Discussion of

"The Term Structure of Expectations and Bond Yields"

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Expectations in Dynamic Macroeconomic Models

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Roadmap

- Context in the literature
- Summary of results
- Comments:
  - Inflation uncertainty
  - Correlation with business cycles
  - Level of TP vs. Changes in TP

Context in the Literature

- The nominal term premium is the residual:

$$\begin{aligned} tp_t(n) &= y_t(n) - \frac{1}{n} E_t\left[\sum_{i=0}^{n-1} y_{t+i}(1)\right] \\ ftp_t(n,m) &= f_t(n,m) - \frac{1}{n} E_t\left[\sum_{i=m+1}^{n+m} y_{t+i}(1)\right] \end{aligned}$$

- To estimate the TP, we need a model of the yield curve and a process for the formation of conditional expectations about the short yield at different forecast horizons

Context in the Literature

- Various models can be used to fit the yield curve:
  - Gürkaynak, Sack and Swanson (2007) use the Nelson-Siegel-Svensson methodology (yields are a function of latent factors)
  - Affine models of the TS (yields are linear functions of the factors; no-arbitrage) - with and without macro factors
  - Structural models

Context in the Literature

- Expected path of interest rates can be computed using:
  - Short-rate expectations computed using risk-neutral probability distributions
  - Adaptive learning and other forms of bounded rationality to model expectations
  - Construct expectations using surveys of interest rates (direct interest rate expectations or through the relation between interest rates and the relation with the output gap and inflation)

Contributions

- Expected path of interest rates can be computed using:
  - Short-rate expectations computed using risk-neutral probability distributions
  - Adaptive learning and other forms of bounded rationality to model expectations
  - Construct expectations using surveys of interest rates (direct interest rate expectations or through the relation between interest rates and the relation with the output gap and inflation)
    - The authors measure the expected yields using a large number of surveys (on output growth, inflation and short nominal interest rates), and directly provide estimates of the TP at various yield maturity-forecast horizon pairs
    - Exercise decomposes expected nominal yields into expected real rates and expected inflation

Contributions

- Approach allows for the estimation of term premia for different yield maturities and forecast horizon pairs; differences in the behavior of medium- and long-term TP
  - Secular decline in medium- and long-term expectations over the 1983-2014 sample
  - Accounting for expectations about future real rates and inflation, TPs are the most important components of medium- and longer-term interest rates: TPs account for $\sim 60\%$ of the variation in forward rates at longer maturities (much less important at shorter maturities)
  - Survey implied TPs co-move more strongly than survey expected short rates for different yield maturities
  - Policy changes through the real interest rate are transmitted along the yield curve through real short-term expectations

Comment 1: Importance of Inflation Uncertainty

- Recurrent theme in the recent macro-finance models of the TP: inflation uncertainty makes nominal bonds risky
  - Piazzesi and Schneider (2006): TP were large during and after Great Inflation (also, when inflation shocks are relatively less significant, term premia are lower)
    - Intuition: If inflation rises persistently when consumption growth falls, long-term nominal bonds lose value in recessions leading to a positive TP (Rudebusch and Swanson, 2012)
  - Rudebusch, Swanson and Wu (2007): When inflation uncertainty was getting lower in the 1990s, downward trend in TP (computed from affine models)

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  - Rudebusch, Swanson and Wu (2007): When inflation uncertainty was getting lower in the 1990s, downward trend in TP (computed from affine models)
- We now have a "model-free" measure of the TP - what is the importance of inflation uncertainty?

Comment 1: Importance of Inflation Uncertainty

- Inflation uncertainty from survey data (Inflation uncertainty and disagreement regarding mean inflation forecast - Wright, 2011; D'Amico and Orphanides, 2014)

$$TP_t = \alpha + \beta x_t + \varepsilon_t$$

  where x_t contains inflation risk measures

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- Is this still true?
- Decomposition of TP_t into real rates and expected inflation can shed further light on this relationship

Comment 2: Relationship with the business cycle

- Cyclical behavior of the TP
  - TP from affine models: rise ahead of and early in recessions, and vice versa fall around the business cycle trough and early in expansions (Cochrane and Piazzesi, 2005)
  - TP estimated using survey data: Survey implied TP move less than statistical models with business cycles; larger correlation with inflation at lower frequencies (Piazzesi, Salomao and Schneider, 2015)

Comment 2: Relationship with the business cycle

- TP estimated using risk-neutral probability distributions imply disagreement on the size of the correlation with business cycles
  - Regression of Ordinary Least Squares and Bias Correction Term Premium estimates on a recession dummy, real GDP growth and OECD's Composite Leading Indicators (not shown)

	Rec dummy		GDP(QoQ)	
	OLS	BC	OLS	BC
Coeff	−0.20	0.72	0.35	−0.27
p value	0.80	0.01	0.23	0.02

OLS (Wright, 2011) and from BC model (Bauer, Rudebusch and Wu, 2013)

Comment 2: Relationship with the business cycle

- What do the TP estimates in the present paper imply about these comovements?
  - Are there substantial differences or similarities in the countercyclical behaviors of short versus medium- and long-term TP estimates?
  - How do implied inflation expectations behave?

Comment 3: TP changes and economic activity

Ben Bernanke (Remarks at the Economic Club of New York, 2006):

> *To the extent that the decline in forward rates can be traced to a decline in the term premium, . . . the effect is financially stimulative and argues for greater monetary policy restraint, all else being equal. ... [W]hen the term premium declines, a higher short-term rate is required to obtain the longterm rate and the overall mix of financial conditions consistent with maximum sustainable employment and stable prices.*

Comment 3: TP changes and economic activity

Janet Yellen (Jackson Hole, 2016)

> *...[D]espite the lower bound, asset purchases and forward guidance can push long-term interest rates even lower on average than in the unconstrained case (especially when adjusted for inflation) by reducing term premiums and increasing the downward pressure on the expected average value of future short-term interest rates. Thus, the use of such tools [forward guidance and asset purchases] could result in even better outcomes for unemployment and inflation on average.*

Comment 3: TP changes and economic activity

- Importance for macroeconomy is reported using the following regression (equations 5.1 and 5.2):

$$\Delta g_{t+h} = \beta_0 + \beta_1 tp_t\,(120) + \beta_2 \underbrace{\left(\frac{1}{n} \sum_{i=1}^{120} E_t y_{t+i} - y_t \right)}_{\text{expdy}_t} + \varepsilon_{t+h}$$

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- Do changes in the term premium matter?

$$\begin{aligned} \Delta g_{t+h} \quad = \quad & \beta_0 + \beta_1 \left[tp_t\,(120) - tp_{t-1}\,(120) \right] \\ & + \beta_2 \left[\text{expdy}_t - \text{expdy}_{t-1} \right] + \varepsilon_{t+h} \end{aligned}$$

Comment 3: Importance of TP changes

- Regressions of GDP growth $(gdp_{t+4} - gdp_t)$ on TP and expected component (Rudebusch, Sack and Swanson, 2006) for 1985-2005:

Variables	Coefficients	
$gdp_t - gdp_{t-4}$	0.32	0.36
	(2.31)	(4.22)
$expdy_t$	0.35	
	(1.59)	
tp_t	0.07	
	(0.92)	
$expdy_t - expdy_{t-4}$		0.30
		(1.37)
$tp_t - tp_{t-4}$		−0.59
		(−1.93)

- Are the changes in TP as important for explaining economic activity? Does the pattern change with forecast horizons?

Summary of Comments

- Very nice paper, significant contribution to the literature
- New estimates of the nominal and real TP can be used to address some of the long-standing issues in macro-finance

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- Very nice paper, significant contribution to the literature
- New estimates of the nominal and real TP can be used to address some of the long-standing issues in macro-finance
- Model for generating these TP dynamics?