Inflation risks and inflation risk premia

by Juan Angel Garcia and Thomas Werner

Discussion by: James M Steeley, Aston Business School

Conference on

"The Yield Curve and New Developments in Macro-finance"
Cambridge, September 2011

The break-even inflation rate (BEIR)

The spread between the yield on nominal and real bonds contains information on inflation expectations and inflation term (risk) premia.

$$y^n_{t,t+\tau} - y^r_{t,t+\tau} = BEIR = E_t(\pi_{t,t+\tau}) + \phi^n_{t,t+\tau}$$

This paper has two objectives:

1) Extract and describe the inflation risk premia in the Eurozone

2) Investigate the relationship between the skewness in inflation probability distributions (from ECB SPF surveys) and inflation risk premia

Summary (1)

Method

- Three-factor affine term structure model (similar to Ang et al (2008), Joyce et al (2010)).
- Real short rate depends on two latent factors
- Nominal yields additionally depend on uncertain inflation

Data

- Nominal zero-coupon yields of 3m, 1y, 2y, 3y, 5y (Bloomberg)
- Real zero-coupon yields of 2y, 3y and 5y (from earlier work that extracted these from nominal and index-linked bonds)
- Measures of inflation, inflation expectations and probabilities

Summary (2)

Results

Inflation risk premia display an upward sloping term structure and are relatively stable, until the recent financial turmoil, when they are more volatile at the short end.

Inflation risk premia are small, 3 basis points at one year to 23 basis at five years.

Inflation risk premia are negatively correlated with inflation risk.

Inflation risk premia are positively correlated with inflation skewness.

Question 1

Why are inflation risk premia so small?

This paper estimates them to be between 3 and 23 basis points. Is this unusual?

Surely inflation risk is important and priced?

A similar paper by Joyce et al (2008) on UK data finds premia of around 50 basis points.

Studies estimating real interest rates, Arak and Kreicher (1985) and Woodward (1988,1990), also found small values and so assumed them away to estimate real rates.

Studies measuring expected inflation, Levin and Copeland (1993) and Evans (2003), found negative inflation term premia.

Another look at the BEIR

$$y^n_{t,t+\tau} - y^r_{t,t+\tau} = BEIR = E_t(\pi_{t,t+\tau}) + \phi^n_{t,t+\tau}$$

What is $\phi^n_{t,t+\tau}$?

It is actually a term premium comprising

The *inflation risk premium*

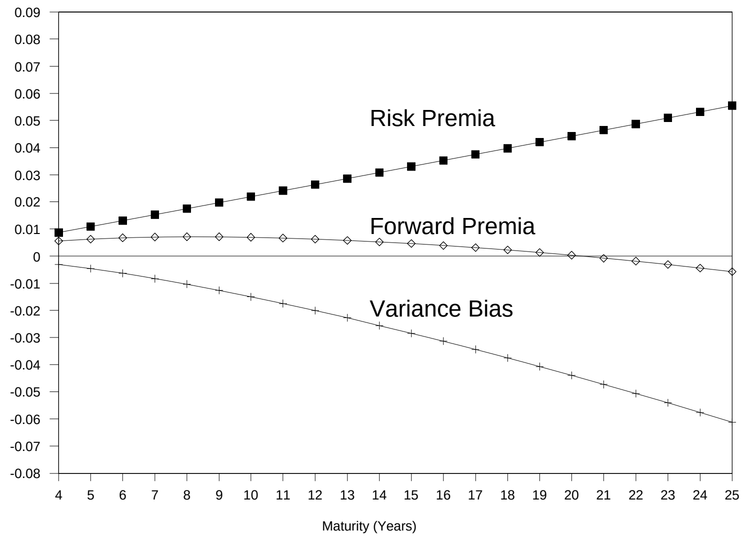
minus a function of the variance of inflation. This is essentially the difference between two Jensen's inequality terms (one each for nominal and real rates) that are present in the difference between forward rates and expected future spot rates in stochastic models of interest rates, and can be thought of as reflecting the *relative convexity* of nominal versus real bonds.

How big is this variance term?

Levin and Copeland (1993) - big enough to make the overall inflation term premium negative.

Schaefer (1996) - 3.4% - but no mean reversion

Steeley (1997) - two-factor affine model of the UK nominal curve



Calibrating (approximately) the variance bias

The variance bias for inflation is the difference between the variance biases for the nominal and real yield curve

$$\frac{1}{2}B_n^2(\tau)\sigma_n^2 - \frac{1}{2}B_r^2(\tau)\sigma_r^2$$

$$B_x(\tau) = \left(1 - e^{-\kappa_x \tau}\right)/\kappa_x$$

$$, x = n, r$$

From table 1: $\sigma_r \approx 0.005$ and $\sigma_n \approx 0.01$.

From table 2: $\kappa_r = 0.05$ and $\kappa_n = 0.08$

Maturity (years)	5	10	30
Bias (b.p.)	6	16	34

Question 2

What is the information content of the inflation expectations?

Breedon and Chadha (1997) found that the inflation term structures "seem at least as good (and probably better over longer horizons) at forecasting future changes in inflation", than standard methods.

Sack (2000) and Shen and Corning (2002) have undertaken similar studies for US inflation.

Table 6 reports high correlation between the estimated expectations and actual inflation in the short term, but low correlation in the long term. Do these translate into forecasting ability (or not)?

Questions 3-5

Could the variance bias help to explain the negative correlation between risk premia and risk?

Why are risk premia derived from a *Gaussian* model explained by the *skewness* in inflation expectations?

How big are the liquidity premia and credit risk premia in the Eurozone index-linked bonds?

Where next?

Both Garcia and Werner (2011) and Joyce et al (2008) follow Evans (1998) procedure to extract real zero-coupon yields from index-linked and nominal coupon bond prices. This procedure requires some form of yield curve smoothing technique, e.g., Nelson and Seigel (1987) to be used, and this does not guarantee arbitrage-free yield curve data.

Christensen, Diebold and Rudebusch (2011) show how to augment the Nelson and Seigel model to make it arbitrage-free, and how to identify the parameters of the underlying affine term structure model.

Why not apply the CDR AFNS (2011) model simultaneously to both the nominal and the real yield curves, but using the framework of Evans (1998) to exactly link the prices of both nominal and index-linked coupon-paying bonds. So, the yield curve fitting and the estimating of the affine model parameters happens together.

Conclusion

A welcome addition to the modelling of inflation risk premia

Identifies an interesting link between the skewness of uncertain inflation and risk premia, and a puzzling negative correlation between risk and risk premia.

And I hope that the future brings

- A greater understanding of these results
- Attempts to estimate AFNS model parameters for both nominal and real yield curves directly from data on coupon-paying bonds