Learning the Macro-Dynamics of U.S. Treasury Yields

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Learning (about the paper)

- Rigorous modeling of learning about price dynamics is hard

  Past and future market participants also learn; need to account for learning dynamics in setting prices

- Reduced-form term structure model bypasses much of this difficulty
- Paper argues model-based forecasts are (mostly) similar to median professional survey forecast

  . . . but model-based forecasts can do better if macro info is incorporated
- Models and professionals differ in implied dynamics of expected excess returns to long-term bonds

Learning (in the model)

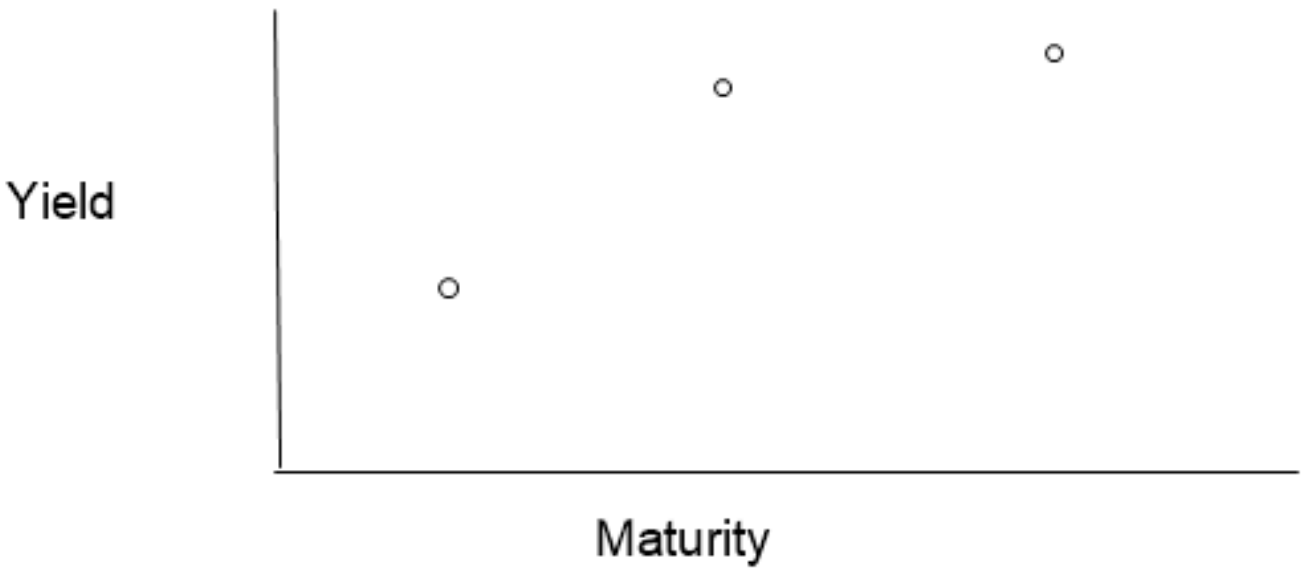
- Dynamics

  (Simplified version)

  Assume reduced-form yield dynamics through t, including learning about macro dynamics, prices that depend on expectations of future learning, are approximated by a first-order, low-dimension VAR estimated at t

- Fit n yields to VAR through t to get params
- Yields on other bonds determined by restricted interpolation

No-arbitage restrictions



- Paper finds that no-arb curve-fitting function varies little over the sample
- Can think of learning as continually updating estimates of the VAR, don't worry about interaction between learning and no-arb restrictions – very nice empirical result

Blue Chip versus model-based forecasts

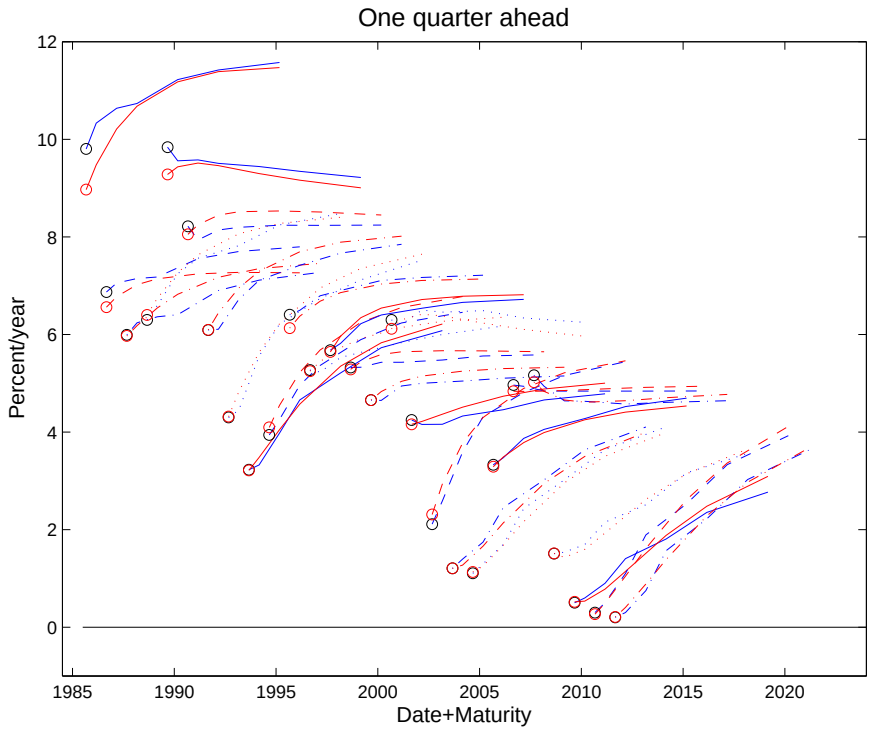
Paper's conclusions

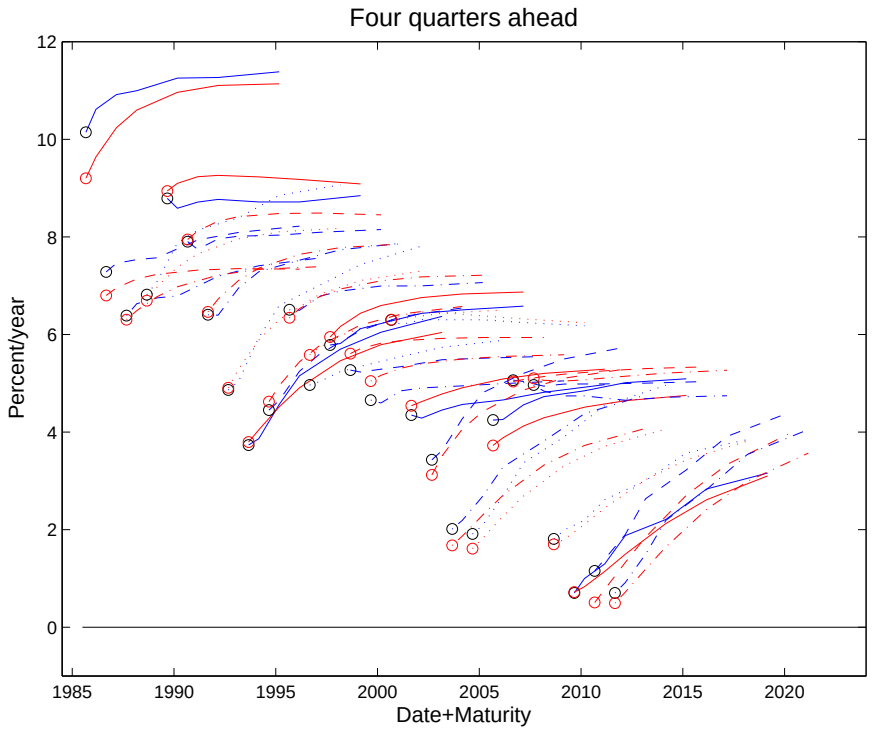
- Similar forecasts when model uses recursive least-squares estimation
- Models are more accurate when
  - They downweight older observations
  - They incorporate macro data in the VAR

My interpretation of the same evidence

- Blue Chip, model-based forecasts differ substantially
- Model-based are more accurate because of known features of survey forecasts

Blue Chip, JSZ model forecasts





Root mean squared forecast differences and errors

Basis points, annualized yields

Diff/Error	Method	Horizon	6 mon	5 yr	10 yr
Diff	BC-JSZ	1Q	23	23	24
Diff	BC-JPS	1Q	37	26	26
Error	BC	1Q	52	49	45
Error	JSZ	1Q	40	43	38
Error	JPS	1Q	36	41	39
Diff	BC-JSZ	4Q	37	42	48
Diff	BC-JPS	4Q	85	81	73
Error	BC	4Q	148	120	106
Error	JSZ	4Q	142	112	93
Error	JPS	4Q	134	106	91

Decomposing forecast errors

$$\text{survey forecast error}_t = \text{JSZ forecast error}_t - \left(\text{survey forecast}_t - \text{JSZ forecast}_t\right)$$

$$RMSE^2_{BC} = RMSE^2_{JSZ} + RMSD^2_{BC,JSZ} - 2\overline{\Pi}(\text{JSZ error}, \text{forecast diff})$$

Five-year yield, one and four quarters ahead (normalize by LHS)

$$1 = 0.755 + 0.210 + 0.035; \qquad 1 = 0.872 + 0.125 + 0.002$$

Replace JSZ with JPS

$$1 = 0.699 + 0.274 + 0.027; \qquad 1 = 0.725 + 0.335 - 0.060$$

Survey bias 1: Slow adjustment

- Coibion and Gorodnichenko: mean forecasts from surveys are sluggish (informational rigidities?)
- Serial correlations of monthly changes in forecasts of ten-year yield
  - Blue Chip: 0.32 (one-Q-ahead), 0.35 (four-Q-ahead)
  - JSZ model: 0.02 (one-Q-ahead), 0.00 (four-Q-ahead)
  - JPS model: 0.07 (one-Q-ahead), 0.08 (four-Q-ahead)

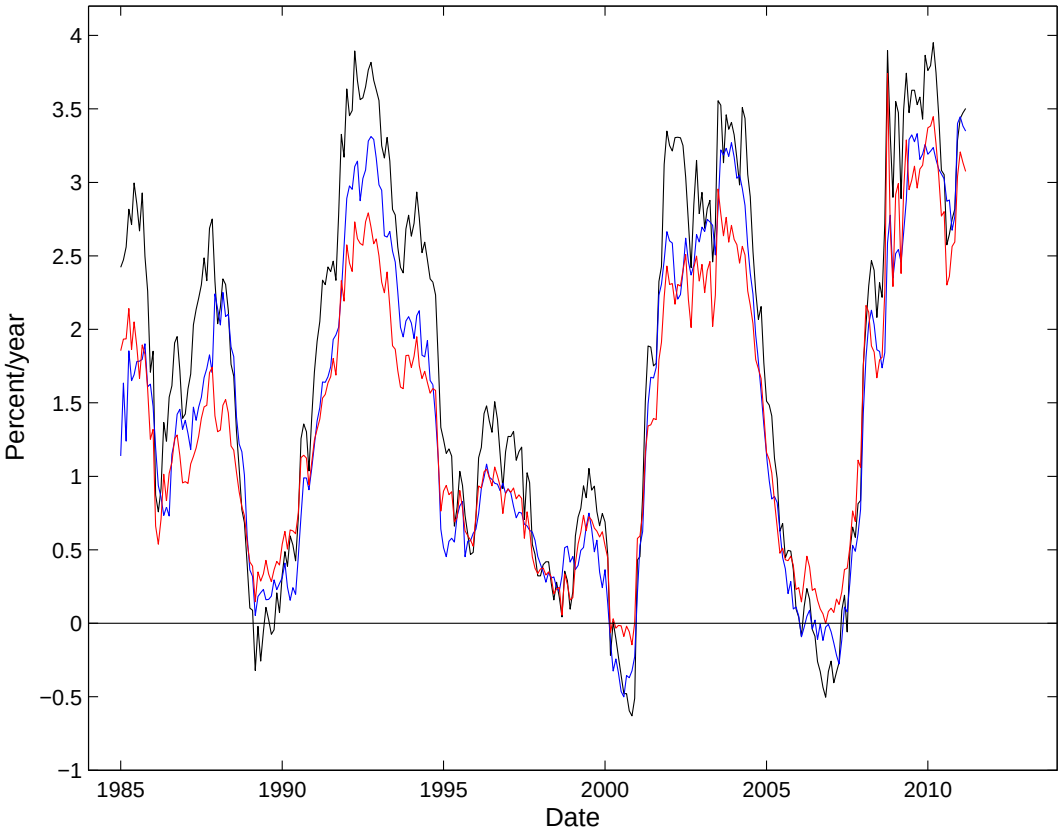
Survey bias 2: Excess persistence

- Piazzesi/Salomao/Schneider (Trend and cycle in bond premia): survey forecasts imply much higher persistence of slope than models imply

$$\hat{E}_t(\text{slope}_{t+4 \text{ quarters}}) = a + b \, \text{slope}_t + e_t$$

- Point estimates of b: Blue Chip, 0.82; JSZ model, 0.71; JPS model, 0.70
- Replace LHS with realized slope: $b = 0.56$

Forecasting the slope of the term structure



- Black line: actual slope
- Blue line: Blue Chip 4-Q-ahead forecast of slope
- Red line: JSZ model 4-Q-ahead forecast of slope

The slope and expected excess returns

- Models: Steep slope implies high, transitory expected excess returns to long-maturity bonds
- Blue Chip: Steep slow implies moderately high, long-lived expected excess returns to long-maturity bonds

Conclusions

- Result that no-arb pricing function varies little over the long sample is surprising and useful
- Comparison with Blue Chip survey forecasts is too sympathetic to the survey forecasts