The Forward Guidance Puzzle

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Disclaimer: The views expressed here do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System
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
Transmission of Monetary Policy

• Pre-Great Recession
  
  • Key instrument of policy: short-term interest rate
  
  • Monetary transmission well understood (extensively studied using both VAR models and DSGE models)

• Post-Great Recession
  
  • “New” policy tools: Forward guidance (FG), LSAPs
  
  • Goal at ZLB: lower long-term bond yields
  → stimulate aggregate expenditures

• But ... effects not well understood; harder to quantify using existing empirical tools (e.g. VARs)
Analyzing the Effects of Forward Guidance – The Challenge

- Announcement by CB that will maintain FFR at ZLB for longer can have two effects (Campbell, Evans, Fisher, Justiniano 2012; Woodford 2012):
  
  1. **More monetary stimulus (Odyssean/Commitment a la Eggertsson and Woodford 2003)** → stimulates economic activity, higher inflation
  
  2. Reveals **bad news about state of economy (Delphic)** → lower projected activity, lower inflation

- Interpretation by market depends in very subtle ways on FOMC communication
Analyzing the Effects of Forward Guidance – The Challenge

- Like Odysseus, central bank commits to keeping FFR low despite temptation to raise FFR once the economy is recovering
Analyzing the Effects of Forward Guidance – The Challenge

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Analyzing the Effects of Forward Guidance – The Challenge

- Like the Oracle of Delphi, central bank announces a low forecast for FFR, given its forecast of weak economic conditions
Analyzing the Effects of Forward Guidance – The Challenge

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DSGE Models Suited to Analyze Forward Guidance?

- Medium-scale New Keynesian DSGE models “fit data well”

- Models are ”structural” → in principle well suited to perform counterfactual experiments

- Problem: Model-implied response to FG much larger than observed → ”Forward Guidance Puzzle”!
DSGE Models Suited to Analyze Forward Guidance?

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• Problem: Model-implied response to FG much larger than observed $\rightarrow$ ”Forward Guidance Puzzle”!
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 $t = 2008.06, .., 2015.02$

- 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
Evidence from Financial Markets: Forward Rates

- Pre-FOMC: solid; post-FOMC: dashed
- FF fut. (purple); Eurodol. fut. (blue); Fwd rates from yield curve (red)

08/09/11 “at least through mid-13”
01/25/12 “at least through late-14”
09/13/12 “mid-15” “...after the economy strengthens”
Evidence from Financial Markets

- As in KVJ (11): look at cross-section of financial markets data
  - Femia et al. 2013, Raskin 2013, Filardo and Hoffman 2014, Moessner 2013, ...

### Changes in bond yields in 2-day following FOMC meeting

<table>
<thead>
<tr>
<th>Maturity (years)</th>
<th>Treasury Yields (constant maturity)</th>
<th>Agency Yields (Fannie/Freddie)</th>
<th>MBS Yields</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 10 5 3 1</td>
<td>30 10 5 3</td>
<td>30 15</td>
</tr>
<tr>
<td>1/25/2012</td>
<td>-5 -12 -15 -8 0</td>
<td>-10 -13 -18 -14</td>
<td>-16 -18</td>
</tr>
<tr>
<td>9/13/2012</td>
<td>17 11 2 2 0</td>
<td>10 5 0 1</td>
<td>-13 -11</td>
</tr>
</tbody>
</table>

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

- Fed announcements affect yields:
  - Hard to reconcile with lack of credibility story
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”

• 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”

• **Odyssean**: significant increase in forecasts for real activity and inflation
# Evidence from Financial Markets

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

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- Real rates **fall**

### Effects of Forward Guidance: Empirical evidence

<table>
<thead>
<tr>
<th>Maturity (years)</th>
<th>Breakevens</th>
<th>Inflation Swaps</th>
<th>Liquidity Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>10</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td>8/9/2011</td>
<td>-7</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>1/25/2012</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>9/13/2012</td>
<td>24</td>
<td>26</td>
<td>27</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Intermediate term</th>
<th></th>
<th>Long term</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aaa</td>
<td>Aa</td>
<td>A</td>
</tr>
<tr>
<td>8/9/2011</td>
<td>-8</td>
<td>-6</td>
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<td>10</td>
<td>7</td>
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- While high-grade yields decrease in August 2011 in line with Treasuries, low-grade corporate yields increase (safety premium ↑)
- Low-grade corporate yields fall in Sept 2012 (safety premium ↓)
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?
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

Forward Guidance

QE Announcement

Bad Output Language

GDP Growth

3-Month TBill

Del Negro, Giannoni, Patterson

Forward Guidance Puzzle

Penn State
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:

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

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

2: Now let \( \pi \) 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
  \( \implies \hat{\pi}_t, \hat{\pi}_{t+1}, \ldots \) rises more \( \implies \) real rate drops even more today
  \( \implies \) consumption increase amplified
The Two Legs of the Forward Guidance Puzzle

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Possible Resolutions

1. The **Euler equation**?
   - Here: Discounting in the Euler equation coming from overlapping generations
     - Werning (2015)

2. The **NKPC**?

3. **Lack of credibility**?
   - At odds with surveys and financial markets responses

4. **Deviations from rational expectations**?
A Proposed Resolution: Finite Life (Blanchard-Yaari)

- Agents face probability $p$ of “dying”

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

- 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 $j$:

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

where $H_t = \sum_{s=0}^{\infty} \frac{Y_{t+s}}{\prod_{l=0}^{s-1} (R_{t+l}/(1-p))}$

- 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)

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A Proposed Resolution: Finite Life (Blanchard-Yaari)

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

- **Individuals**: consumption ↑, wealth ↓ (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):

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

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
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

- $r_\ast = 1/\tilde{\beta}$ 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** $\Rightarrow$ mitigate aggregate response
Reference Slides
• “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 ↑ in equilibrium following an announcement about the reaction function (consistent with 9/13/12)