Expecting the Fed

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Motivation

Fact. There is information in the time series of interest rates and in macro variables that is not in today’s yield curve, but predicts bond returns/yields.

H1. [FIRE] A variable has an offsetting effect on the risk premium vs the expected short rate, maturity by maturity:

\[
y_t^{(2)} = \frac{1}{2} F_t (i_t + i_{t+1}) + \frac{1}{2} F_t \left( rx_{t+1}^{(2)} \right) \text{ (ex-ante)} \quad (1)
\]

H2. [≠FIRE] Forecast errors about the short rate are ex-post predictable:

\[
y_t^{(2)} = \frac{1}{2} (i_t + i_{t+1}) + \frac{1}{2} rx_{t+1}^{(2)} \text{ (ex-post)} \quad (2)
\]

\[
i_{t+1} - F_t(i_{t+1}) = - \left[ rx_{t+1}^{(2)} - F_t(rx_{t+1}^{(2)}) \right] \quad (3)
\]

Focus. How does the private sector form and update expectations about \(i_t\) and thus future path of monetary policy?
Term structure of short rate expectations

Professional forecasts from the Blue Chip survey (BCFF), available 1983-2010

Similar pattern for Greenbook forecasts of FFR as well as for SPF and BCFF forecasts of 3-month T-bill

Forecasters predict about 18% of variation in FFR one year ahead; more than 80% remains unexplained
Term structure of forecast errors

Forecast error defined as: $FE_{t-h,t}^{FFR} = FFR_t - E_{t-h}^s(FFR_t)$, where $h$ ranges from one through four quarters, $E^s(\cdot)$ denotes survey-based expectations.

Largest and most volatile errors occur in easing episodes; avg. forecast error $= -1.43\%$ in easings and $0.60\%$ in tightenings, at $h = 4Q$.
Term structure of forecast errors

The table reports out-of-sample (sequential) RMSEs (in % p.a.) for forecasting FFR at horizons 1–4Q ahead, OOS period 1983-2010.

<table>
<thead>
<tr>
<th>Model</th>
<th>h=Q1</th>
<th>h=Q2</th>
<th>h=Q3</th>
<th>h=Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) FFR survey</td>
<td>0.33</td>
<td>0.75</td>
<td>1.12</td>
<td>1.47</td>
</tr>
<tr>
<td>(2) Random walk</td>
<td>0.54</td>
<td>0.95</td>
<td>1.31</td>
<td>1.63</td>
</tr>
<tr>
<td>(3) AR(2)</td>
<td>0.52</td>
<td>0.95</td>
<td>1.29</td>
<td>1.60</td>
</tr>
<tr>
<td>(4) AR(p) dynamic</td>
<td>0.55</td>
<td>0.97</td>
<td>1.30</td>
<td>1.61</td>
</tr>
<tr>
<td>(5) VAR(2) OLS</td>
<td>0.55</td>
<td>0.93</td>
<td>1.30</td>
<td>1.64</td>
</tr>
<tr>
<td>(6) TVP VAR(2)</td>
<td>0.56</td>
<td>1.02</td>
<td>1.42</td>
<td>1.79</td>
</tr>
</tbody>
</table>
i. Ex-post, the short rate appears more predictable than it has been ex-ante
   — Distant lags of short rate predict its changes after conditioning on information in the yield curve
   — Slow mean-reversion at business cycle frequency

ii. A wedge between information in the time series and cross section of yields
   — Effect located at the short maturity range
   — Lagged information explains up to 25% of ex-post FFR forecast errors
   — Traces low-frequency variation in monetary policy surprises

iii. Two factor structure in realized/predictable bond excess returns
    — At short maturities, ex-ante unexpected short rate component
    — At long maturities, “usual” risk premium

iv. More general feature of expectations formation?
    — Lagged information survives in tests for information frictions (noisy, sticky)
    — Explains portion of ex-post errors of unemployment controlling for other information rigidities
    — Visible in money market fund flows; evidence of extrapolation


Monetary policy and information frictions: Woodford (2001), Mankiw and Reis (2002), Orphanides and Williams (2005), Sims (2003), Angeletos and La’O (2011)


Short rate expectations
A yield curve decomposition

\[
\Delta FFR^c = \Delta FFR \quad \Rightarrow \quad FFR^c = \text{slope}
\]
A yield curve decomposition

Cieslak and Povala (2011):

i. $\tau_t^{CPI}$: Slow-moving inflation endpoint (target) $\rightarrow$ level

$\Delta FFR^C = \Delta FFR \bowtie FFR^C = $slope $\bowtie$
Cieslak and Povala (2011):

i. $\tau_t^{CPI}$: Slow-moving inflation endpoint (target) $\rightarrow$ level

ii. $FFR_t^c$: Monetary policy cycle moving the short end $\rightarrow$ slope

$$FFR_t^c = FFR_t - \hat{\beta}_t^{CPI}, \quad \hat{\beta} = 1.26$$
A yield curve decomposition

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iii. $RP_t$: A risk premium factor

\[ \Delta FFR^c = \Delta FFR \rightarrow FFR^c = \text{slope} \rightarrow \]
Cieslak and Povala (2011):

i. $\tau_{t}^{CPI}$: Slow-moving inflation endpoint (target) $\rightarrow$ level

ii. $FFR_{t}^{C}$: Monetary policy cycle moving the short end $\rightarrow$ slope

$$FFR_{t}^{C} = FFR_{t} - \hat{\beta}\tau_{t}^{CPI}, \quad \hat{\beta} = 1.26$$

iii. $RP_{t}$: A risk premium factor

- Inflation target $\tau_{t}^{CPI} \approx$ random walk
- Forecasting $\Delta FFR_{t,t+1}$ amounts to forecasting $\Delta FFR_{t,t+1}^{C}$ [corr. 0.99]
- $FFR_{t}^{C} \approx$ slope w/o risk premium [corr. w/ slope -0.93]
- For robustness, we fix $\hat{\beta} = 1$, and use long-term inflation surveys

$$\Delta FFR_{t}^{C} = \Delta FFR \sim FFR_{t}^{C} = \text{slope} \sim$$
Short rate dynamics and expectations

Statistics, but not surveys, tells us that short rate is quite predictable (survey sample 1983-2010):

\[
\Delta FFR_{t,t+1} = \alpha_0 + \alpha_1 FFR_t^c + \alpha_2 FFR_{t-1}^c + \varepsilon_{t+1}, \quad \bar{R}^2 = 0.46
\]

Long-run mean reversion appears not fully subsumed in FFR forecasts:

\[
\Delta FFR_{t,t+1} = \alpha_3 + \alpha_4 \left[ E_t^s (FFR_{t+1}) - FFR_t \right] + \alpha_5 FFR_{t-1}^c + \varepsilon_{t+1}, \quad \bar{R}^2 = 0.46
\]

Lagged slope plays a similar role to \( FFR_{t-1}^c \) (though risk premium):

\[
\Delta FFR_{t,t+1} = \alpha_6 + \alpha_7 \left[ E_t^s (FFR_{t+1}) - FFR_t \right] + \alpha_8 S_{t-1} + \varepsilon_{t+1}, \quad \bar{R}^2 = 0.31
\]
Short rate dynamics and expectations

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\]

Thus, ex-post forecast errors are predictable with lagged information:

\[
\text{FE}_{t,t+1}^{FFR} = \delta_0 + \delta_1 FFR_{t-1}^c + \varepsilon_{t+1}, \quad \bar{R}^2 = 0.26
\]

\( S_{t-1} \) explains 15%; \( FFR_{t-1}^c \) constructed with inflation surveys explains 25%. 

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Persistent monetary policy surprises

Kuttner (2001) surprises available from 1989:12; change in the fed funds futures around FOMC announcement; we sum them up over 8 meetings

Tight policy in the past → more negative surprises going forward as policy eases; suggestive of private sector extrapolating recent experience
A different look at FE predictability

i. Time series: $\Delta FFR_{t-1,t}$

ii. Expectations/“Cross section”: $E^s_t(FFR_{t+1}^c) = E^s_t(FFR_{t+1}) - \tau_t^{CPI}$

No need to estimate proj. coefficient for $\tau_t^{CPI}$; $\tau_t^{CPI}$ is real time
A different look at FE predictability

i. Time series: $\Delta FFR_{t-1,t}$

ii. Expectations/"Cross section": $E_t^s(FFR_{t+1}^C) = E_t^s(FFR_{t+1}) - \tau_{t_{CP}}$

No need to estimate proj. coefficient for $\tau_{t_{CP}}$; $\tau_{t_{CP}}$ is real time

To fit the FE, a projection extracts a component orthogonal to $t$ expectations:

$$FE_{t,t+1}^{FFR} = \delta_3 + \delta_4 \left[ \Delta FFR_{t-1,t} - E_t^s(FFR_{t+1}^C) \right] + \epsilon_{t+1}, \quad R^2 = 0.33$$

Similar results using inflation surveys instead of $\tau_{CP}$; range of $\bar{R}^2$: 20%-25%
A different look at FE predictability

i. Time series: $\Delta FFR_{t-1,t}$

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$$FE_{t,t+1}^{FFR} = \delta_3 + \delta_4 \left[ \Delta FFR_{t-1,t} - E_t^s(FFR_{t+1}^c) \right] + \epsilon_{t+1}, \quad \bar{R}^2 = 0.33$$

Similar results using inflation surveys instead of $\tau_{t}^{CPI}$; range of $\bar{R}^2$: 20%-25%

Define: $MP_t^\perp = \Delta FFR_{t-1,t} - E_t^s(FFR_{t+1}^c)$

- Idea that there is persistent information in short rate dynamics that is not im- pounded into expectations in real time
- $MP_t^\perp$ is essentially orthogonal to time-$t$ yield curve (proj. on 5 PCs gives $\bar{R}^2 = 10\%$)
- If expectations $\approx$ RW, $MP_t^\perp$ collapses to $-FFR_{t-1}^c$ [corr=$-0.90$]
- An interpretation of an unspanned short rate factor
Expected and ex-ante unexpected returns
Bond excess returns move on **two factors** with opposite loadings across maturities; two factors capture $> 95\%$ of variation.

Long-maturity component explained well with $RP_t$; short-maturity component—with lagged short rate information.

Similar in spirit to JPS, JLS who combine macro and yield curve info.
Factor structure of excess bonds returns

\[ r_{x_{t,t+1}}^{(n)} = \alpha_0 + \alpha_1 R P_t + \alpha_2 F F R^c_{t-1} + \varepsilon_{t+1} \]

<table>
<thead>
<tr>
<th>( r_{x_{t,t+1}}^{(n)} )</th>
<th>( r_{x_{t,t+1}}^{(2)} )</th>
<th>( r_{x_{t,t+1}}^{(3)} )</th>
<th>( r_{x_{t,t+1}}^{(5)} )</th>
<th>( r_{x_{t,t+1}}^{(7)} )</th>
<th>( r_{x_{t,t+1}}^{(10)} )</th>
<th>( r_{x_{t,t+1}}^{(20)} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. ( r_{x_{t,t+1}}^{(n)} = \alpha_0 + \alpha_1 R P_t + \varepsilon_{t,t+1} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R P_t )</td>
<td>0.52</td>
<td>0.56</td>
<td>0.64</td>
<td>0.68</td>
<td>0.72</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>(4.26)</td>
<td>(5.22)</td>
<td>(6.62)</td>
<td>(7.23)</td>
<td>(8.09)</td>
<td>(7.11)</td>
</tr>
<tr>
<td>( \bar{R}^2 )</td>
<td><strong>0.26</strong></td>
<td>0.31</td>
<td>0.41</td>
<td>0.47</td>
<td>0.52</td>
<td>0.49</td>
</tr>
<tr>
<td>B. ( r_{x_{t,t+1}}^{(n)} = \alpha_0 + \alpha_1 R P_t + \alpha_2 F F R^c_{t-1} + \varepsilon_{t,t+1} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R P_t )</td>
<td>0.56</td>
<td>0.60</td>
<td>0.67</td>
<td>0.71</td>
<td>0.74</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>(4.57)</td>
<td>(5.80)</td>
<td>(7.14)</td>
<td>(7.54)</td>
<td>(8.13)</td>
<td>(6.77)</td>
</tr>
<tr>
<td>( F F R^c_{t-1} )</td>
<td><strong>0.49</strong></td>
<td>0.45</td>
<td>0.34</td>
<td>0.27</td>
<td>0.21</td>
<td><strong>0.11</strong></td>
</tr>
<tr>
<td></td>
<td>(4.89)</td>
<td>(4.16)</td>
<td>(3.14)</td>
<td>(2.57)</td>
<td>(2.05)</td>
<td>(1.11)</td>
</tr>
<tr>
<td>( \bar{R}^2 )</td>
<td>0.50</td>
<td>0.51</td>
<td>0.52</td>
<td>0.54</td>
<td>0.56</td>
<td>0.50</td>
</tr>
</tbody>
</table>

\( R P_t \) is bond risk premium constructed by Cieslak and Povala (2011).

Similarly, lagged slope, \( S_{t-1} \), increases the \( R^2 \) to 45% at the short end.
Decomposing realized return on 2-year bond

- Focus on the short end where effect of lags is the strongest: 2-year bond
- Obtain a direct survey-based measure of ex-ante unexpected returns
- BCFF survey, same panel of forecasters as above, but available over shorter sample 1988–2010
- Decompose the annual return on the 2-year Treasury bond as:

\[
rx_{t,t+1}^{(2)} = \left[ f_t^{(2)} - E_t^s(y_{t+1}^{(1)}) \right] - \left[ y_{t+1}^{(1)} - E_t^s(y_{t+1}^{(1)}) \right].
\]

- Unexpected return comoves strongly with the FFR forecast error:

\[
corr(U_t(rx_{t,t+1}^{(2)}), F^tE^{FFR}_{t,t+1}) = -0.93
\]
Predicting components of realized return on 2-year bond

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$MP_t^\perp$</td>
<td>$FFR_{t-1}^c$</td>
<td>$S_{t-1}$</td>
<td>CFNAI$_t$</td>
<td>$\Delta$Unempl$_t$</td>
<td>$RP_t$</td>
<td></td>
</tr>
<tr>
<td>A. Predicting <strong>ex-ante unexpected</strong> return on 2-year bond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta$</td>
<td>-0.60</td>
<td>0.57</td>
<td>-0.48</td>
<td>-0.39</td>
<td>0.42</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(-5.12)</td>
<td>(4.46)</td>
<td>(-3.75)</td>
<td>(-2.43)</td>
<td>(2.63)</td>
<td>(1.22)</td>
</tr>
<tr>
<td>$\bar{R}^2$</td>
<td>0.35</td>
<td>0.32</td>
<td>0.22</td>
<td>0.15</td>
<td>0.18</td>
<td><strong>0.02</strong></td>
</tr>
<tr>
<td>B. Predicting <strong>expected return</strong> on 2-year bond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta$</td>
<td>-0.05</td>
<td>0.01</td>
<td>-0.14</td>
<td>0.17</td>
<td>-0.05</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>(-0.34)</td>
<td>(0.08)</td>
<td>(-0.77)</td>
<td>(1.49)</td>
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<td>(4.33)</td>
</tr>
<tr>
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<td><strong>0.00</strong></td>
<td><strong>0.00</strong></td>
<td><strong>0.02</strong></td>
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<td><strong>0.00</strong></td>
<td><strong>0.23</strong></td>
</tr>
</tbody>
</table>

Projections of unexpected and expected return on 2-year bond:

**Columns (1)-(3):** on lagged term structure information

**Columns (4)-(5):** on real activity proxies as predictors: CFNAI and growth of unemployment

**Column (6):** on statistical risk premium proxy, $RP_t$

Available BCFF sample: 1987:12-2010:12
## Predicting components of realized return on 2-year bond

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
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<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( MP^\perp_t )</td>
<td>( FF_{t-1}^c )</td>
<td>( S_{t-1} )</td>
<td>( CFNAI_t )</td>
<td>( \Delta Unempl_t )</td>
<td>( RP_t )</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
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<td>-0.05</td>
<td>0.01</td>
<td>-0.14</td>
<td>0.17</td>
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<td></td>
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<td>(0.08)</td>
<td>(-0.77)</td>
<td>(1.49)</td>
<td>(-0.47)</td>
<td>(4.33)</td>
</tr>
<tr>
<td>( \bar{R}^2 )</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
<td>0.02</td>
<td>0.00</td>
<td>0.23</td>
</tr>
</tbody>
</table>

### Projections of unexpected and expected return on 2-year bond:

**Columns (1)-(3):** on lagged term structure information

**Columns (4)–(5):** on real activity proxies as predictors: CFNAI and growth of unemployment

**Column (6):** on statistical risk premium proxy, \( RP_t \)

Available BCFF sample: 1987:12-2010:12

- **FIRE explanation for excess predictability** (\( H1 \): offsetting risk premia and expectations) requires significant relationship between expected returns and predictors (\( \neq \) panel B, cols (1)-(5))
- At the short end, survey evidence speaks to \( \neq \)FIRE story (\( H2 \)), i.e. ex-post predictable but ex-ante unexpected returns (panel A)
- This does not preclude the first effect (\( H1 \)) to take hold at the long end
Additional evidence

Long samples, frictions, concerns
A. Consider a simple autoregressive **time series** model for the short rate 
[e.g. Modigliani and Sutch (1966), Sargent (1972)]

B. Use the **cross-sectional** information (fitted slope $\hat{S}_t$) to predict changes

<table>
<thead>
<tr>
<th>Sample period</th>
<th>$R^2$ lag</th>
<th>Wald pval</th>
<th>BIC max.lag</th>
<th>$\beta^e$ [t-stat]</th>
<th>$R^2_{\hat{S}_t}$</th>
<th>$R^2_{raw \ S_t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1875:3-1913:4</td>
<td>0.40</td>
<td>0.27</td>
<td>–</td>
<td>1.13 [5.70]</td>
<td>0.39</td>
<td>0.35</td>
</tr>
<tr>
<td>1914:1-1951:2</td>
<td>0.07</td>
<td>0.20</td>
<td>–</td>
<td>0.28 [1.60]</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>1951:3-1979:2</td>
<td>0.39</td>
<td>0.00</td>
<td>14</td>
<td>0.56 [3.61]</td>
<td>0.17</td>
<td>0.14</td>
</tr>
<tr>
<td>1984:1-2011:4</td>
<td>0.41</td>
<td>0.00</td>
<td>16</td>
<td>0.50 [2.65]</td>
<td>0.12</td>
<td>0.09</td>
</tr>
<tr>
<td>1951:3-2011:4</td>
<td>0.13</td>
<td>0.00</td>
<td>16</td>
<td>0.26 [1.25]</td>
<td>0.02</td>
<td>0.03</td>
</tr>
</tbody>
</table>

$\hat{S}_t$ is a fitted value from a regression of slope on lags of $i_{t-j}: j \in 0, 1, 2, 4$ years

- Distant lags double predictability of short rate changes relative to time $t$ information
- Extra information in the dynamics seems to coincide with an active monetary policy (post-Accord)
- Clear data limitations: slope does not capture the whole time $t$ information *(see next)*
**Short rate dynamics post Accord**

- Post Fed-Treasury Accord period: condition on the entire available cross section of yields (PCs); select lags optimally (BIC)

\[
\Delta i_{t,t+1} = \beta_0 + \sum_{j=1}^{6} \beta_j PC^j_t + \delta_1 i_{t-L_1} + \delta_2 i_{t-L_2} + \epsilon_{t+1}
\]

<table>
<thead>
<tr>
<th>Sample period</th>
<th>$\bar{R}^2$ PCs</th>
<th>$\bar{R}^2$ PCs &amp; lags</th>
<th>Wald pval lags</th>
<th>BIC max.lag (qtrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952:3–1979:2</td>
<td>0.08</td>
<td>0.36</td>
<td>0.00</td>
<td>13</td>
</tr>
<tr>
<td>1984:1–2011:4</td>
<td>0.37</td>
<td>0.55</td>
<td>0.00</td>
<td>16</td>
</tr>
<tr>
<td>1952:3–2011:4</td>
<td>0.18</td>
<td>0.25</td>
<td>0.01</td>
<td>16</td>
</tr>
</tbody>
</table>

- Significant information in lagged short rates beyond time $t$ cross section
- Evidence that lag structure not constant across monetary policy regimes
Noisy and sticky information models imply that forecast errors are predictable with forecast updates (Coibion and Gorodnichenko (2012)):

\[ \text{FE}_{t,t+h}^{FR} = \beta_0 + \beta_1 \left[ E_t^s(FFR_{t+h}) - E_{t-1/4}(FFR_{t+h}) \right] + \beta_X X_t + \varepsilon_{t+h} \]

with \( \beta_1 > 1 \) and \( \beta_X = 0 \)

<table>
<thead>
<tr>
<th></th>
<th>( h = 1Q ) ahead</th>
<th>( h = 3Q ) ahead</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( X_t )</td>
<td>( X_t )</td>
</tr>
<tr>
<td></td>
<td>Baseline ( MP_t ) ( FFR_{t-1}^c ) ( S_{t-1} )</td>
<td>Baseline ( MP_t ) ( FFR_{t-1}^c ) ( S_{t-1} )</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>0.15 ( (6.95) )</td>
<td>0.34 ( (2.99) )</td>
</tr>
<tr>
<td></td>
<td>0.13 ( (5.23) )</td>
<td>0.26 ( (2.57) )</td>
</tr>
<tr>
<td></td>
<td>0.11 ( (3.22) )</td>
<td>0.22 ( (1.97) )</td>
</tr>
<tr>
<td></td>
<td>0.14 ( (5.36) )</td>
<td>0.29 ( (2.73) )</td>
</tr>
<tr>
<td>( \beta_X )</td>
<td>0.12 ( (3.18) )</td>
<td>0.46 ( (4.08) )</td>
</tr>
<tr>
<td></td>
<td>-0.12 ( (-2.78) )</td>
<td>-0.44 ( (-3.00) )</td>
</tr>
<tr>
<td></td>
<td>0.07 ( (1.66) )</td>
<td>0.29 ( (2.54) )</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.09 ( (6.95) )</td>
<td>0.08 ( (2.99) )</td>
</tr>
<tr>
<td></td>
<td>0.15 ( (5.23) )</td>
<td>0.22 ( (2.57) )</td>
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</tr>
</tbody>
</table>

Importance of forecast updates subsides with horizon \( h \); role of yield curve lags increases

Similarly, lagged yield curve predicts unemployment FE beyond forecast updates
Extensions and concerns

We have not settled on a final story, but have documented additional facts:

- **Greenbook** FFR forecasts have similar properties \( \text{corr} = 88\% \) with BCFF FE at \( h = 4Q \)

- **Other macro variables.** Unemployment FE are strongly related to \( F E^{FFR} \) \( \text{corr} = -70\% \), and also predictable with lagged yield curve info

- **Flows** into money market are high following high \( FFR_t^c \) (flat \( S_t \)) suggesting extrapolation of recent past
  - Some evidence of market segmentation: speculative positions in Eurodollar futures predict the direction of FEs (Piazzesi and Swanson 2008), no such link in fed funds futures

- **Risk premia.** Could it just be risk premium at the short end of the curve?
  - Survey-based expected returns are uncorrelated with fitted ones from predictive regressions using real activity and uncertainty proxies
  - But indeed, FE of one investor type can be risk premium for someone else

- **Survey samples** are short, and the 1983-2010 period is unique in many ways

Survey vs. statistical premia T-bills
Based on survey forecasts, a portion of ex-post predictable short rate variation seems not anticipated ex-ante.

Distinguishing these sources of predictability in bond returns is potentially important: different channels/models.

Going forward:

- Which model of expectations formation? Learning about time-varying policy rule, natural expectations, other...
- Implications within GE models
- Importance for real effects of monetary policy?