

The Forward Guidance Puzzle

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Forward Guidance

- Announcements about future interest rate changes: key instrument of monetary policy at least since 2008 (also before – see Campbell et al. 2012)
- ① What are the effects of forward guidance?
 - On financial markets
 - On expectations – Evidence from Blue Chip surveys
- ② Can its effects be captured by standard medium-scale DSGE models? No!
 - ⇒ **Forward Guidance Puzzle:** Excessive response of output and inflation
 - The farther into the future is the change in FFR, the stronger the economy's response
- ③ A proposed resolution to the FG puzzle
 - Accounting for finite life: Blanchard-Yaari's perpetual youth in a medium-scale DSGE model

Evidence from Blue Chip Financial Forecasters

- Compute *change in forecasts* in a one-month window around the announcement
- ... controlling for:
 - all macro economic news (surprises)
 - asset price movements (ex event window)
- Panel regression for variable (k), horizon (h), forecaster (i):

$$\Delta f(k, h)_{t,i} = \gamma_0 + \gamma'_1 \text{ Macro news} + \gamma'_2 \text{ Asset Price Changes} \\ + \gamma'_3 \text{ } i\text{-specific control} + \beta \text{ Announcement Dummy} + \epsilon_{i,t}$$

for $t = 2008.06, \dots, 2015.02$

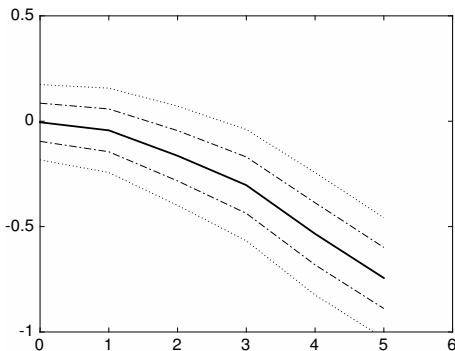
- Std errors corrected for correlation across i 's and heteroskedasticity

August 2011

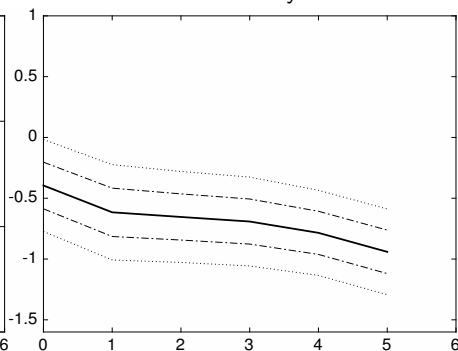
“ ... exceptionally low levels of the FFR **at least through mid-2013**”

- Projections for 3-month rates and 10-year yields decline
 - Change in forecasts of financial variables *in line with asset response in two-day window*
 - Forecasters *believe* the FOMC announcement

3-Month TBill



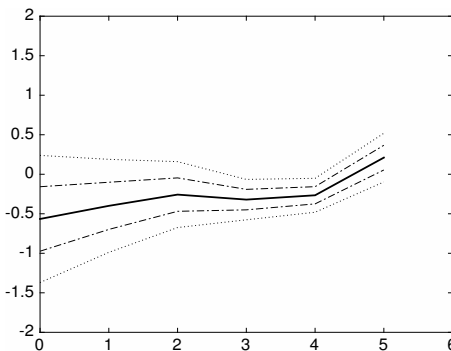
10 Treasury



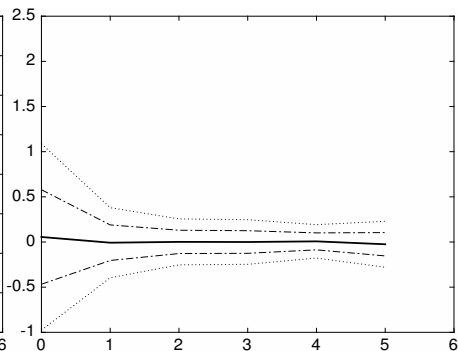
August 2011

“... economic growth so far this year has been considerably slower than ... expected. ...The Committee now **expects a somewhat slower pace of recovery** over coming quarters ... **economic conditions ... are likely to warrant** exceptionally low levels of the FFR at least through mid-2013”

GDP Growth



CPI Inflation

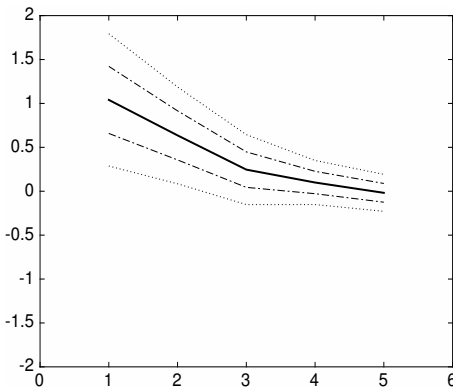


- Possible example of **Delphic** forward guidance: bad news about the economy

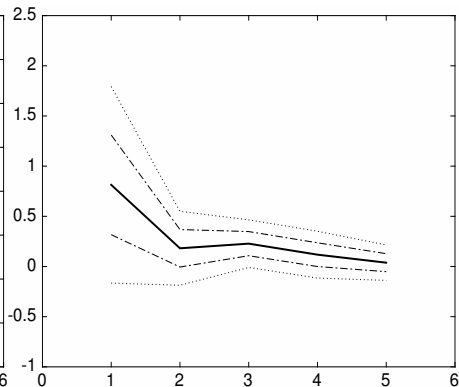
September 2012

- ... “highly accommodative stance ... will remain appropriate for a considerable time after the economic recovery strengthens. ... at least through mid-2015”

GDP Growth



CPI Inflation

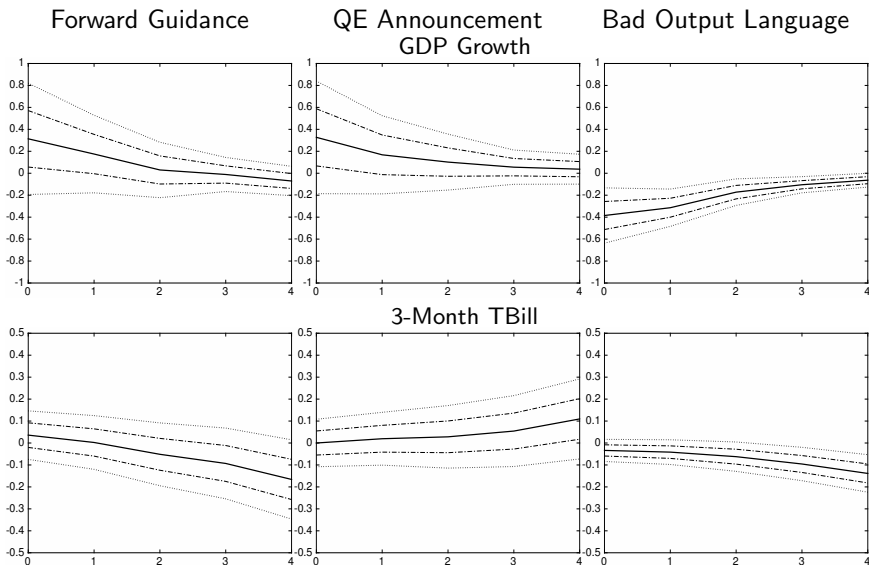


- **Odyssean:** significant increase in forecasts for real activity and inflation

Effect of Different Aspects of the FOMC Statement

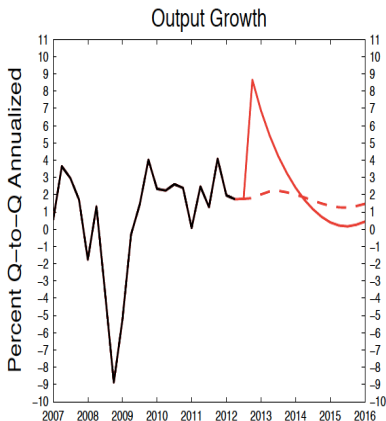
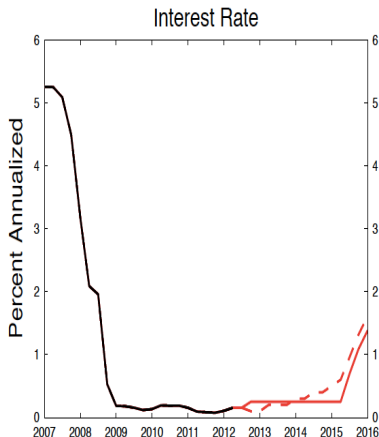
- Add dummies for announcements of:
 - Forward guidance episode
 - QE
 - Continuation of QE
 - Output conditions
 - Inflation conditions

Effect of Different Aspects of the FOMC Statement



The Forward Guidance Puzzle

- Medium-scale DSGE – Good forecasting performance
 - *In principle* well suited for counterfactual experiments
- 2012Q2 “experiment”: FFR kept at ZLB through 2015Q2



See also Carlstrom et al. 2012

The Two Legs of the Forward Guidance Puzzle

1: Consumption depends on the expected future short-term real rates:

$$\hat{c}_t = -E_t[\hat{R}_t - \hat{\pi}_{t+1} + \hat{c}_{t+1}] \implies \hat{c}_t = -\sum_{j=0}^{\infty} E_t \underbrace{[\hat{R}_{t+j} - \hat{\pi}_{t+1+j}]}_{\hat{r}_{t+j}}$$

- **Contemporaneous** shock: $\hat{r}_t \downarrow \implies \hat{c}_t \uparrow, \hat{c}_{t+1} = 0, \dots$
- **Anticipated** shock: $\hat{r}_{t+H} \downarrow \implies \hat{c}_t \uparrow, \hat{c}_{t+1} \uparrow, \dots, \hat{c}_{t+H} \uparrow$
- The farther the rate drop, the longer does consumption boom last (McKay, Nakamura, Steinsson, 2015)

2: Now let π move. NK Phillips curve implies

$$\hat{\pi}_t = \kappa \sum_{j=0}^{\infty} \beta^j E_t[\hat{c}_{t+j}]$$

- **Anticipated** shock: more prolonged consumption boom
 $\implies \hat{\pi}_t, \hat{\pi}_{t+1}, \dots$ rises more \implies *real* rate drops even more today
 \implies consumption increase amplified

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Possible Resolutions

① The **Euler equation?**

- McKay, Nakamura, Steinsson (2015), Caballero and Fahri (2014), HANK/Mol, Kaplan, Violante (2015)
- **Here:** Discounting in the Euler equation coming from overlapping generations
- Werning (2015)

② The **NKPC?**

- Kiley et al. 2014, Carlstrom et al. 2012

③ **Lack of credibility?**

- At odds with surveys and financial markets responses

④ **Deviations from rational expectations?**

- Gabaix (2015), Garcia-Schmidt, Woodford (2015)

A Proposed Resolution: Finite Life (Blanchard-Yaari)

- Agents face probability p of “dying”

$$\sum_{s=0}^{\infty} (\beta(1-p))^s \log(C_{j,t+s})$$

- Life-insurance companies offer an annuity contract \rightarrow individual wealth accumulates at $R/(1-p)$

$$S_{j,t+1} = \frac{R_t}{1-p} (S_{j,t} + Y_t - C_{j,t})$$

- Individual EE for each cohort j :

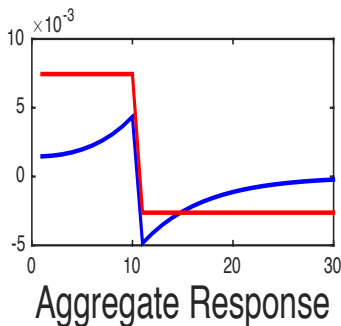
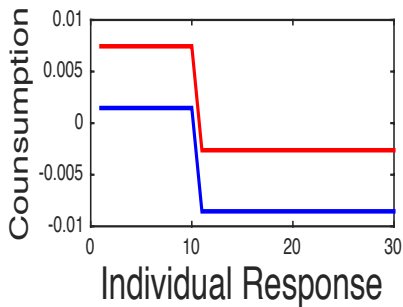
$$C_{j,t+1} = \beta R_t C_{j,t}$$

- Aggregate EE:

$$C_{t+1} = R_t \beta C_t - \frac{p(1-\beta(1-p))}{(1-p)} S_{t+1}$$

A Proposed Resolution: Finite Life (Blanchard-Yaari)

- Announced future drop in R . "Death" probability: $p = 0$, $p > 0$



- Individuals*: consumption \uparrow , wealth \downarrow (standard Euler eq)
- But **unborn cohorts cannot react to the announcement**
- In the *aggregate*, C increases as it gets closer to drop in R (as newborn cohorts react)

Smets-Wouters Model with Blanchard-Yaari Households

- Aggregate consumption Euler equation (simplified):

$$\hat{c}_t = - \left(\hat{R}_t - E_t[\hat{\pi}_{t+1}] \right) + (1 - \eta) E_t[\hat{s}_{t+1}] + \eta E_t[\hat{c}_{t+1}]$$

where $\eta < 1$ when $p > 0$

- Evolution of wealth \hat{s}_t and fiscal policy
- All other equations are the same as in SW (with $\tilde{\beta} = \eta\beta$), e.g. NK Phillips Curve:

$$\pi_t = E_t \sum_{j=0}^{\infty} \tilde{\beta}^j \kappa m c_{t+j}$$

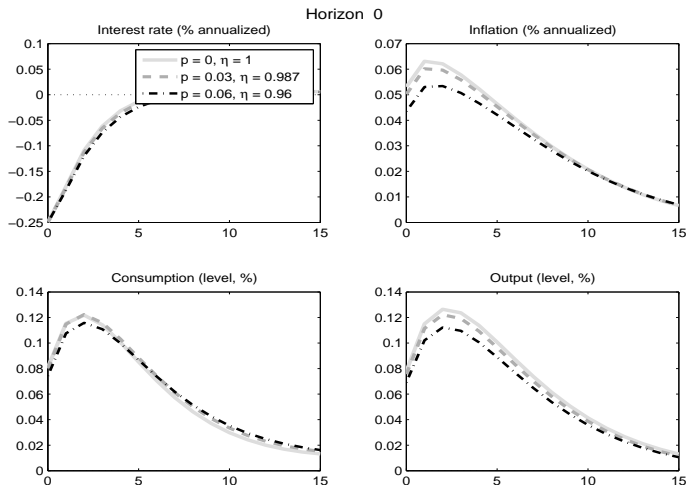
- SWBY: Tractable medium scale DSGE (builds on Nistico, Castelnuovo and Nistico, ...)

Does it Matter Quantitatively?

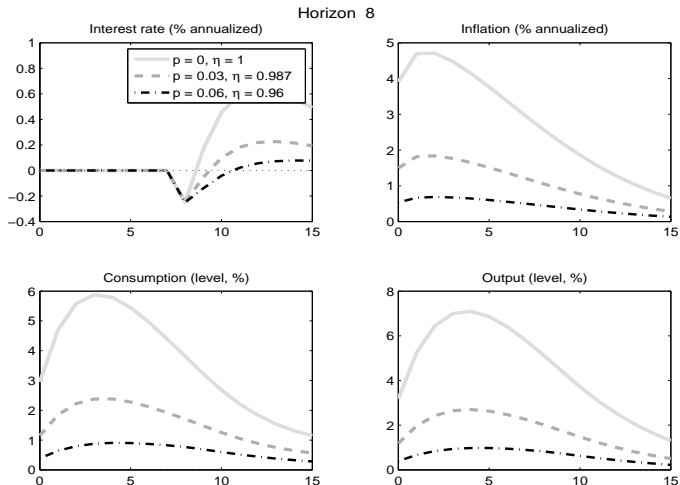
- Calibration of p :
 - Average death prob. (Soc. Sec.) per quarter: 0.4% to 0.8%
 - In addition, can loosely think of p as the probability of entering/exiting hand-to-mouth status (e.g. bankruptcy,..., from Kaplan, Violante, Wieder 2014: 2.3%)
 - Baseline: $p = 3\%$; alternative: $p = 6\%$
- All other parameters taken from Smets and Wouters

Contemporaneous drop in FFR

- Response to contemporaneous shock similar for $p = 0$, 3% or 6%



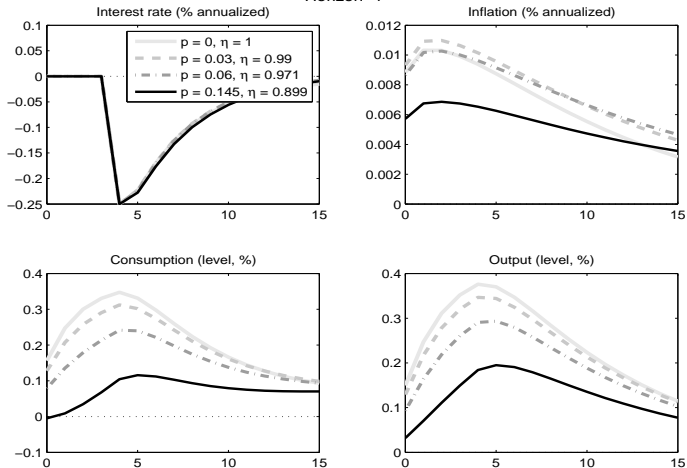
Announcement of FFR drop in 8 quarters



- With $p = 0$: FG causes huge changes in output and inflation
- With $p = 3\%$, response of output and inflation cut by 2/3

Estimated Model

Horizon 4



- $r_* = 1/\tilde{\beta}$ is fixed across simulations
- Very preliminary results!

Conclusions

- ① What are the effects of forward guidance?
 - **Stimulative, non-trivial, but not huge**
- ② Can its effects be captured by standard medium-scale DSGE models?
 - No! Estimated DSGE model delivers **implausibly large responses to forward guidance**
- ③ A proposed resolution to the forward guidance puzzle
 - **Blanchard-Yaari**
 - Compositional effects imply **discounting in the Euler equation** \implies mitigate aggregate response

Reference Slides

Evidence from Financial Markets

2-day changes following FOMC meeting

Maturity (years)	TIPS (constant maturity)					Implied Vol.	SP 500	DJ IA	FX USD/EUR
	30	20	10	7	5		(% change)		(% change)
8/9/2011	-26	-16	-33	-52	-39	-8.11	0.12	-0.83	-0.01
1/25/2012	-8	-11	-15	-18	-20	-4.21	0.29	0.46	0.56
9/13/2012	-9	-8	-15	-19	-25	-1.13	2.03	1.95	1.78

Notes: All figures are in basis points unless otherwise noted.

- Real rates fall
- Stocks prices: modest changes in Aug. 2011 and Jan. 2012; larger increases in Sept. 2012

Evidence from Financial Markets

2-day changes following FOMC meeting

Maturity (years)	Breakevens			Inflation Swaps					Liquidity Premium		
	20	10	5	30	20	10	5	1	20	10	5
8/9/2011	-7	10	21	8	9	14	13	-3	16	4	-8
1/25/2012	3	3	5	3	3	4	8	12	0	1	3
9/13/2012	24	26	27	26	27	21	28	23	3	-5	1

Notes: All figures are in basis points unless otherwise noted.

- Inflation breakeven and Inflation swaps increase especially in Sept. 2012
- Little variation in liquidity premium (TIPS-Treasury spread, Fleckenstein et al.)

Evidence from Financial Markets

- August 2011:
 - Bond yields and real rates fall; little change in stocks prices
 - Inflation breakeven and inflation swaps increase slightly
- January 2012:
 - Financial market response similar to that of August 2011, but more modest
- September 2012: Different response
 - Real yields fall
 - But bond yields rise with inflation breakeven and inflation swaps; stock market rises
- Sept. 2012: Could be consistent with Odyssean forward guidance: monetary policy more accommodative than expected and provides more stimulus
 - ... “highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens”.
 - What happened to output forecasts?

Evidence from Financial Markets

2-day changes following FOMC meeting

Corporate Yields

	Intermediate term						Long term					
	Aaa	Aa	A	Baa	Ba	B	Aaa	Aa	A	Baa	Ba	B
8/9/2011	-8	-6	-8	-8	2	16	-11	-9	-5	-5	26	33
1/25/2012	-10	-13	-11	-16	-9	-13	-12	-15	-17	-13	-16	-10
9/13/2012	11	10	7	-2	-8	-15	0	-1	-1	5	-12	-18

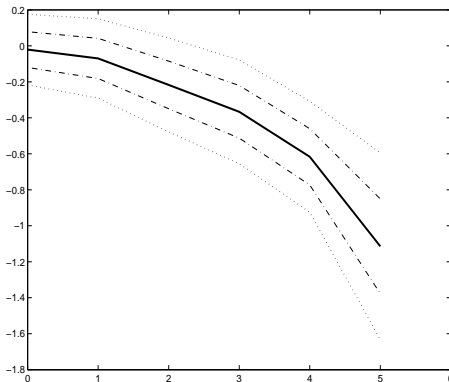
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- **Safety premium:**
 - August 2011: flight to safety. High-credit-quality bonds yields fall (less than Treasuries) but lower quality bond yields rise
 - Sept. 2012: more risk taking. High-credit-quality bonds yields rise but lower quality bond yields fall

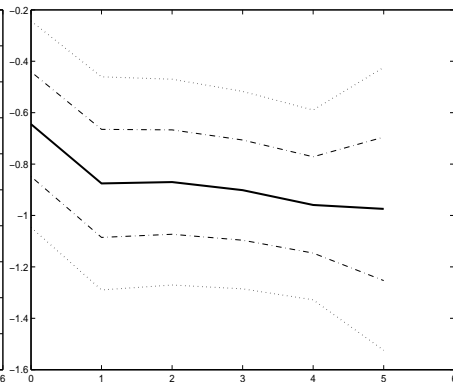
Blue Chip Financial Forecasters: August 2011

- “economic conditions ... are likely to warrant exceptionally low levels of the FFR at least through mid-2013”

3-Month TBill



10-Year Treasury

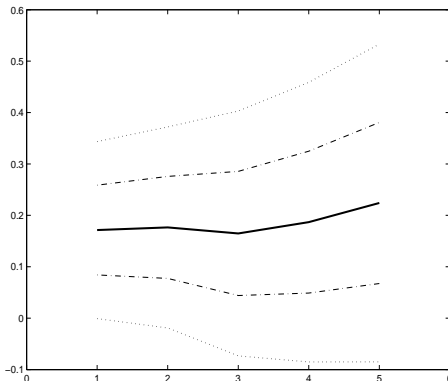


- Forecasters believe the announcement
- Forecasts of financial variables in line with two-day window asset response

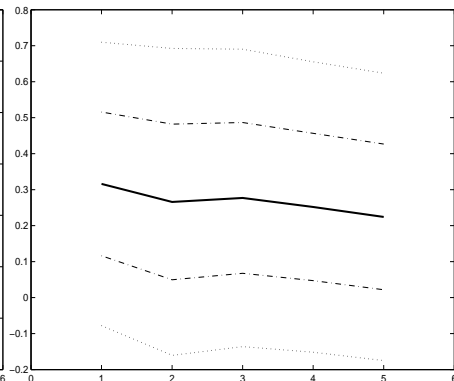
September 2012

- ... “highly accommodative stance ... will remain appropriate for a considerable time after the economic recovery strengthens. ... exceptionally low levels for the FFR are likely to be warranted at least through mid-2015”

3-Month TBill



10-Year Treasury



- Long term-rates increase (in line with market reaction)

Fwd Guidance Puzzle and Effects of Changes in the Reaction Function

- “Excessive” response of output and inflation as well
- Note: Nominal rates can \uparrow in equilibrium following an announcement about the reaction function (consistent with 9/13/12)

