EUROPEAN CENTRAL BANK

EUROSYSTEM

"The return of inflation and inflation risks"

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Outline

1. Motivation
2. Main takeaways
3. Inflation RNDs: Empirical approach
4. Inflation risks in the euro area and the U.S.
5. Robustness checks and additional considerations
6. Concluding remarks

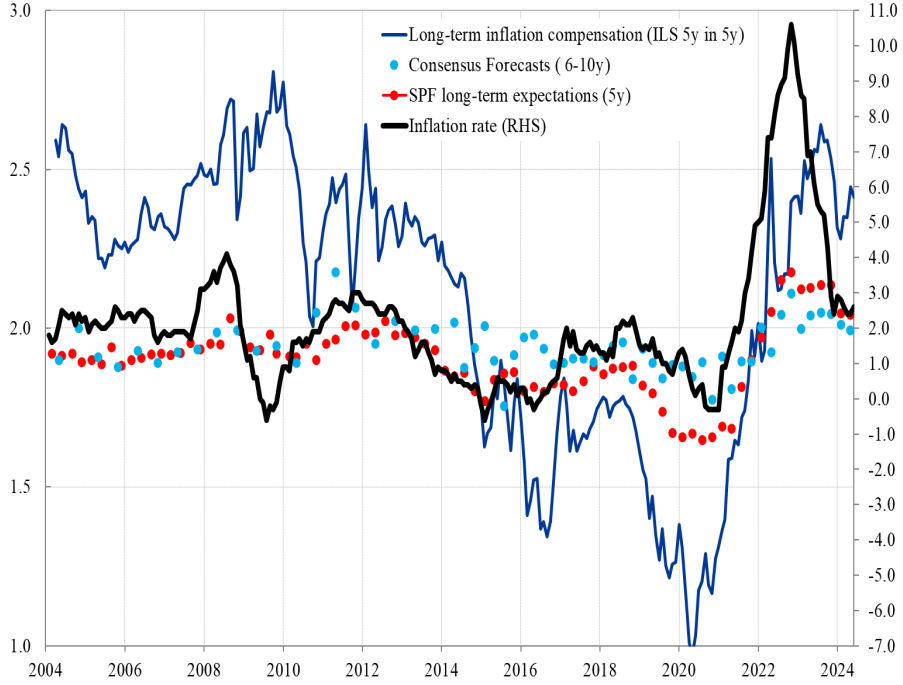
Motivation

- Inflation has fluctuated significantly off target over recent years
- Standard measures of inflation expectations provide information on central scenarios for the inflation outlook…
- …but economic decisions would benefit from additional information about probabilities for alternative outcomes surrounding central scenarios

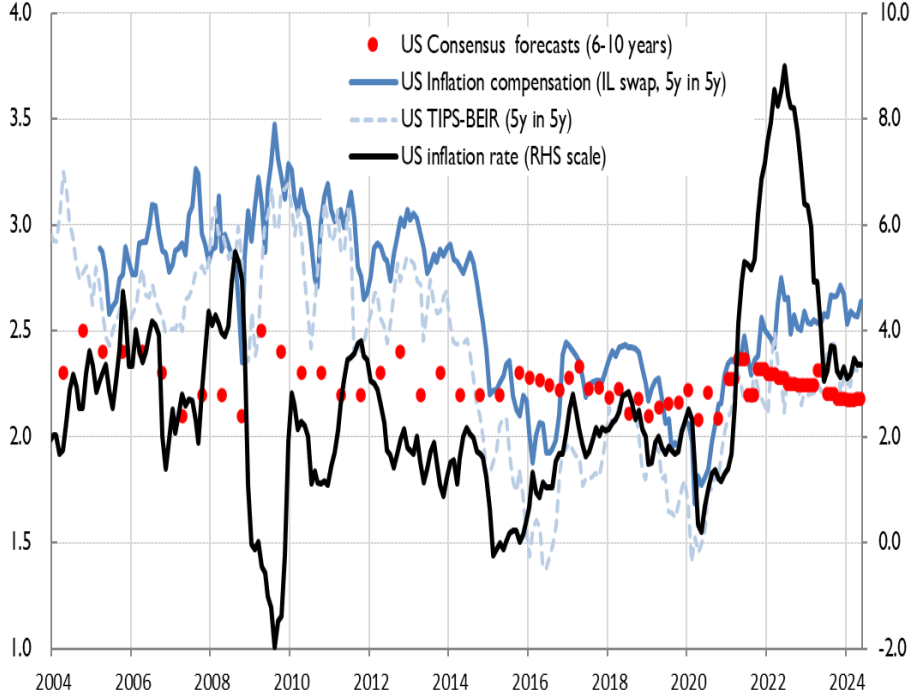
➔ evidence on inflation risks across horizons can help assess
(i) how persistent inflation shocks will be
(ii) challenges to price stability over the medium term

Inflation and inflation expectations: overview

Euro area



U.S.



Garcia et al. (2024), Inflation risks

This paper

Goal: explore the information content of the term structure of inflation risks
(based on inflation options market, risk-neutral measures)

What we do:

- use a *robust* methodology for estimating inflation RNDs
- gauge inflation risks at short (2y), medium (5y) and long-term (5y5y) horizons
- explore the dynamics of inflation risks in the euro area and the U.S. since 2009
- assess risks to price stability posed by the 2022-24 inflation overshooting episode

Part of a still limited but growing literature using the inflation options market data

(Kitsul and Wright, JFE 2013; Gimeno and Ibanez, JIMF 2018, Hilscher et al. 2022, among others)

Main takeaways

Inflation RNDs provide important insights

- monitoring risks at different horizons
- persistence of inflation shocks
- novel information about inflation expectations formation

Significant differences between euro area and US inflation risks

- distinct challenges to price stability
- different dynamics of inflation risks since GFC

Challenges to price stability over the recent inflation surge appear contained

- receding fast in the euro area, somewhat less so in the U.S.
- but close monitoring warranted

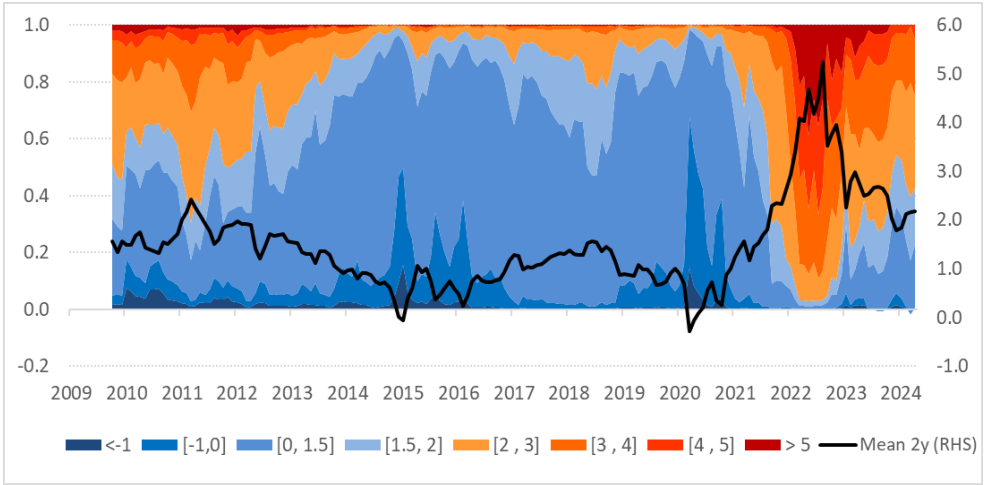
Gauging inflation risks: estimation approach

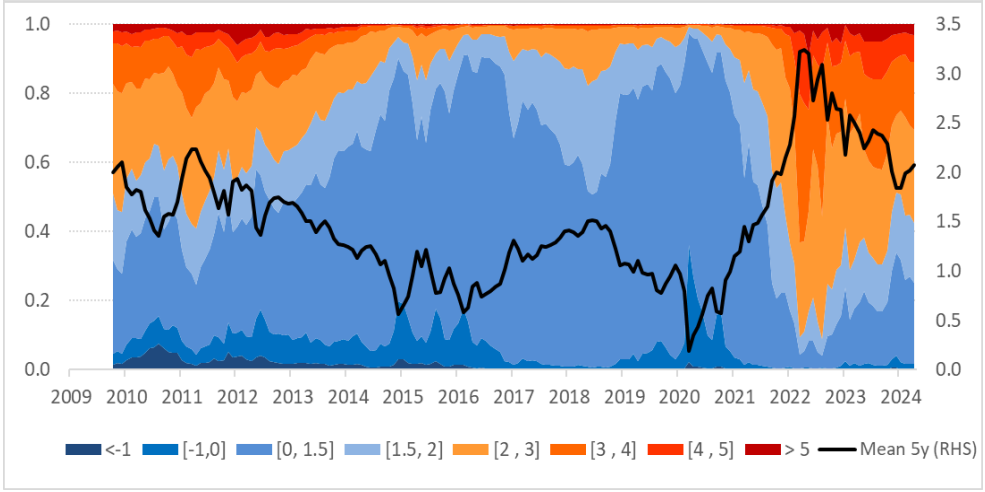
- Data
  - Strike prices of inflation caps (0.5%, 1.0%, …, 6.0% strikes) and floors (-3.0%, -2.5%, …,3.0%)
  - Cleaned considering market activity and regularity conditions (e.g. price monotonicity)
  - ILS rates and OIS rates

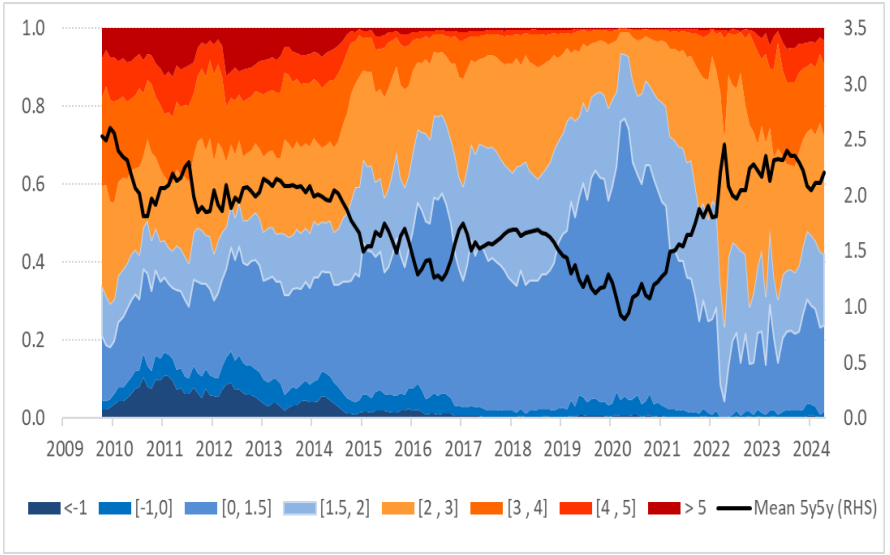
- Spot inflation RNDs (for traded horizons, e.g. 2y, 5y, 10y)
  - spline interpolation and extrapolation in volatility space (satisfying no-arbitrage)
  - non-parametric approach (allowing for asymmetry and fat tails)

- Forward inflation RNDs (for non-traded horizons of interest, e.g. 3y2y, 5y5y RND)
  - Student t-copula to model relationship between spot RNDs
  - 2-parameter for more flexibility (tail dependence) and good data fitting

Term structure of inflation risks: euro area RNDs

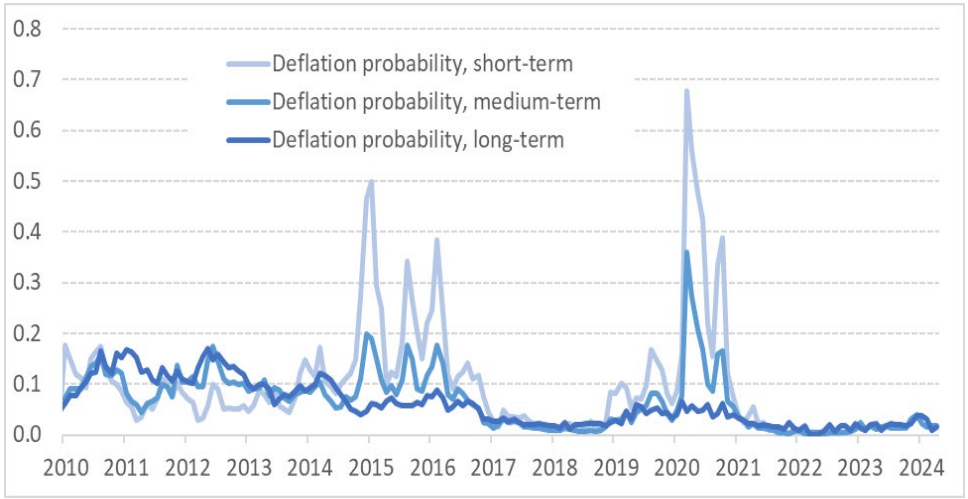






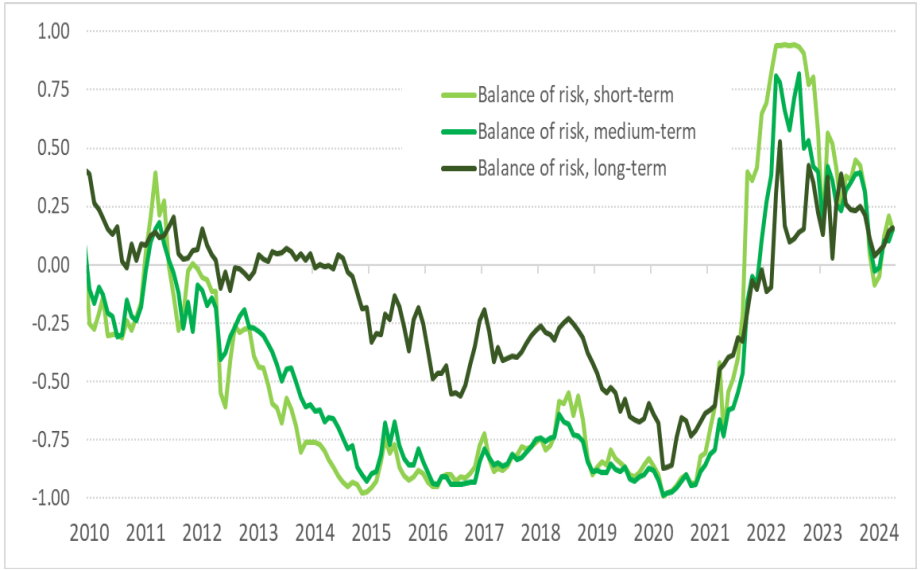
Garcia et al. (2024), Inflation risks

Term structure of inflation risks: euro area tail risks and BoR



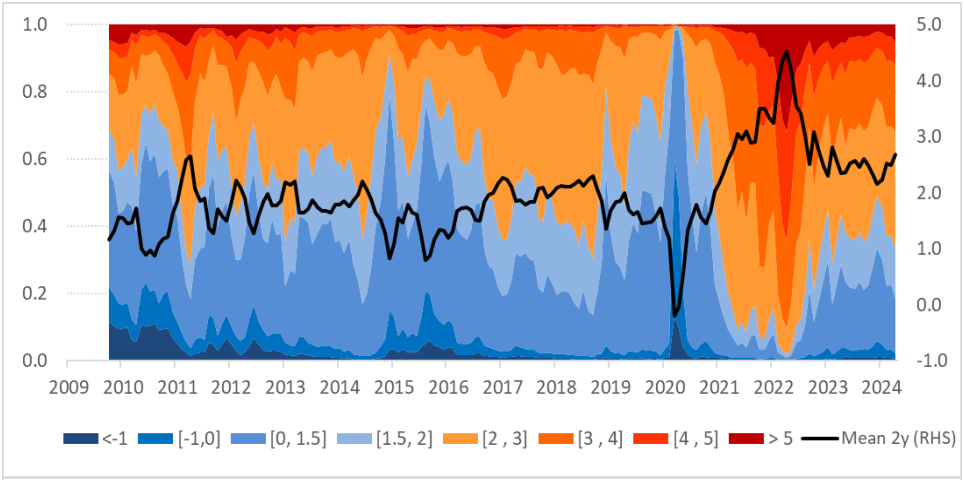
Risks to price stability across horizons

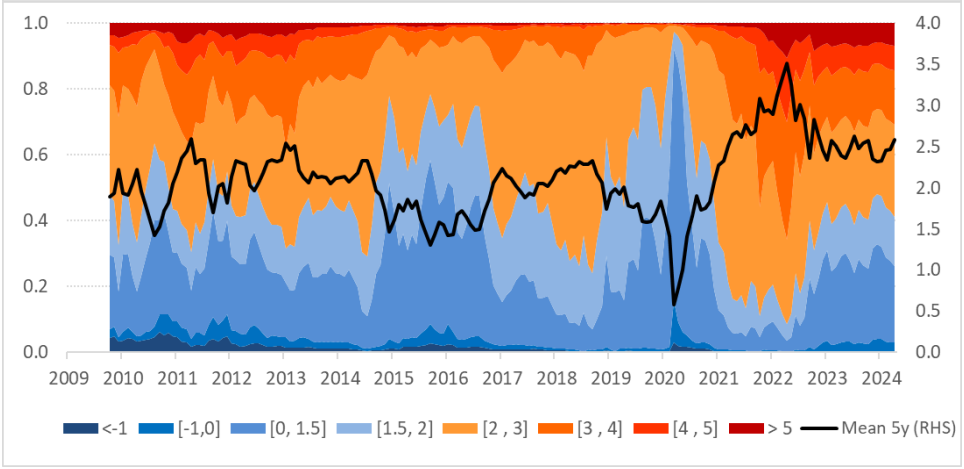
BoR = Prob ($\pi > 2\%$) - Prob ($\pi < 2\%$)

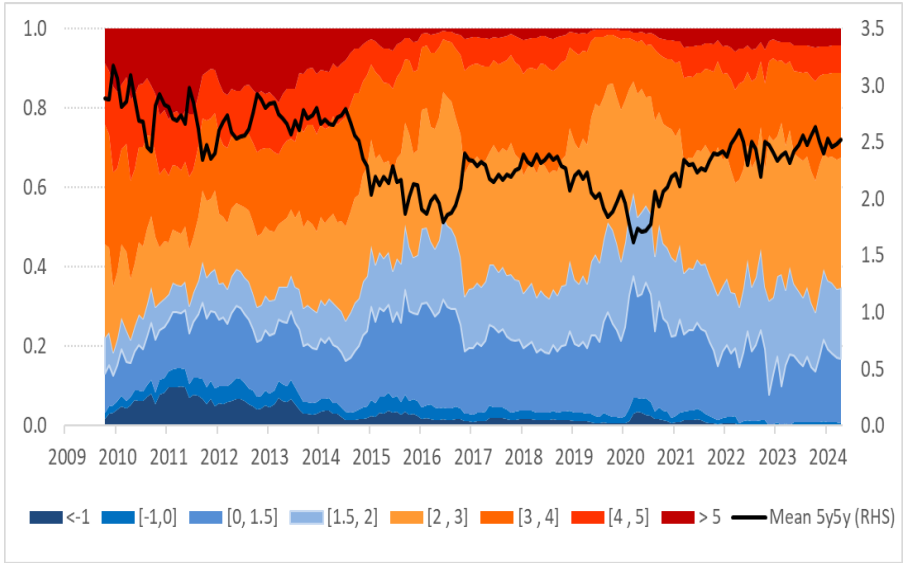


Garcia et al. (2024), Inflation risks

Term structure of inflation risks: US RNDs

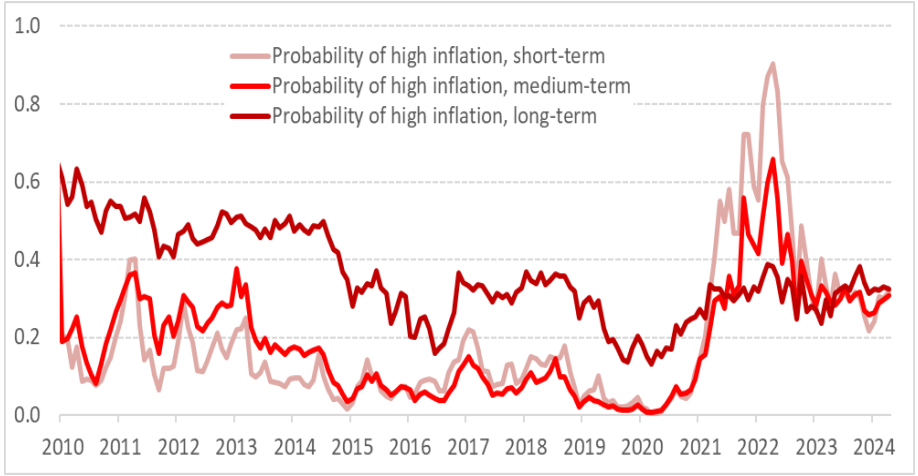


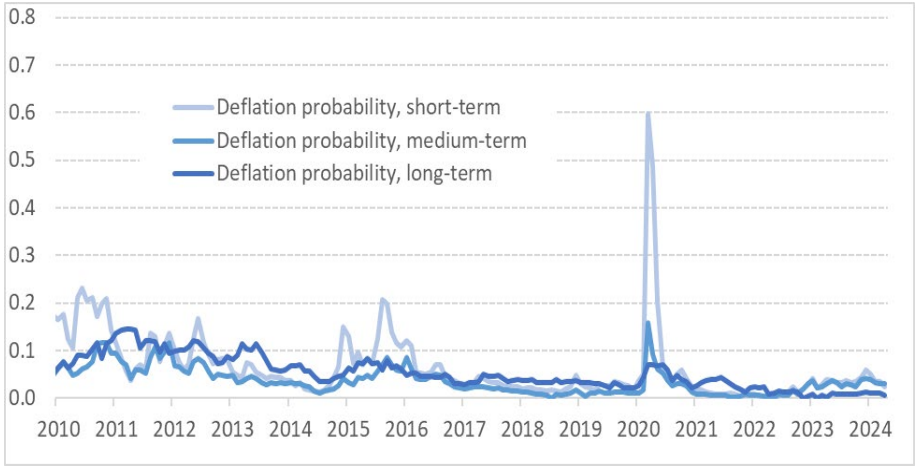




Garcia et al. (2024), Inflation risks

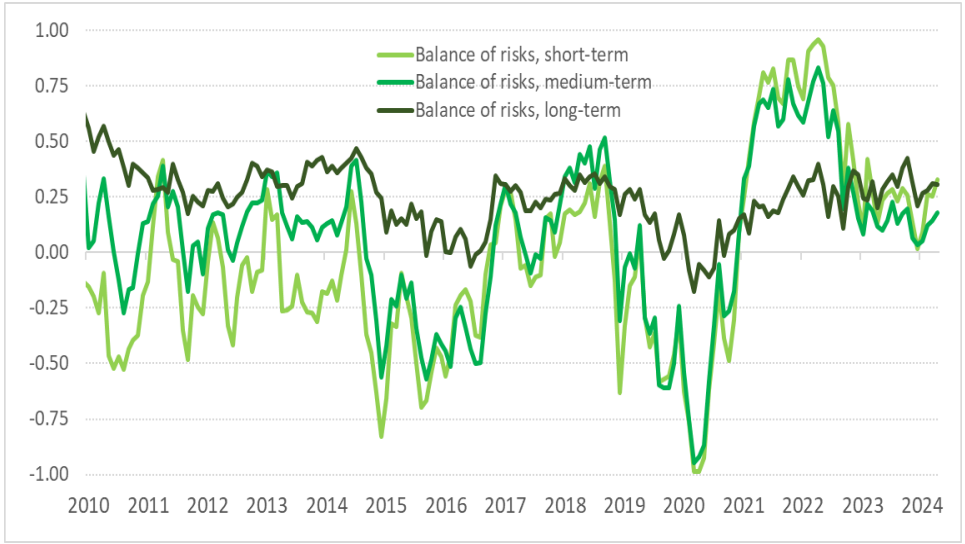
Term structure of inflation risks: US tail risks and BoR





Risks to price stability across horizons

BoR = Prob ($\pi > 2\%$) - Prob ($\pi < 2\%$)



Garcia et al. (2023), Inflation risks

The dynamics of inflation risks

Metric: evolution of pass-through β_t

from { (i) inflation; (ii) short-term inflation expectations; (iii) short/medium term inflation risks } to medium/long-term inflation risks

Formally

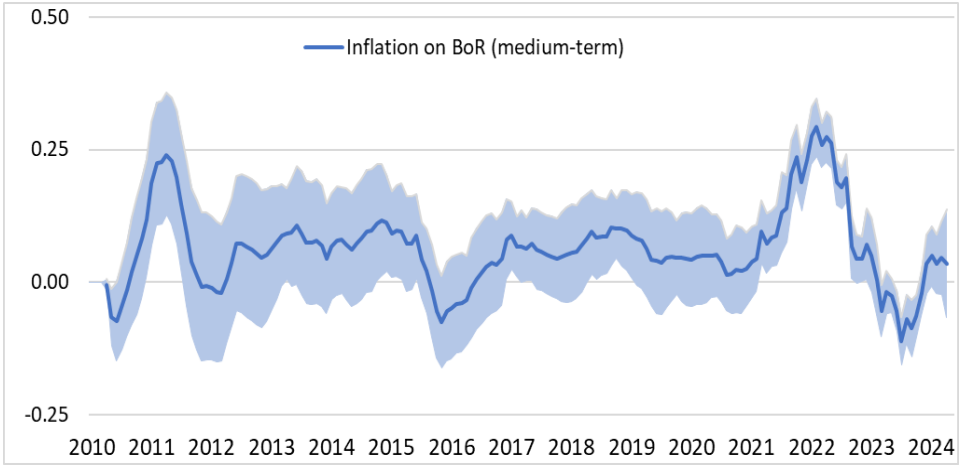
$$\Delta risk_t^{LT} = \alpha + \beta_t \Delta \pi_t^{e(ST)} + \upsilon_t$$

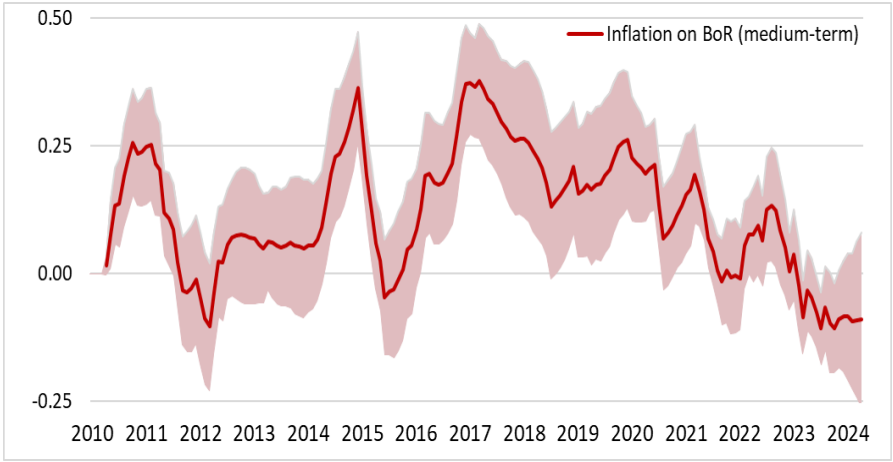
$$\beta_t = \beta_{t-1} + u_t$$

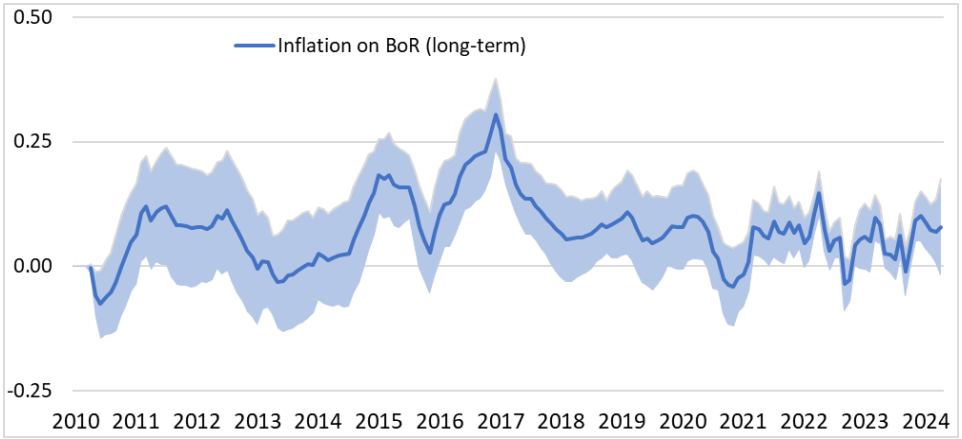
$$\upsilon_t \sim N(0, e^{h_t}), \quad h_t = h_{t-1} + \eta_h, \quad \eta_{h_i} \sim N(0, \sigma_{h_i}^2)$$

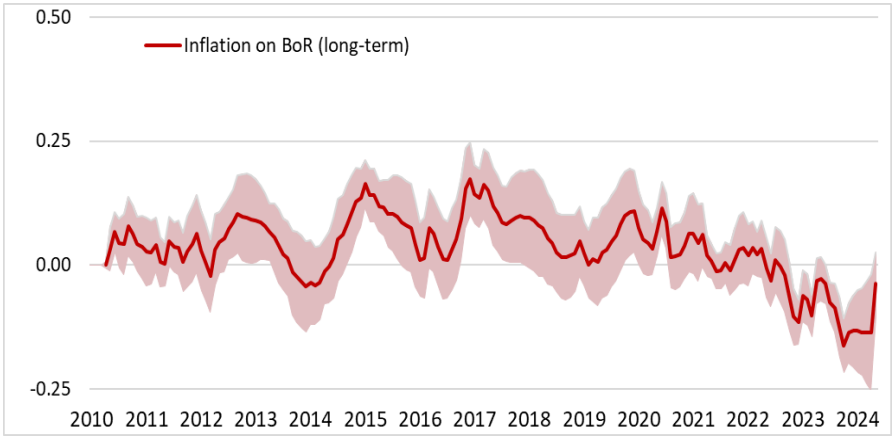
(following e.g. Jochmann, Koop and Potter (2010) and Chan (2013))

Inflation pass-through on inflation risks (MT and LT) : EA / US



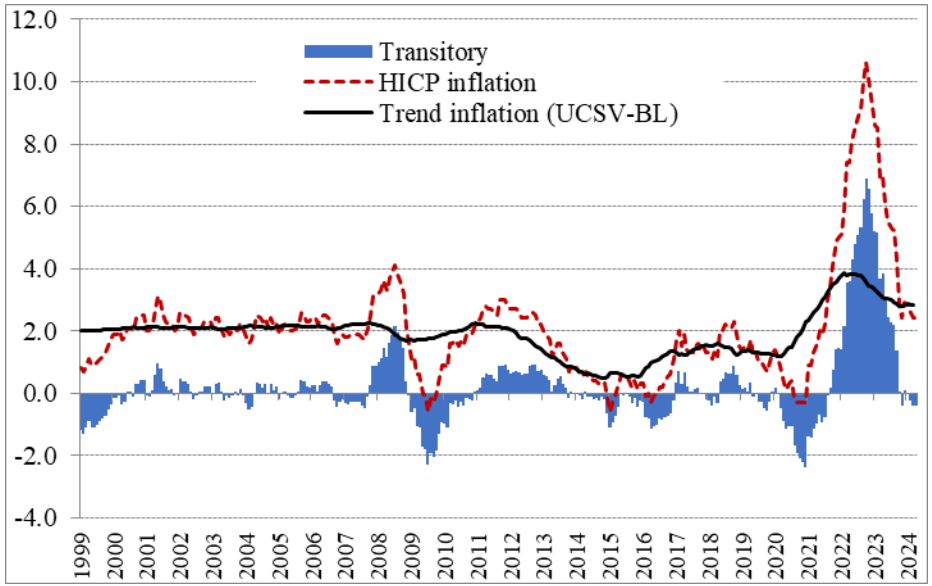


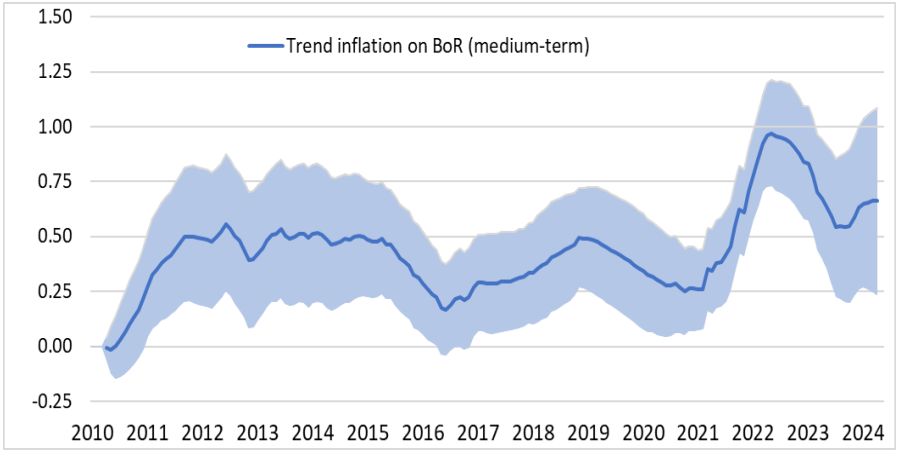


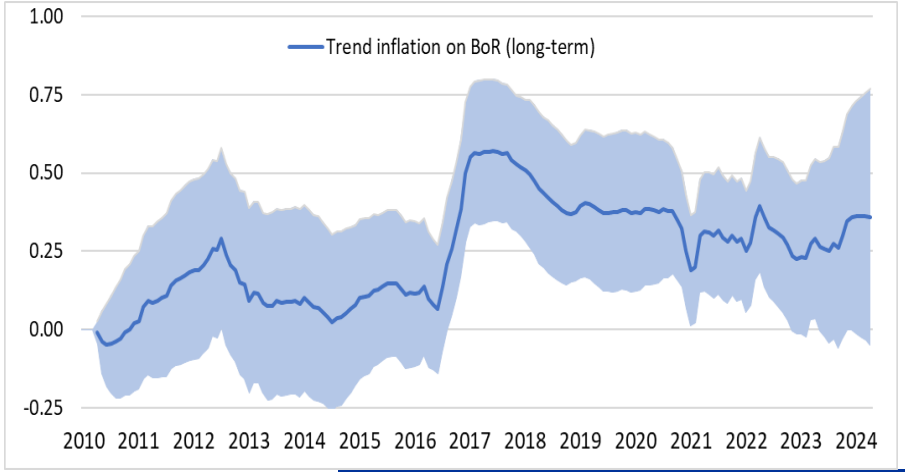


A closer look at inflation dynamics and pass-through: EA risks (MT and LT)

UCSV inflation decomposition: $\pi_t = \pi_t^* + c_t$



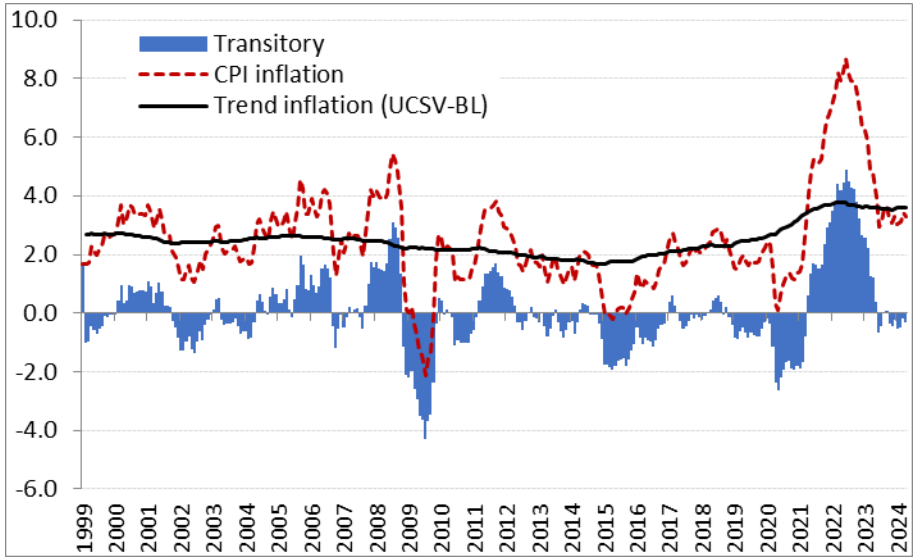


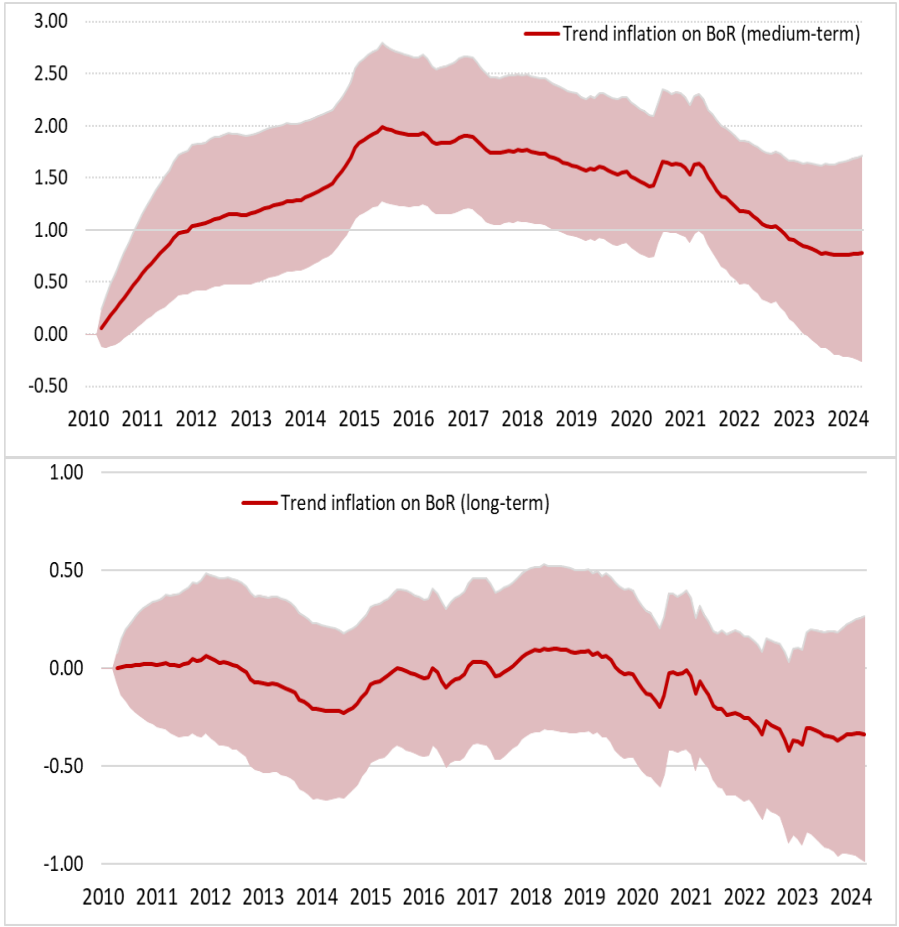


Garcia et al. (2024), Inflation risks

A closer look at inflation dynamics and pass-through: US risks (MT and LT)

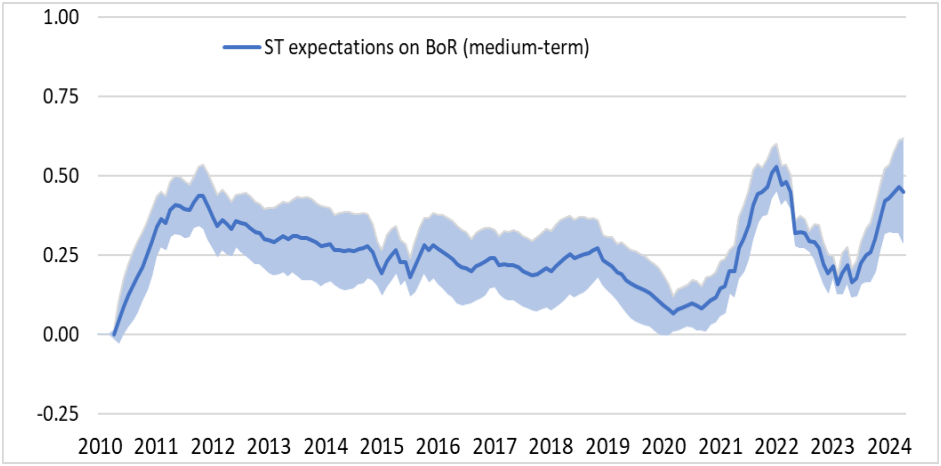
UCSV inflation decomposition: $\pi_t = \pi_t^* + c_t$

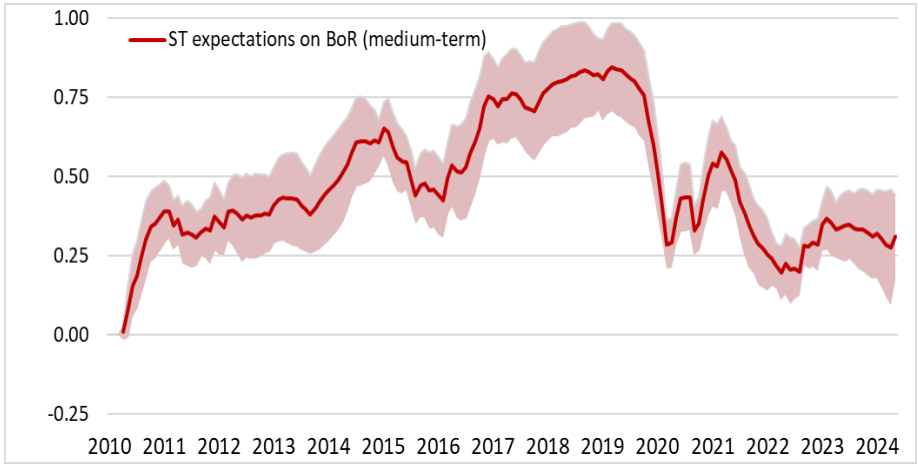


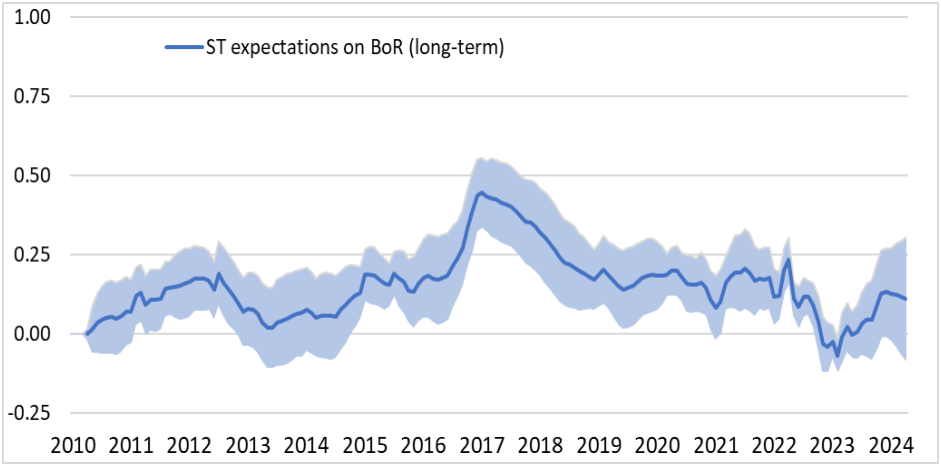


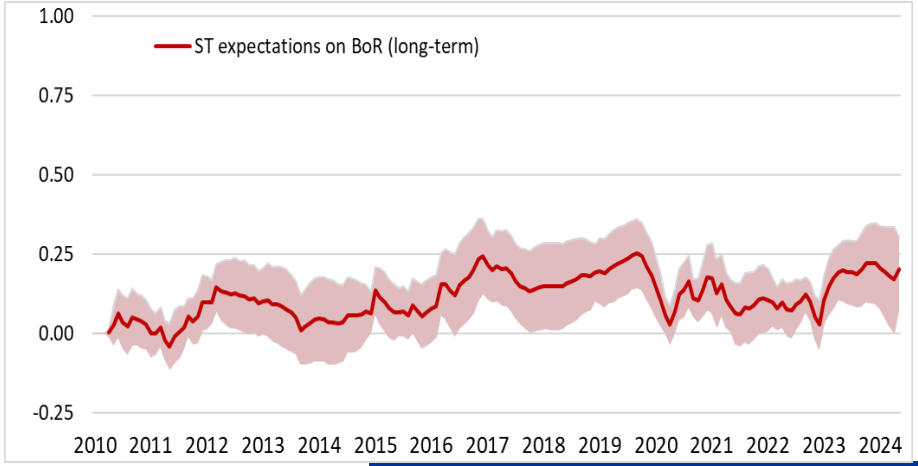
Garcia et al. (2024), Inflation risks

Short-term expectations pass-through on inflation risks (MT and LT) : EA / US

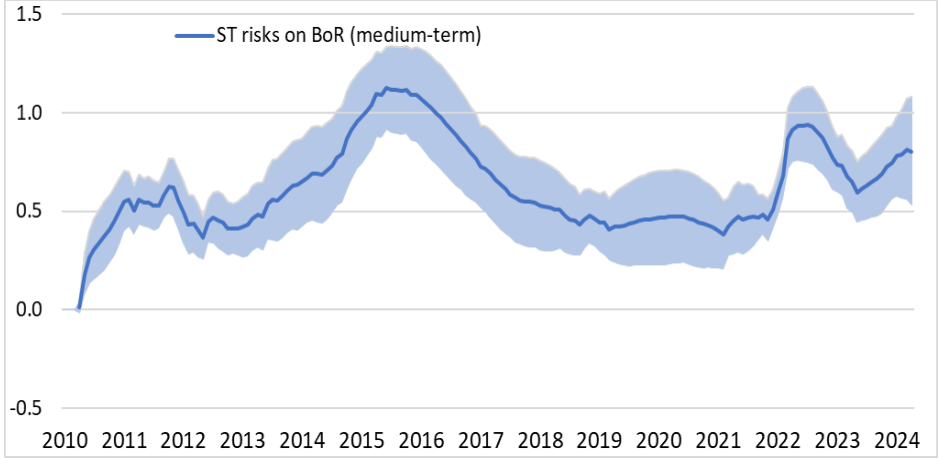


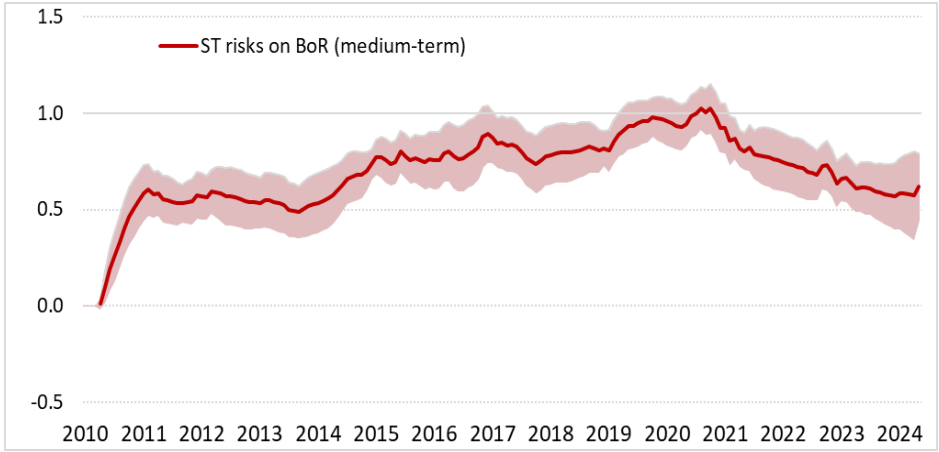


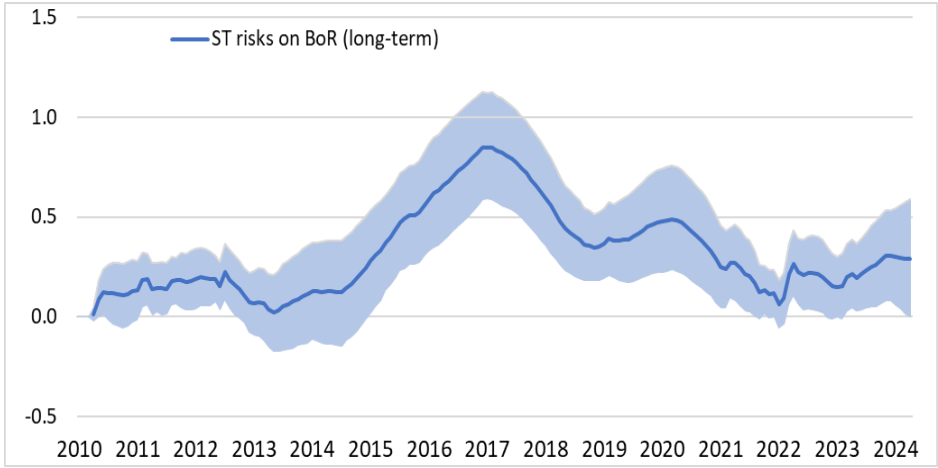


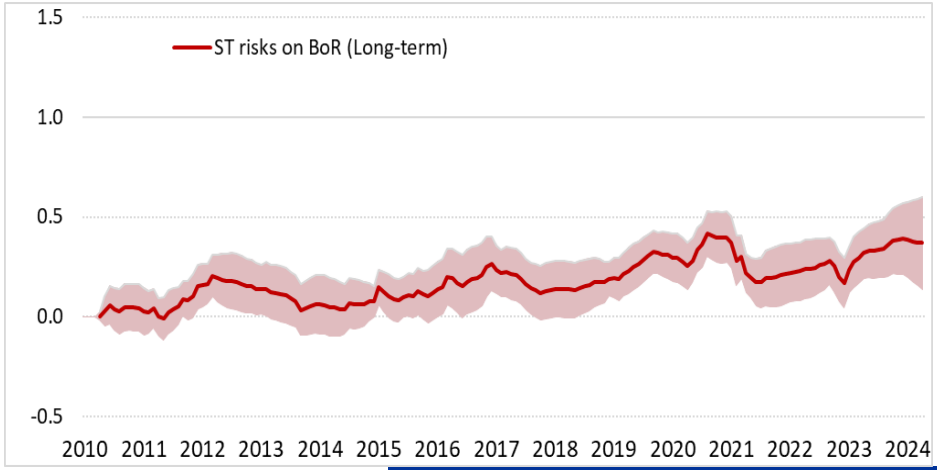


Entrenchment of inflation risks: short-term pass-through (MT and LT): EA / US









Robustness checks and additional remarks

on past-through windows

- key findings robust to alternative windows (6 months vs 3m & 12m)

on forward RNDs (T-copula for long-term forward RND, 5y5y)

- stylised facts robust to alternative calibration windows (100 days vs 45d &150d)
- T-copula provides better fitting than Gaussian and Grouped T-copula

on risk-neutral vs “objective” inflation probabilities

- inflation risk premium also relevant for monetary policy (e.g. Kocherlakota, 2013)
- model-free objective densities very limited, model-based needed for long-term
- joint modelling potentially more promising

Concluding remarks

- inflation RNDs offer important insights on the inflation outlook
- traded inflation options can be used to gauge inflation risks across horizons (short, medium and long horizons)
- there are significant differences between EA and US inflation risks in the 2010s
- More recently, the pass-through from short-term expectations and risks suggests
  - risks to price stability seem to be relatively contained on both sides of the Atlantic
  - but close monitoring is warranted

Thanks for your attention!