

Revisions to Short Rate Expectations: Policy Shocks vs. Macroeconomic News

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The Impact of News on Financial Markets

Monetary Policy

How does the Fed affect the term structure of interest rates?

- ▶ Regress yield changes on policy shock measures derived from changes in money market futures.
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How do macroeconomic data releases affect interest rates?

- ▶ Regress yield changes on surprise component of macroeconomic data release.
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 - ▶ Hardouvelis (1988), Fleming & Remolona (1997).
- ⇒ Shortcomings of the conventional regression approach.
- ⇒ Need for an integrated framework to assess the impact of policy shocks and macroeconomic news.

Understanding News and the Term Structure

Object of Interest

Revision to the entire expected path of the future short rate

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 - ▶ Absence of arbitrage
 - ▶ Parsimonious representation of high-dimensional object
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 - ▶ Absence of arbitrage
 - ▶ Parsimonious representation of high-dimensional object
 - ▶ Recognize heterogeneity of news events
- ▶ Benefits
 - ▶ Coherent framework to think about news and the term structure
 - ▶ Uncover differences in the various sources of news
 - ▶ Describe the effects of news events on the entire term structure with only a few factors

Modeling Revisions: Affine Term Structure Model

- ▶ Three factors determine the short rate: $r_t = X_{1t} + X_{2t} + X_{3t}$
- ▶ Risk-neutral dynamics

$$X_{1t} = \theta_1 X_{1,t-1} + \theta_2 X_{1,t-2} + \xi_{1t},$$

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- ▶ Variance regimes

$$\xi_t \stackrel{\mathbb{Q}}{\sim} N(0, V_{r(t)}), \quad E^{\mathbb{Q}}(\xi_t \xi'_s) = 0 \quad t \neq s$$

$r(t) \in \{1, 2, \dots, R\}$ is the regime on day t .

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- ▶ Revisions (assuming equal roots):

$$(E_t^{\mathbb{Q}} - E_{t-1}^{\mathbb{Q}})r_{t+h} = (1+h)\rho^h \xi_{1,t} + \rho^h \xi_{2,t} + \xi_{3,t}$$

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- ▶ Why this model?

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- ▶ Similarities/differences? Relation to expected average fed funds rate?

- ▶ Daily changes in money market futures rates:

$$\Delta f_t^{(i)} = N^{-1} \sum_{h=iN-d(t)+1}^{(i+1)N-d(t)} (E_t^{\mathbb{Q}} - E_{t-1}^{\mathbb{Q}}) r_{t+h}$$

FF: $N = 31$, $d(t)$ is day of the month.

ED: $N = 91$, $d(t)$ is day of the quarter.

Estimation

- ▶ Empirical specification

$$\Delta f_t = \mu + H'_{d(t)} \xi_t^{\mathbb{P}} + \varepsilon_t$$

- ▶ pricing errors: $\varepsilon_t \sim N(0, R)$, $E(\varepsilon_t \varepsilon'_s) = 0$, $t \neq s$
- ▶ non-zero mean results from change of measure

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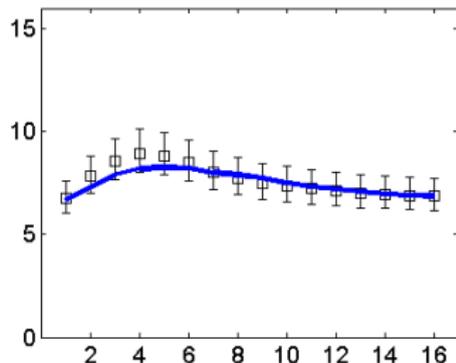
- ▶ Implies distribution for futures rates

$$\Delta f_t \sim N\left(0, H'_{d(t)} V_{r(t)} H_{d(t)} + R\right)$$

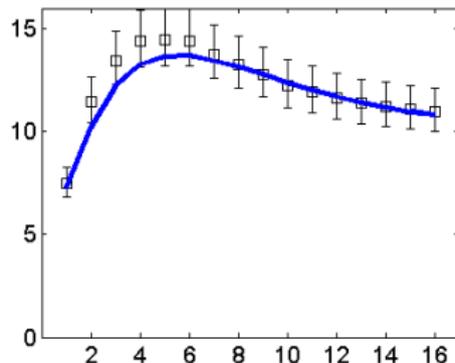
- ▶ Assume $E(\Delta f_t \Delta f'_s) = 0$, $t \neq s$, reasonable since no consecutive days in the sample
- ▶ MLE

Term structures of volatility

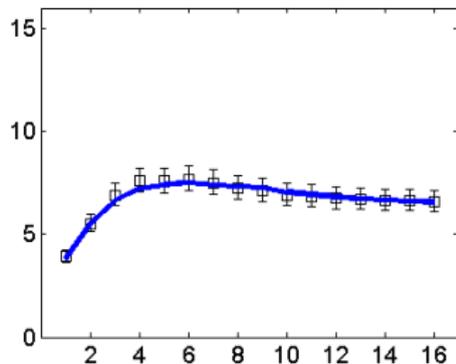
Policy days



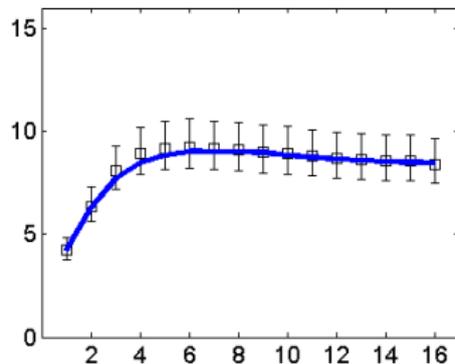
Employment report



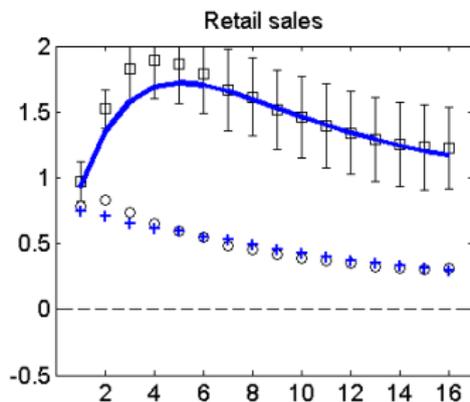
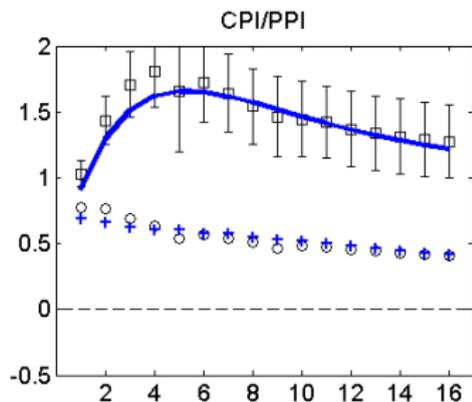
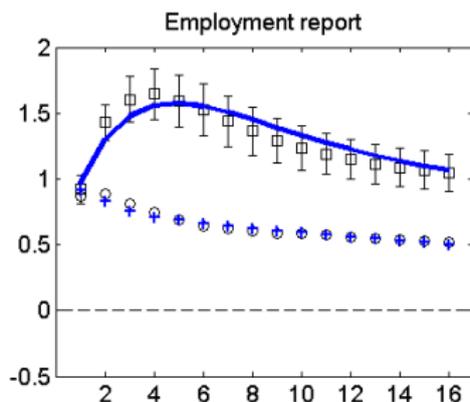
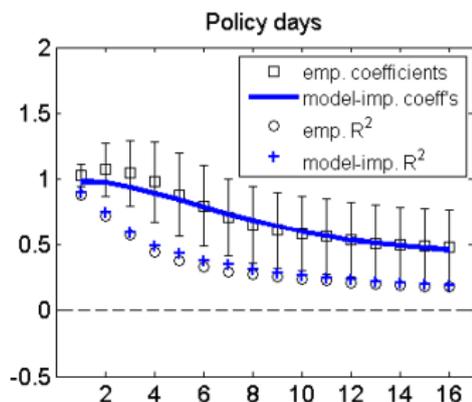
CPI/PPI



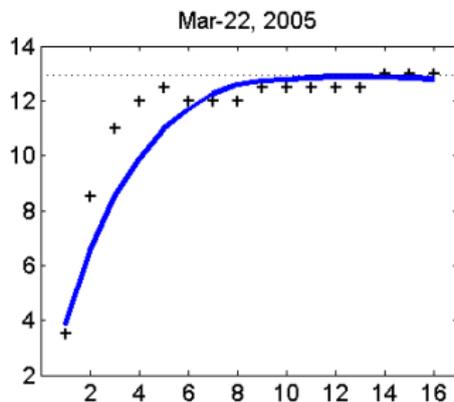
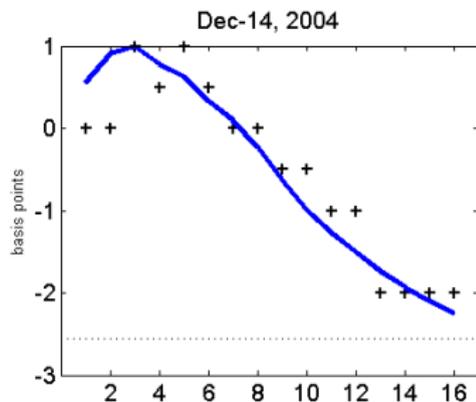
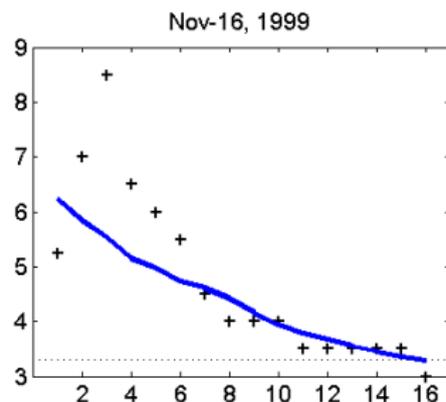
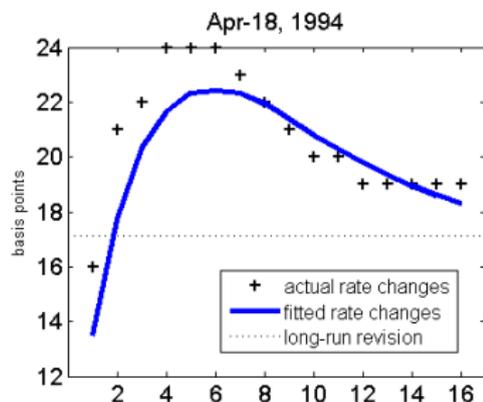
Retail sales



A new perspective on the regression approach



Policy shocks – capturing a multidimensional object



Policy shocks – a horizon-specific measure

| | Target factor | | | Target and path factor | | | | Horizon-spec. measure | | |
|----------------------|-----------------|------------------|--------|------------------------|------------------|------------------|-------|-----------------------|------------------|-------|
| | const. | target | R^2 | const. | target | path | R^2 | const. | shock | R^2 |
| yields | | | | | | | | | | |
| two years | -0.23 (0.42) | 0.50** (0.12) | 0.24 | 0.11 (0.19) | 0.50** (0.04) | 0.42** (0.02) | 0.86 | 0.22 (0.19) | 0.80** (0.03) | 0.86 |
| five years | -0.28 (0.46) | 0.29* (0.14) | 0.08 | 0.07 (0.23) | 0.29** (0.07) | 0.42** (0.03) | 0.76 | 0.04 (0.26) | 0.68** (0.04) | 0.75 |
| ten years | -0.41 (0.42) | 0.13 (0.11) | 0.02 | -0.13 (0.27) | 0.13 (0.07) | 0.34** (0.04) | 0.58 | -0.25 (0.03) | 0.46** (0.05) | 0.51 |
| forward rates | | | | | | | | | | |
| two years | -0.18 (0.54) | 0.34* (0.15) | 0.08 | 0.25 (0.26) | 0.34** (0.07) | 0.52** (0.03) | 0.80 | 0.31 (0.27) | 0.76** (0.04) | 0.81 |
| five years | -0.41 (0.49) | 0.07 (0.14) | < 0.01 | -0.11 (0.34) | 0.07 (0.10) | 0.36** (0.05) | 0.48 | -0.24 (0.39) | 0.45** (0.06) | 0.40 |
| ten years | -0.60 (0.44) | -0.08 (0.07) | 0.01 | -0.45 (0.39) | -0.08 (0.07) | 0.18** (0.04) | 0.17 | -0.41 (0.39) | 0.19** (0.05) | 0.11 |

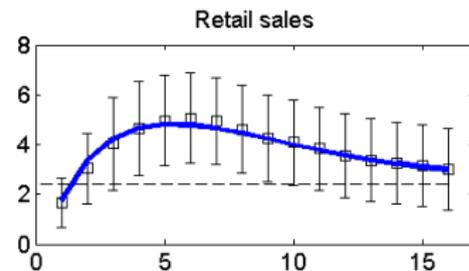
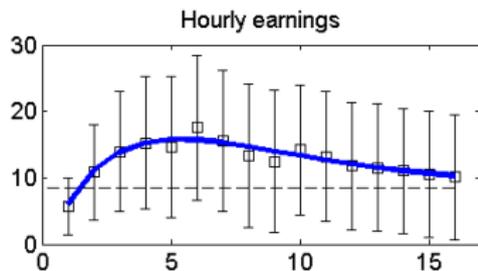
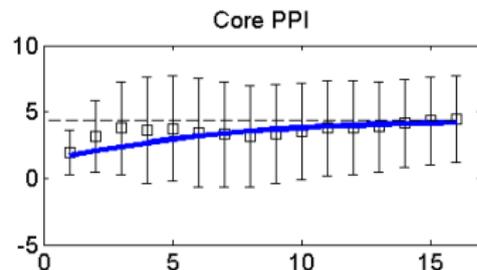
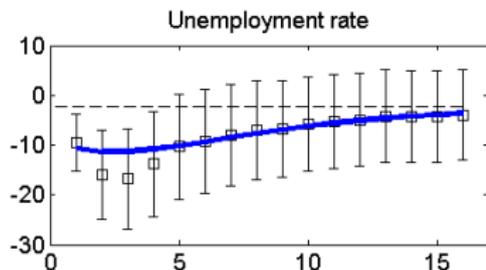
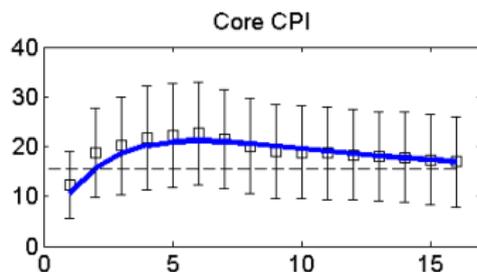
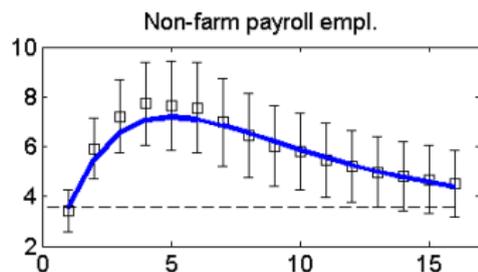
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- ▶ Construction: Predict yield changes based on the short end.
- ▶ Explanatory power as large as for target and path factor *together*.

The impact of macroeconomic announcements



Take-aways

- ▶ Monetary policy actions affect the entire term structure. Strongest impact: 1-2 years maturity.
- ▶ Significant differences in term structures of volatility conditional on types of news.
- ▶ Revisions resulting from policy actions vary greatly, but macro news always have the same type of effect.
⇒ Multi-dimensionality of policy news.
- ▶ Term structure of announcement effects.
- ▶ Policy inertia.
- ▶ Excess-sensitivity of far-ahead forward rates.