 \tau_{\eta}^{-1} + c^2 \tau_{\xi}^{-1}$$

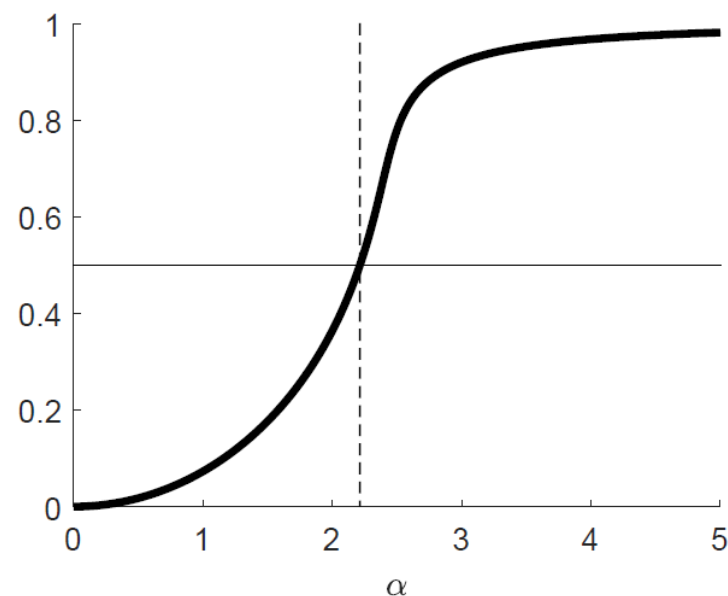
**Uncertainty**  $Var(\theta|x_i, s_i, y) = \frac{\alpha^2}{\frac{1}{1-c} \tau_{\eta} + \tau_{\varepsilon} + \tau_{\pi}}$

## Equilibrium

- $c$  is a real root of fixed-point equation

$$\frac{\frac{1}{1-c}\tau_\eta}{\left(\frac{1}{1-c}\tau_\eta + \tau_\varepsilon + \tau_\pi\right)^2}\alpha^2 - \frac{c}{\tau_\xi} = 0$$

- $c \in (0,1)$
- $c \rightarrow 0^+$  as  $\alpha \rightarrow 0^+$  or  $\tau_\eta \rightarrow 0^+$
- Unique for  $8\tau_\eta > \tau_\varepsilon + \tau_\pi$

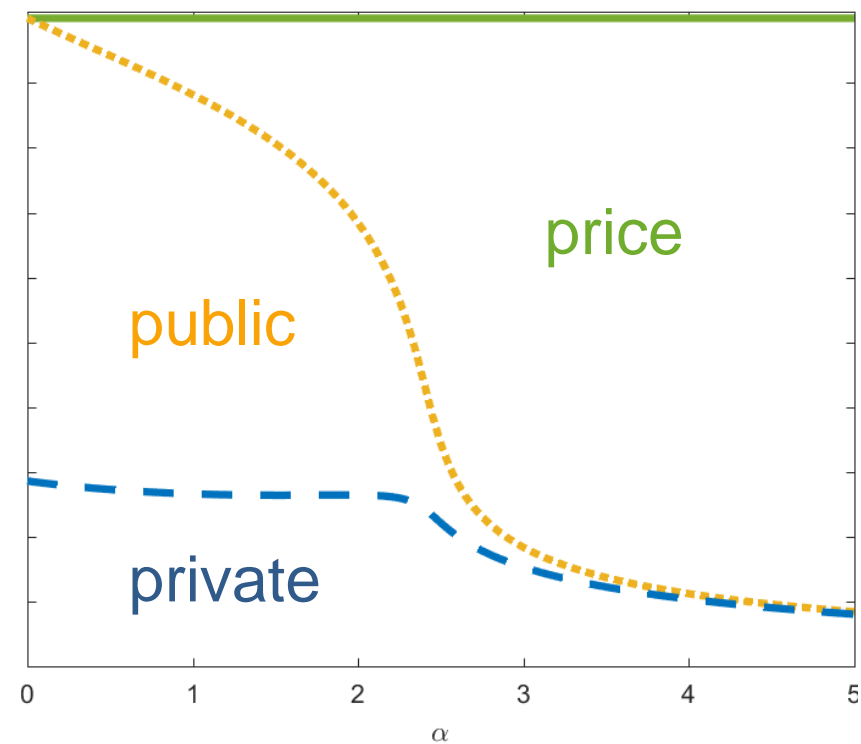
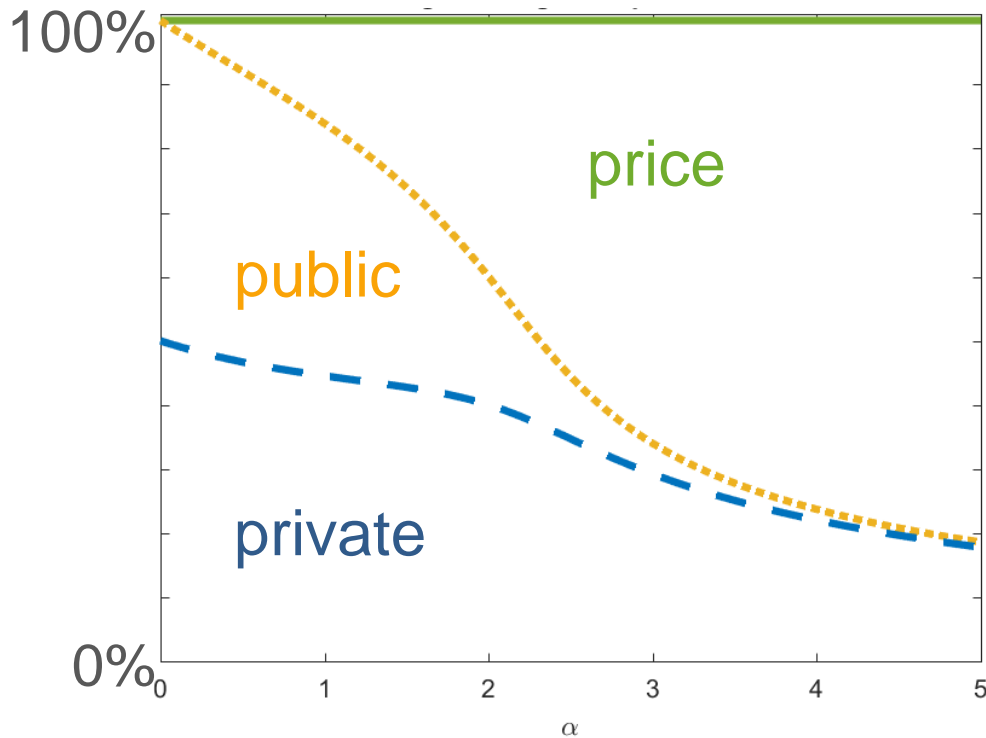


Forward guidance disproportionately increases the weight of the public signal.

## Contributions of signals to agent's expectation

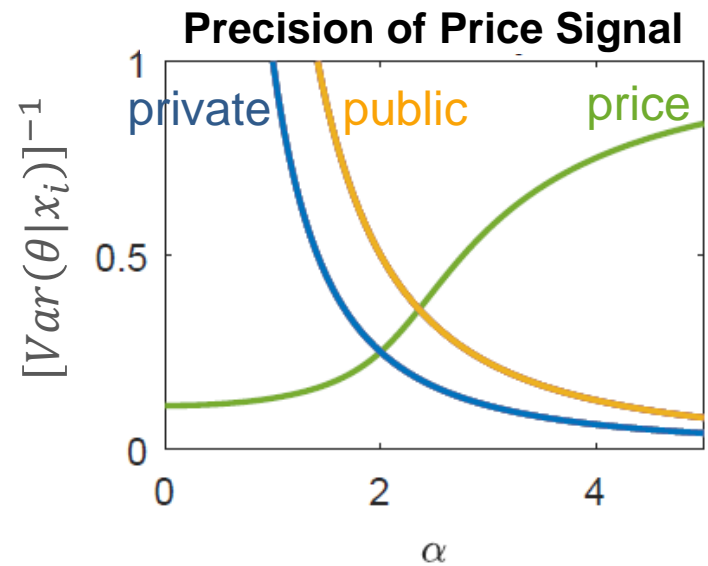
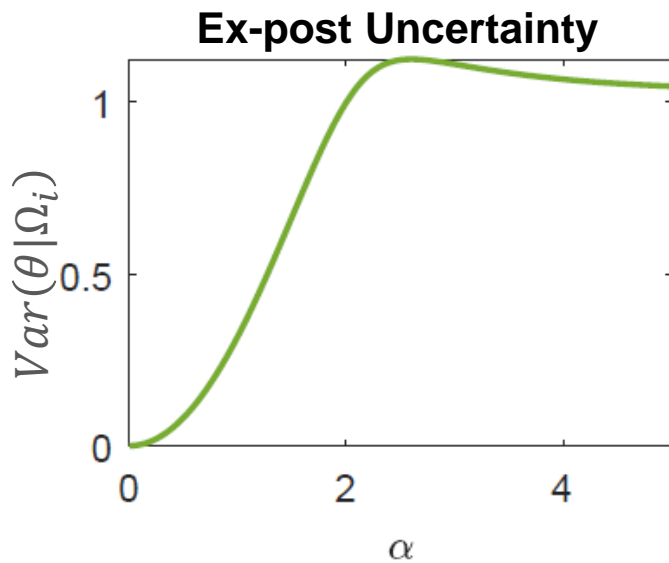
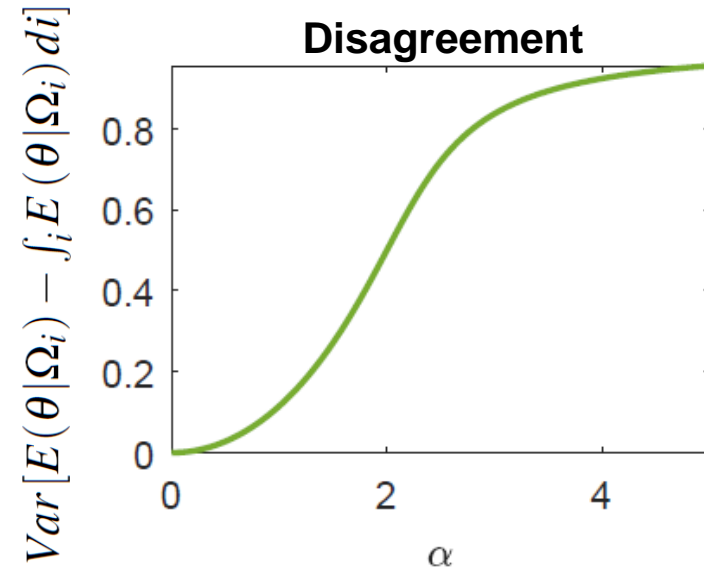
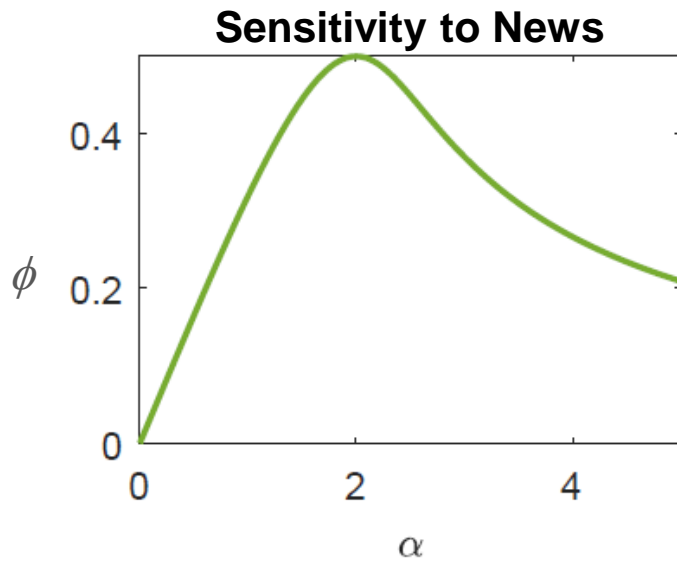
Public and private signal equally noisy

Private signal noisier than public signal





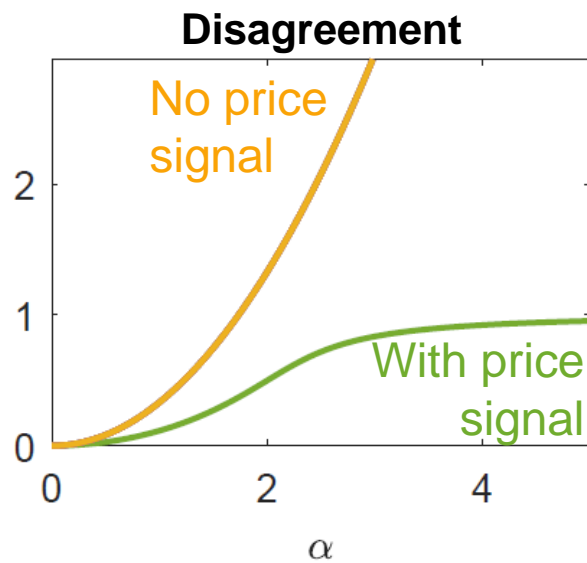
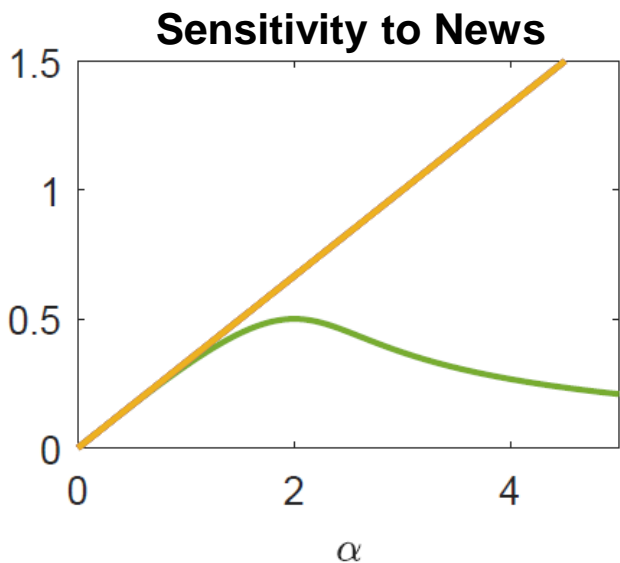
Weak forward guidance can increase news-sensitivity, lowers disagreement only by little, and increase uncertainty.



# In absence of informative market signals, stronger forward guidance always dampens the sensitivity of prices.

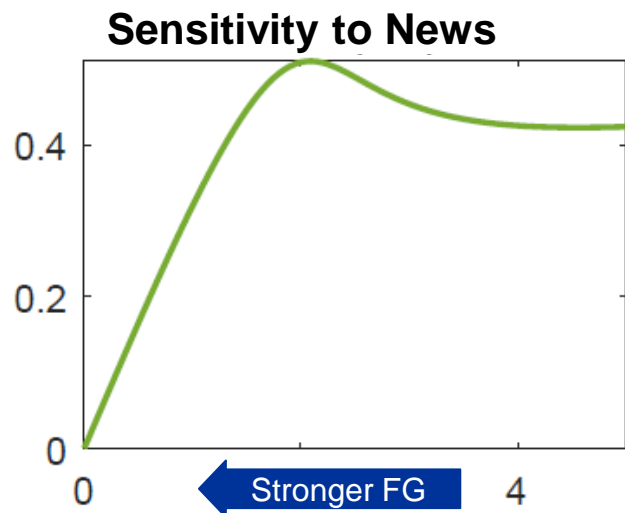
Without an endogenous price signal (i.e.  $c = 0$  or  $\tau_\xi \rightarrow 0$ ):

- news sensitivity  $\phi$  strictly increases in  $\alpha$
- same for disagreement and uncertainty



- 1 News-sensitivity of bond yields and disagreement
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If market prices are an important source of information, marginally increasing weak forward guidance can increase uncertainty.



- **Effect of forward guidance depends on type of guidance**
  - Sensitivity of bond yields to news *increased* under short-horizon FG
  - Effect of change in FG depends on strength of guidance already in place

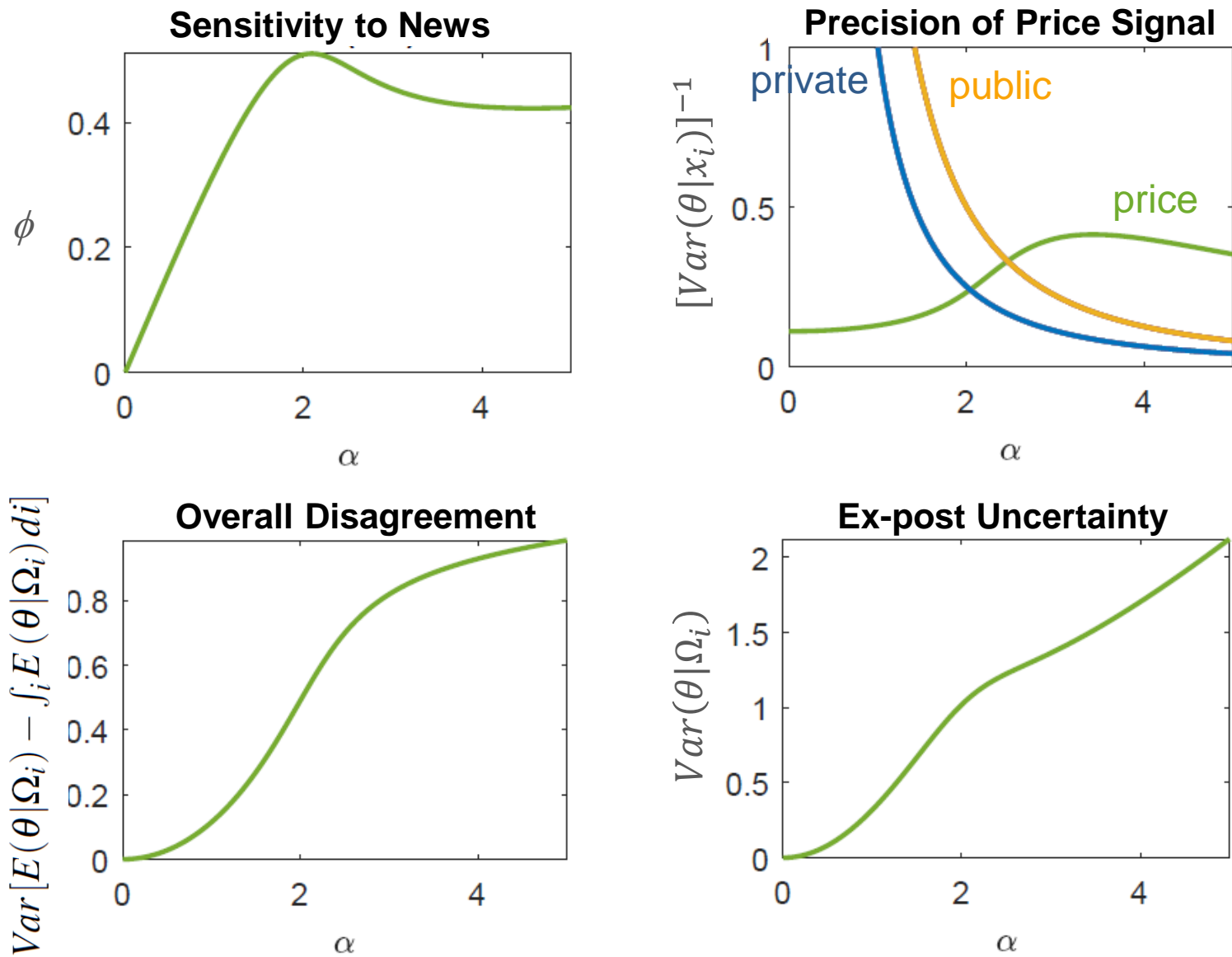
- In line with **agents endogenously adjusting their reliance on private, public, and price signals**
  - Additional public information can hamper aggregation of private information in prices

# BACKUP

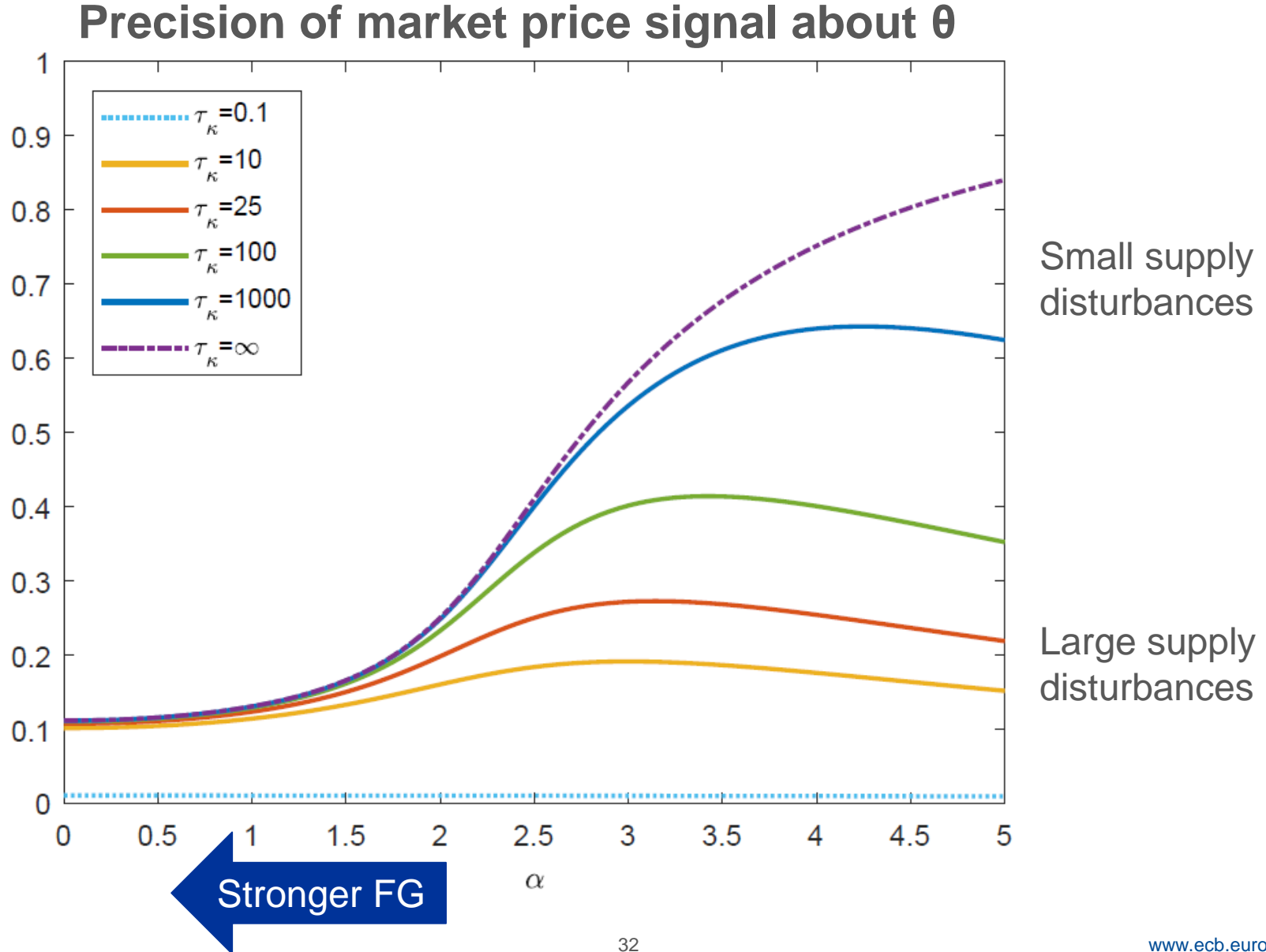
# Summary statistics

Dependent variable		(1) macro indicators (count)	(2) Bond Yield obs. at ELB (count)	(3) first obs. (year)	(4) Disagreement obs. at ELB (count)	(5) first obs. (year)
Canada		6	406	2009	95	2009
Euro area	Germany	8	583	2009	83	2009
	Italy	8	654	2009		
Japan		8	1023	2000	216	1999
Sweden		8	487	2009	70	2009
UK		7	664	2009	95	2009
USA		9	1102	2003	110	2003
Total			4919		669	

In presence of large supply disturbances, these effects are less pronounced.



The precision of the price signal is nonlinear in the strength of guidance.





News sensitivity can be hump-shaped if supply disturbances are sufficiently small.

### News sensitivity $\Phi(\alpha)$

