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Articles

Term Structures of Inflation Expectations and Real Interest Rates

S. Borağan Aruoba

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Abstra

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Notes

1 My analysis focuses on CPI inflation as opposed to, for example, personal consumption expenditures (PCE) price index inflation, gross domestic product (GDP) price deflator inflation, or any of the "core" versions that strip out energy and food prices. PCE inflation has been released since the mid-1990s, but it has been scarcely
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captures stochastic volatility in the trend process. My results regarding long-run inflation expectations are similar to his.

4 Gospodinov and Wei (2016) extended the model in D'Amico, Kim, and Wei (2018) to include information from derivative markets and oil futures, which they argue improves the forecasting performance of the model. Abrahams et al. (2016) also used real and nominal bond yields for a similar purpose, though, they use observable factors to adjust TIPS yields for liquidity.

5 For example, Haubrich, Pennacchi, and Ritchken (2012) used survey data that are similar to mine as well as swap and nominal yield data, and their forecast accuracy is worse than what I obtain, primarily because it is more volatile.

6 They showed that the relationship between macroeconomic surprises and yields that is strong before the crisis weakens or disappears after 2008.

7 The original NS model starts with the assumption that the forward rate curve is a variant of a Laguerre polynomial, which results in the function in (1) when converted to yields. As such, it has no economic foundation, unlike some of the papers cited in the introduction that contain asset-pricing models. The slope factor in Diebold, Rudebusch, and Aruoba (2006) is defined as −St. The three factors are labeled as such because, as Diebold, [illegible] yt(0) (with the defi[illegible] nd decays to zero affe[illegible] determined by the v[illegible]

8 For an [illegible]

9 In prac[illegible] e online appendi[illegible]

10 In [illegible] rnative. I show tha[illegible] tion, and I use this [illegible]

11 See, [illegible] of estimati[illegible] example with a st[illegible] Koopman (2012) f[illegible]

12 It is important to note that by decomposing the nominal rate this way, I implicitly include the inflation risk premium in rt(τ). However, this is not crucial as it is natural for the ex-ante real rate to include this risk. The debate on the size of the inflation risk premium is far from settled in the literature. See, for example, D'Amico, Kim, and Wei (2018), Duffee (2018), and Haubrich, Pennacchi, and Ritchken (2012).

13 In all figures, the two National Bureau of Economic Research (NBER) recessions in the sample are shown with gray shading, and September 2008 is shown with a vertical line. The latter is arguably the height of the financial crisis, and significant changes occur in both the inflation forecasts and the financial variables introduced later. Also, where relevant, I use red dashed lines to denote pointwise 95% confidence bands.

14 In fact, since TIPS break-even rates are defined as the difference between nominal yields and the TIPS rate, and I define my ex-ante real rate as the difference between the nominal yields and my inflation expectations, the difference between TIPS yields and my real interest rate is by construction equal to the difference between the break-even rate and my inflation expectations. Note that I do not show a TIPS rate for the 6-month and 1-year maturities since Gürkaynak, Sack, and Wright (2010) cautioned against using their model to generate TIPS rates for maturities lower than two years.

15 The two models have the same number of parameters, and thus the difference in

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19 Both of these papers start their estimations prior to the introduction of the respective financial asset, using only nominal yields. As such, their reported inflation expectations can be considered as being related to TIPS and swaps only after 1999 for TIPS and 2004 for swaps. The forecasts of D'Amico, Kim, and Wei (2018) are graciously provided by the Federal Reserve Board. The forecasts of Haubrich, Pennacchi, and Ritchken (2012) are available from the website of the Federal Reserve Bank of Cleveland (www.clevelandfed.org). The forecasts of other studies cited in the Introduction are not publicly available; therefore, I am not able to use them in this comparison.

20 As Campbell, Shiller, and Viceira (2009) noted, following the failure of Lehman Brothers in September 2008, a large amount of TIPS bonds flooded the market as Lehman's holdings were being sold, followed by large institutional investors. This depressed the price, increased the TIPS yields, and with little change in the nominal yields led to a large decline in break-even rates.