Trend Inflation and Inflation Compensation

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Motivation and contributions

Motivation :
1. Euro area afflicted by low (and below-target) inflation since 2013: how has trend inflation evolved?
2. Do market and survey expectations reflect the same long-term inflation level? Why do they look so different then?

Figure 1. Euro area inflation and indicators of long-term inflation expectations
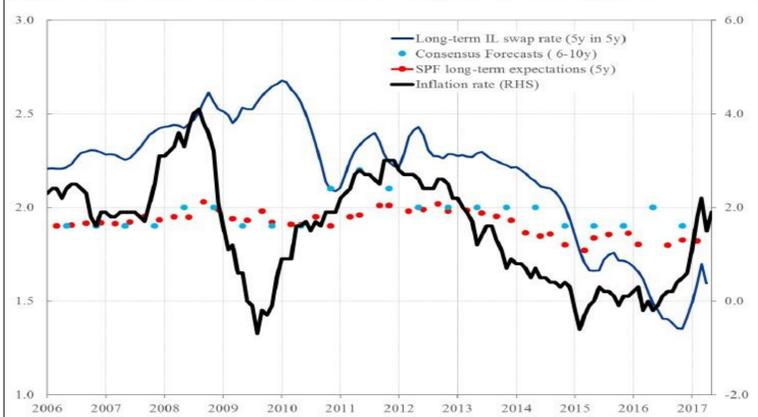
Note. The Figure depicts realized inflation (year-on -year rate of growth of HICP) and some indicators of inflation long-term inflation expectation in the euro area. First, our benchmark measure of long-term inflation compensation, the five-year forward inflation-linked swap rate five years ahead (blue line, calculation details can be found in Section 2 of the paper). The chart also includes two measures of survey expectations: Consensus Economics forecasts 6-to-10 years ahead (blue dots) and the 5-years ahead expectations from ECB's Survey of Professional Forecasters (red dots). For background information on the ECB's SPF, see Garcia, 2003). The chart illustrates two important features of euro area inflation expectations over the last decade First, long-term forward inflation compensation tended to be significantly above survey measures of long-term inflation expectations. with the discrepancy widely attributed to the presence of the inflation risk premia in inflation compensation. In recent years however long-term forward inflation compensation declined significantly as actual inflation rates drifted downwards since 2013. Survey measures of inflation expectations have in contrast remained relatively more stable in the euro area, but a significant decline away from the 2% target level of the ECB can also be appreciated since mid-2013.
Sources: Eurostat, ICAP, Consensus Economics, ECB's SPF, and author's calculations.

Main goals of the paper:
1. Estimate trend inflation consistent with market-based inflation expectations along the lines of Chan, Clark and Koop (2017).
2. Assess whether the protracted period of below-target inflation has weakened the anchoring of euro area inflation expectations

Two important contributions to related literature:
1. We incorporate market-based inflation expectations into the literature on the estimation of trend inflation using UCSV models.
2. We provide a decomposition of the observed long-term inflation compensation into inflation expectations and inflation risk premium (and other premia) along the lines of the term structure literature.

Key Findings

1. **EA inflation expectations were well-anchored between 2004-2012.**
   - **But the anchoring has weakened significantly since 2012.**
   - **Trend inflation remains significantly below the 2% mark.**
   - *These finding holds for both the market or survey inflation expectations*
2. **Decline in long-term inflation compensation since 2013 reflects *both* lower premia *and* also lower inflation expectations.**
3. **EA survey long-term inflation expectations strongly *biased* .**

Econometric Model

$$\pi_t - \pi_t^* = b_t(\pi_{t-1} - \pi_{t-1}^*) + v_t, \quad v_t \sim N(0, e^{h_{v,t}}), \quad (1)$$

$$ils_t = d_{0,t} + d_{1,t}\pi_t^* + \epsilon_{z,t} + \psi\epsilon_{z,t-1}, \quad \epsilon_{z,t} \sim N(0, \sigma_w^2), \quad (2)$$

$$\pi_t^* = \pi_{t-1}^* + n_t, \quad n_t \sim N(0, e^{h_{n,t}}), \quad (3)$$

$$b_t = b_{t-1} + \epsilon_{b,t}, \quad \epsilon_{b,t} \sim TN(0, \sigma_b^2), \quad (4)$$

$$d_{i,t} - \mu_{i,t} = \rho_{d_i}(d_{i,t-1} - \mu_{d_i}) + \epsilon_{d_i,t}, \quad \epsilon_{d_i,t} \sim N(0, \sigma_{d_i}^2), \quad i = 0, 1, \quad (5)$$

$$h_{i,t} = h_{i,t-1} + \eta_{h_i}, \quad \eta_{h_i} \sim N(0, \sigma_{h_i}^2), \quad i = v, n. \quad (6)$$

- Equation (2) provides a decomposition of inflation compensation (*ILS*).
- Once trend inflation part is estimated $(d_{1,t}\pi_t^*)$, the remaining part of the observed inflation compensation reflects premia: broadly speaking
   - $d_{0,t}$ estimates can be used to gauge the inflation risk premium.
   - MA(1) error terms can be attributed to liquidity premia or other temporary market disturbances.

Main Results

Figure 3: Trend inflation estimates using different measures of long-term inflation compensation
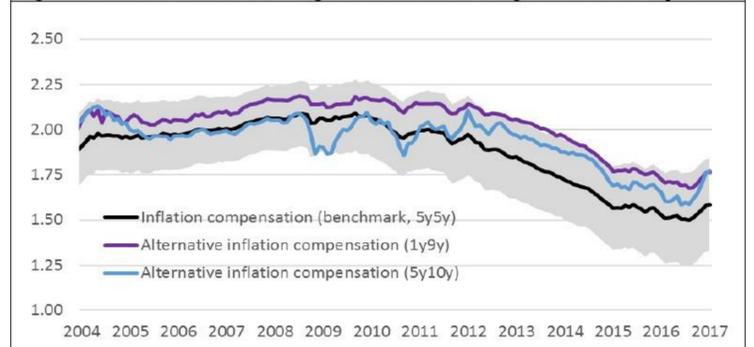
Figure 4. Trend inflation estimates using long-term inflation compensation and survey inflation expectations (five-year forward IL swap rates in five years and Consensus Economics forecasts 6-to-10 years ahead)
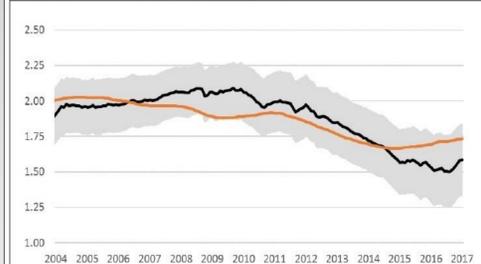
Figure 5. Trend inflation estimates using model specifications with and without long-term information (inflation compensation and survey inflation expectations (five-year forward IL swap rates in five years and Consensus Economics forecasts 6-to-10 years ahead)
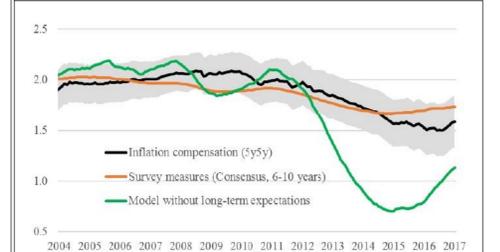
Figure 6: Bias in the estimation of trend inflation using survey inflation expectations (Consensus Economics forecasts 6-to-10 years ahead)
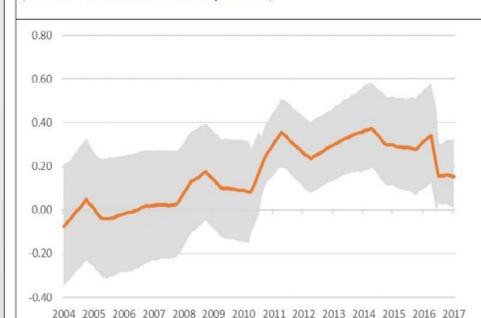
Figure 7: Decomposition of long-term inflation compensation based on our trend inflation model (benchmark model specification using five-year forward IL swap rates in five years)
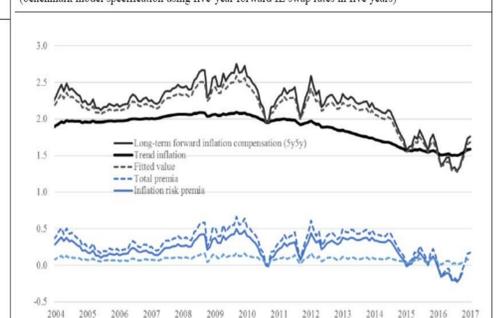
Figure 8: Estimates of inflation risk premium using different measures of long-term inflation compensation
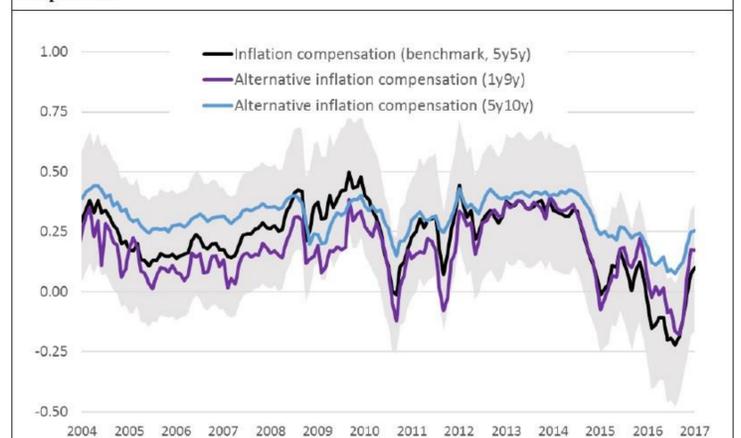
Conclusions and policy implications

- This paper incorporates market-based inflation expectations into the estimation of trend inflation in the euro area.
- Trend inflation provides evidence of a significant deterioration in the anchoring of EA long-term inflation expectations since 2013.
- These findings provide strong support for the PSPP by the ECB since early 2015.
- Trend inflation significantly below 2% calls for a continuation of policy stimulus for a sustained adjustment in the path of inflation towards 2%.

Key References

1. Chan, J.C., Clark, T.E. and Koop, G., (2015). "A new model of inflation, trend inflation, and long-run inflation expectations", *Journal of Money, Credit, and Banking,* forthcoming.
2. Kozicki, S. and P. Tinsley (2012), "Effective use of survey information in estimating the evolution of expected inflation", *Journal of Money, Credit and Banking*, 44, 145-169.