INFLATION EXPECTATIONS:
RISE AND RESPONSES

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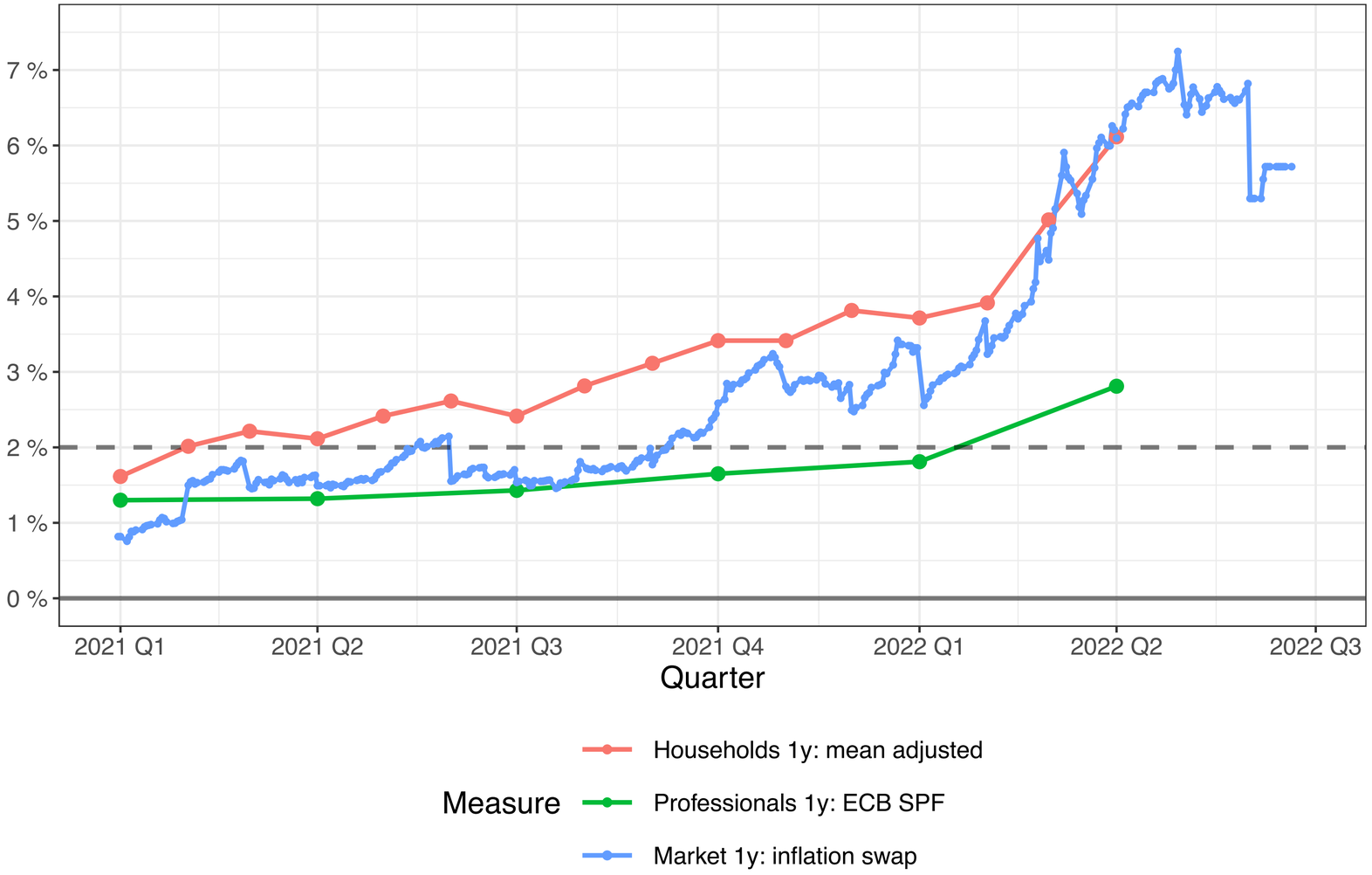
How to measure expectations?

- **Ask people**
  - Bundesbank survey on consumer expectations, since 2019:M1.
  - ECB consumer expectations survey, since 2021:M1.
  - 1 year as well as 3-5-10 years ahead. Biases, over-reactions, small signal-to-noise in 2000-20
- **Ask markets**
  - ECB survey of professional forecasters, since 1999
  - ECB survey of monetary analysts, since 2021:06
  - Strategic behavior, conformism, poor record at turning points.
- **Measure market prices**
  - Inflation swaps and options (or breakevens)
  - Separate compensation for risk, take out noise, adjust horizons and payoffs

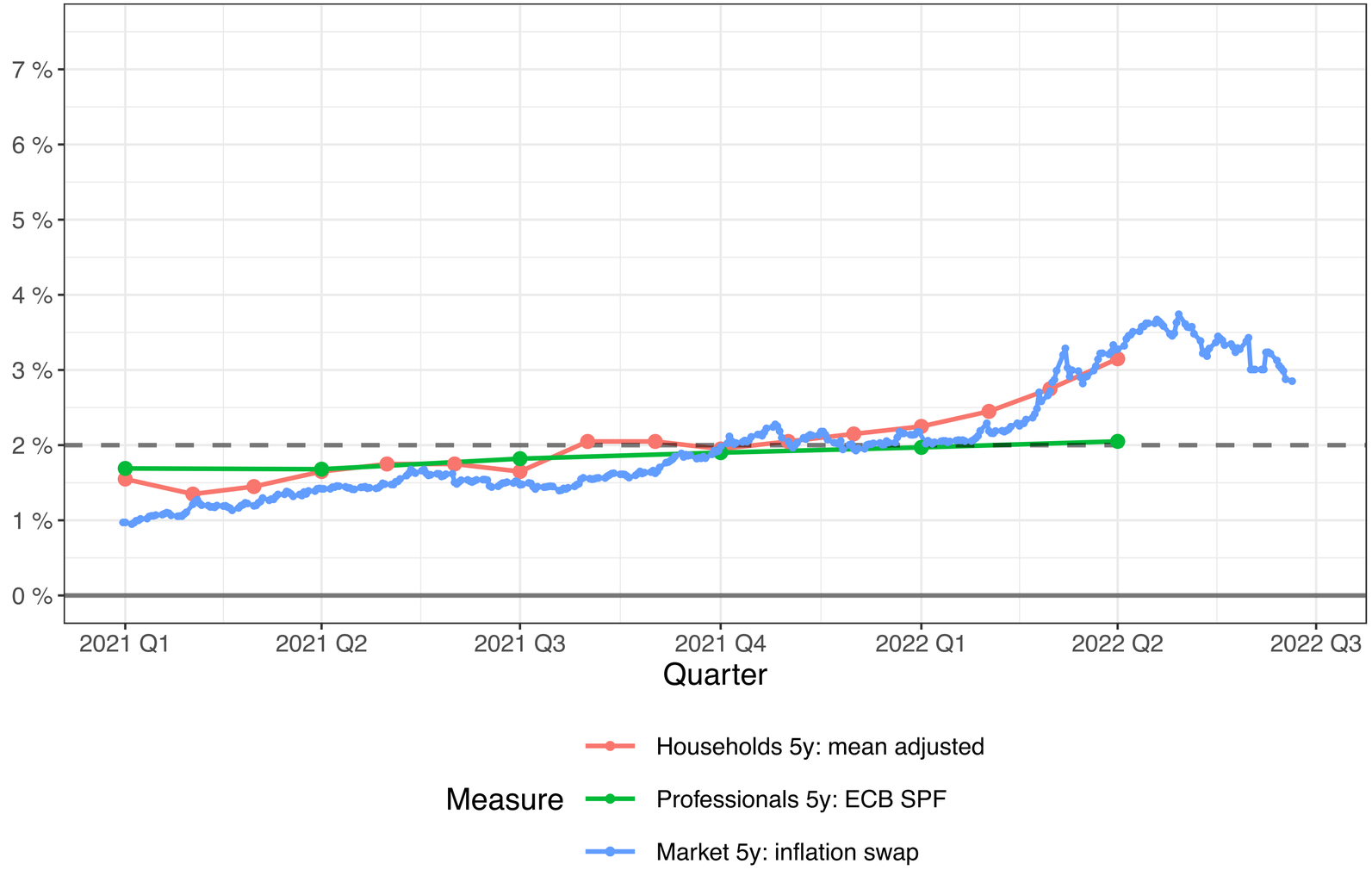
Inflation expectations in the Eurozone: 1 year



- German households a little ahead in 2021H2.
- After Russian invasion in 2022, swaps rise more (recession more likely, rise in risk compensation?)
- Professionals useless
- May-June: steady prices, reversal as monetary policy tightens, people?

Mean adjustment from Reis (2020): subtract StDev(0.5Skew)$^{1/3}$ averaged over sample from the mean

Looking at a further horizon: 5 years



- Over 5 years, perhaps can average over biases and mis-interpretations of current events, and so reveal anchors.
- Households rose ahead and then markets from January-April
- Professionals behind yet again.
- May-June again halt?

Mean adjustment from Reis (2020): subtract StDev(0.5Skew)$^{1/3}$ averaged over sample from the mean

Combining them to extract common driver

$$v_t^h = \pi_t^* + c_t^h + \theta_t(e_t^h + \pi_t^e - \pi_t^*)$$

$$\text{with} \quad c_t^h \sim E(\lambda_t), \quad e_t^h | \pi_t^e \sim N(0, \sigma_t^2)$$

$$\text{cross-sectional distribution} \quad v_t^h \sim F_t(\pi_t^e)$$

$$q_t = \frac{\int y_t(\pi_t^e) g_t(F_t^{-1}(\omega_t)) f_t(F_t^{-1}(\omega_t)) d\pi_t^e}{\int g_t(F_t^{-1}(\omega_t) f_t(F_t^{-1}(\omega_t)) d\pi_t^e}$$

$$\text{with:} \quad \omega_t \sim B(\beta), \quad \pi_t^e | q_t \sim G(\pi_t^e)$$

$$E_t^b = \mathbb{E}_t(\pi_t | v_t^{\text{median}}, q_t)$$

Households: biased from experiences, sluggish average, over-react individually

Markets: more information, sensitive to news, filled with noise

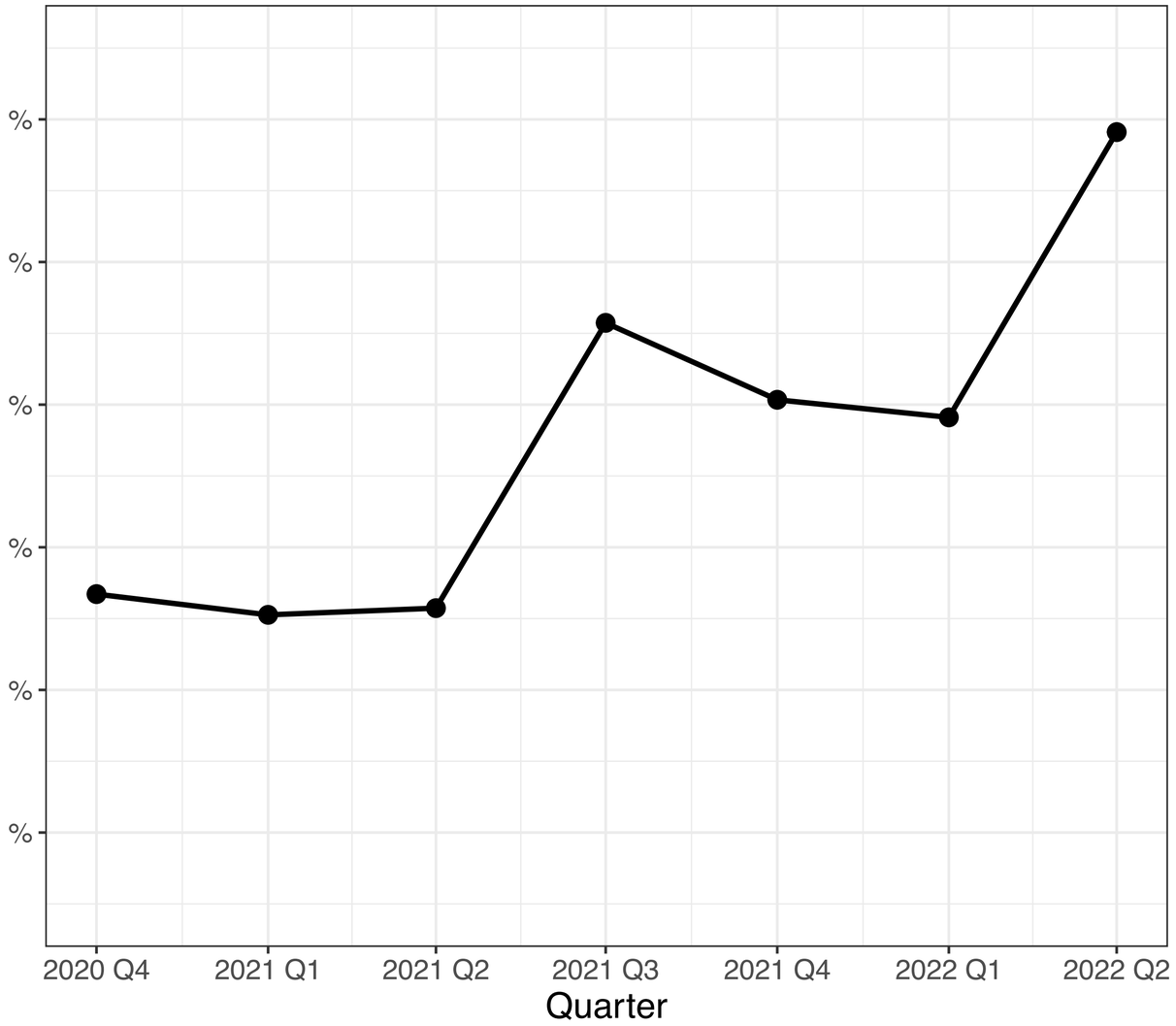
Professionals: median is misleading, not marginal traders.

Data inputs: use standard deviation and skewness in survey to weigh moments

Model outputs: reaction, dispersion and bias (θ, σ, λ), market noise (ω),

fundamental expected inflation (π^e)

Estimates of EZ fundamental 5y inflation



What happened in 2021Q3-Q4?

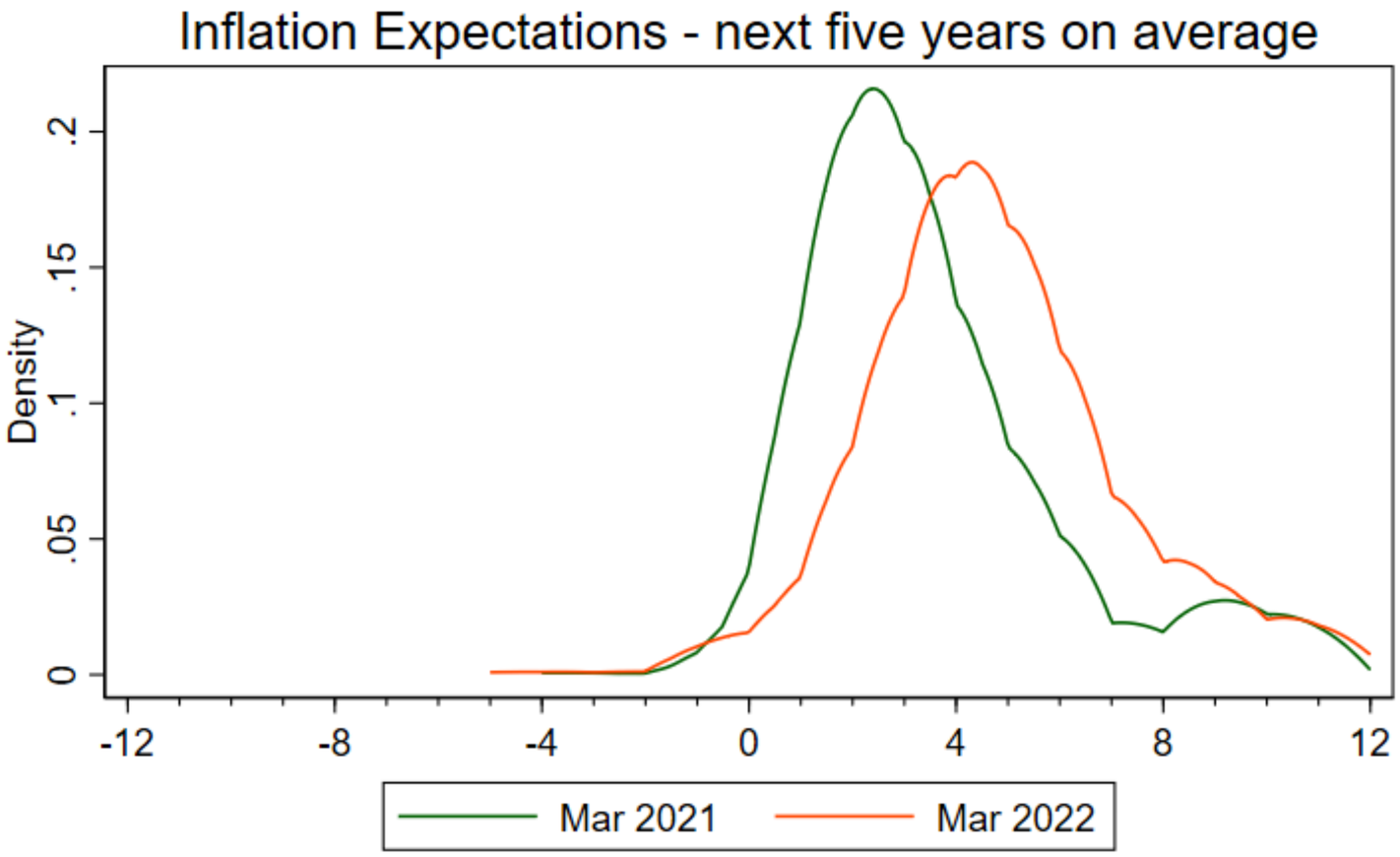
- skewness and dispersion rise
- early indicator, prices follow, then median

What happened in Feb-April?

- markets jump, skewness and dispersion fall, sharp rise.

New anchor: higher by 1.5% first, then by 3% (what now?)

Hopes and concerns



Source: Bundesbank-Online-Panel-Households (BOP-HH).
Questions: And what value do you think the rate of inflation or deflation will take on average over the next five years?
Notes: Inflation indicators truncated to values in the range [-12, +12], weighted data.

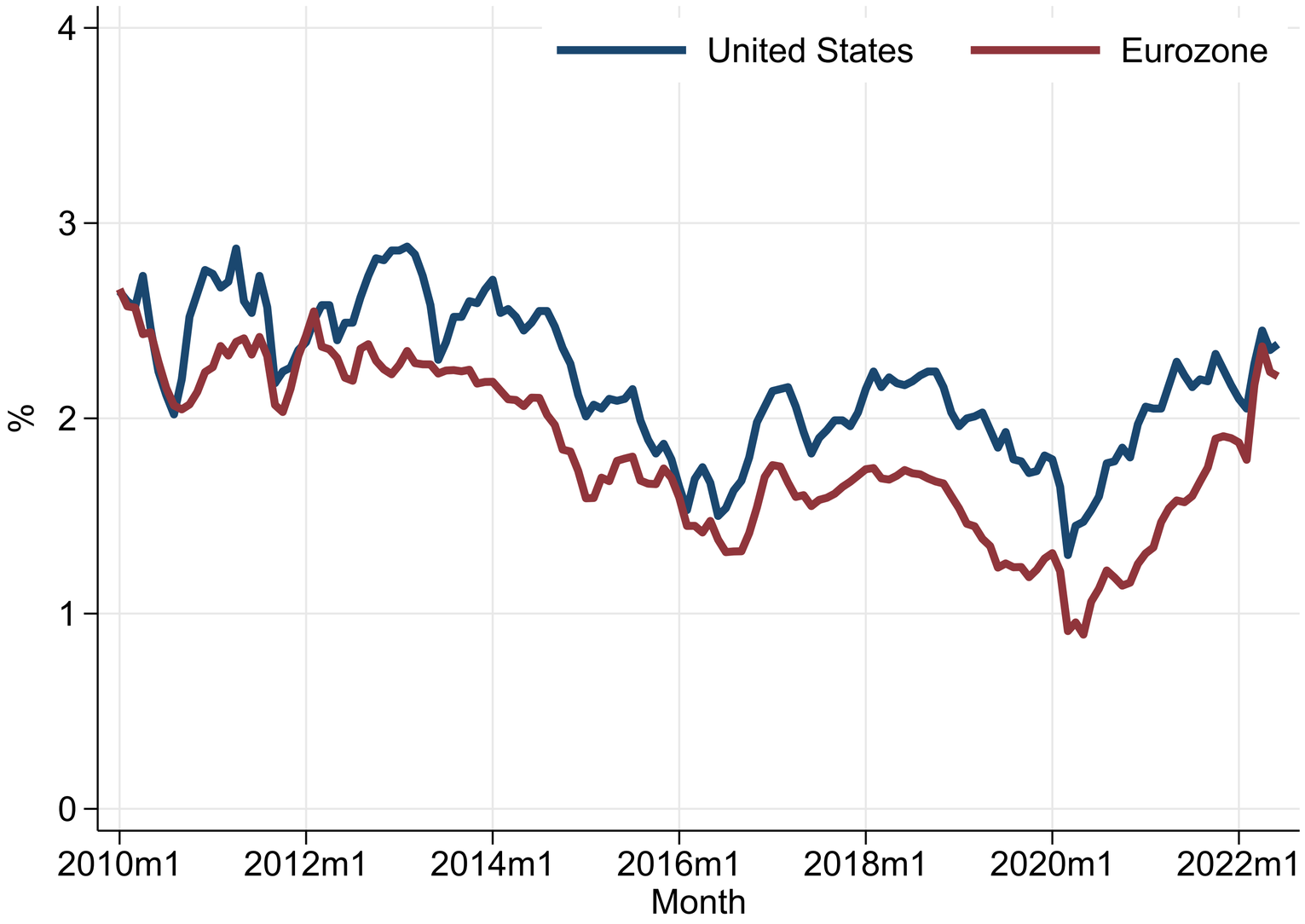
One hand:

- Stabilized at 4% inflation
- Upper bound from German households
- 8 + 5 + 3 + 2 + 2 = 4%

Other hand

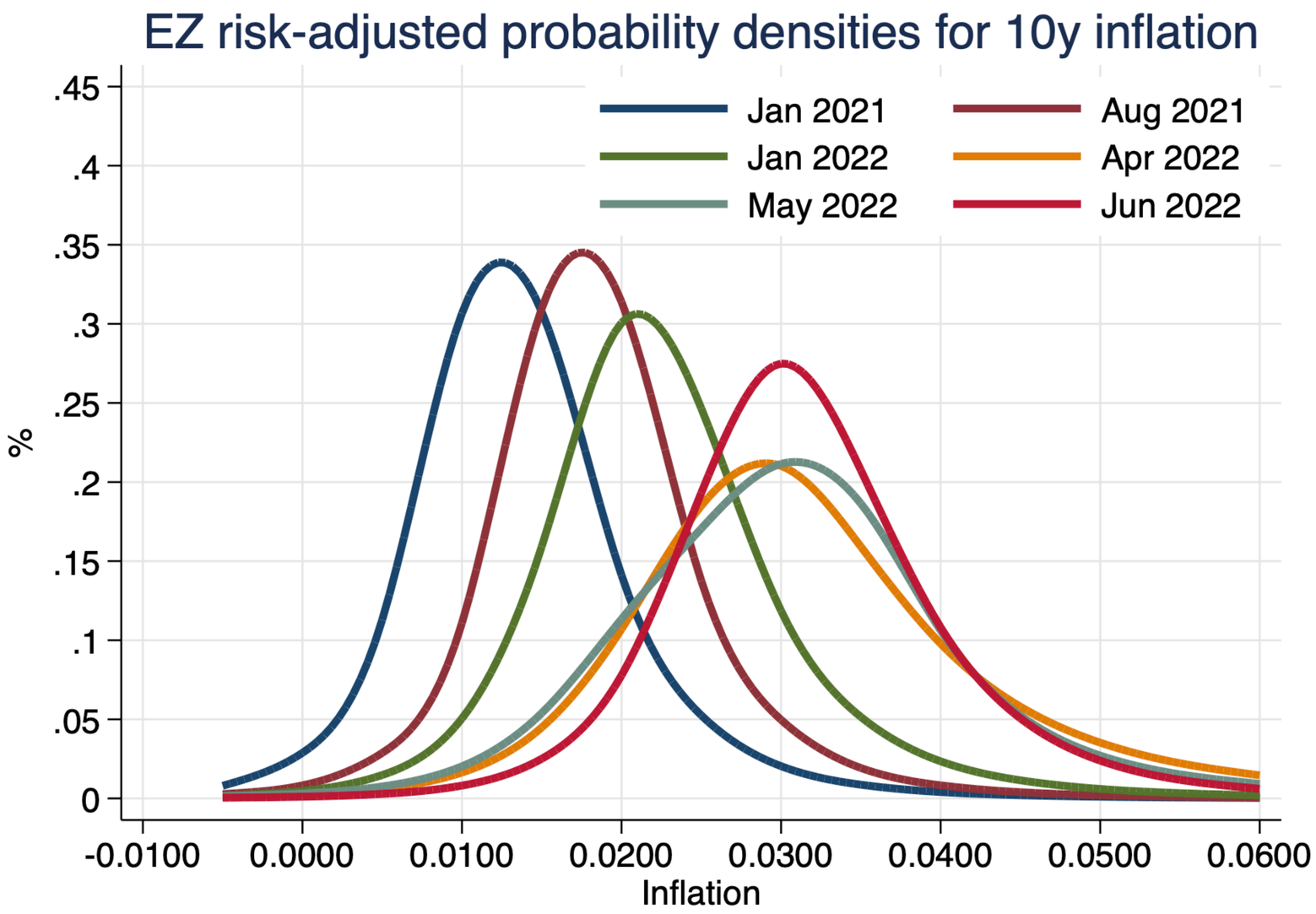
- 5y versus 10y
- Not unanchored, rather anchored above 2% inflation

Longer horizons: only markets can be used



- Once get to 5y5y horizon, really measures of credibility.
- Answer should be 2% always and most of variance is in price and quantity of risk.
- What are plausible risk premia? Range from -0.1% to 0.6% historically.

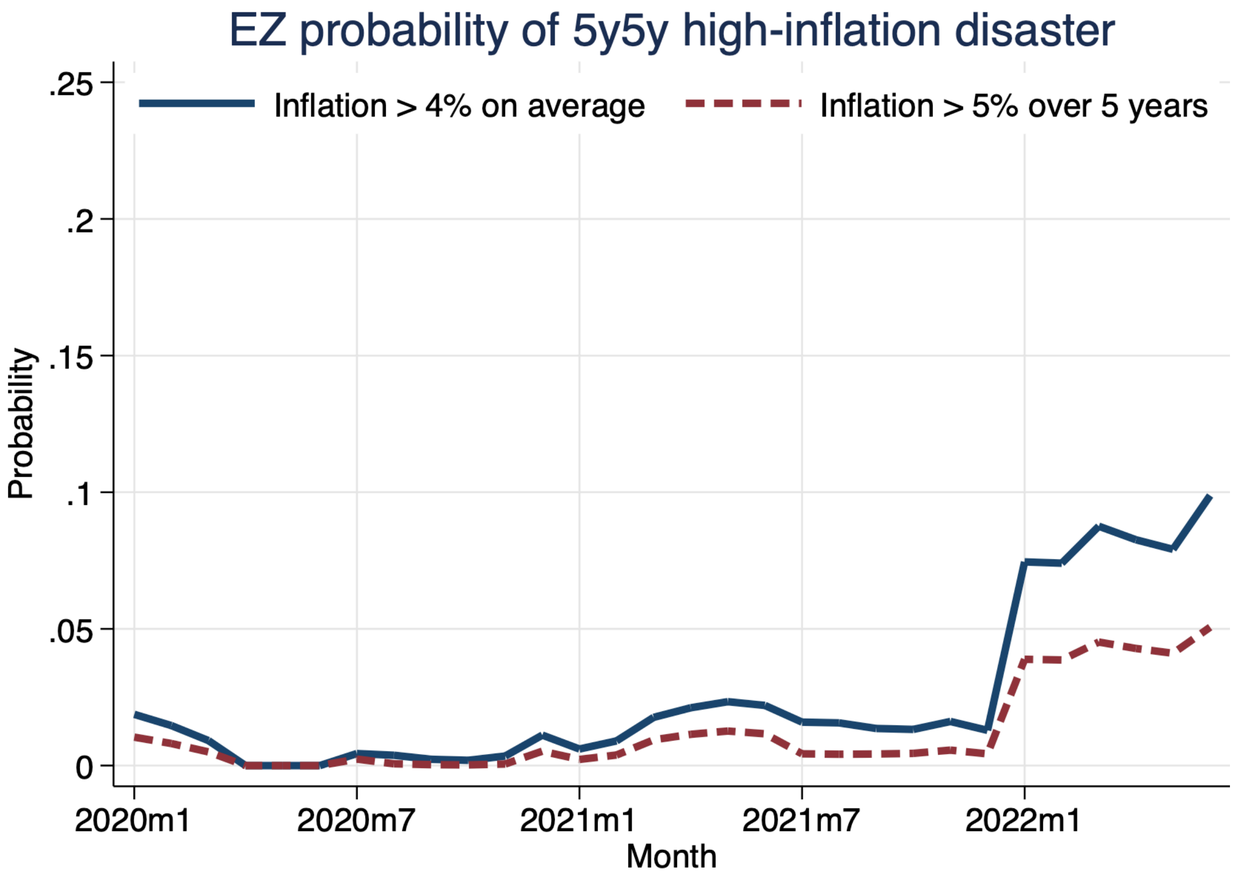
Some distributions at 10y horizon

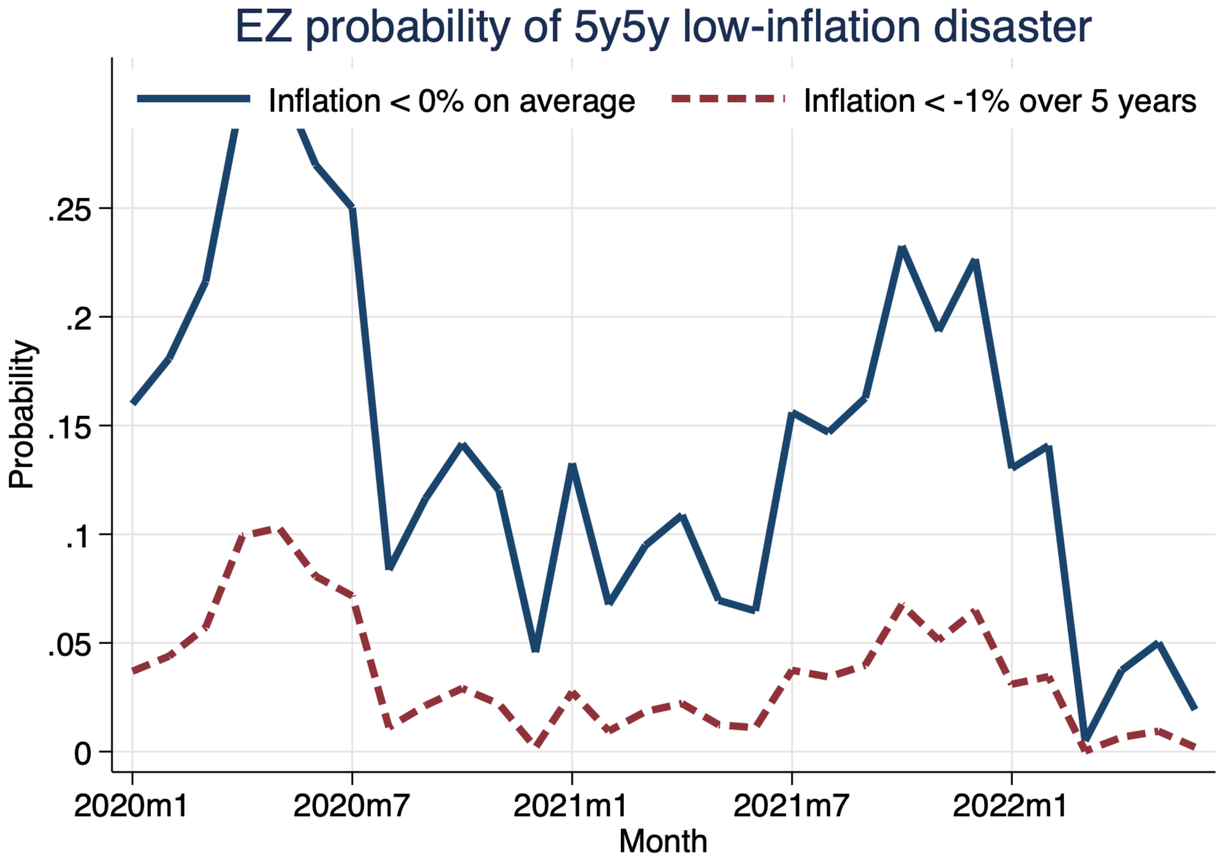


- Mixing 5y with 5y5y
- No adjustment for risk

- Shift in 2022
- Last observation, June 2022, slight improvement relative to April-May 2022.
- Apparent anchoring at higher value, around 2-3%

Probabilities of inflation disaster





- Some loss of credibility around December-January of 2022
- Quite stable since then.

Responses of policy: need a model

$$\pi_t = \mathbb{E}_t \pi_{t+1} + \kappa y_t + z_t$$

$$y_t = \omega_y \mathbb{E}_t y_{t+1} - \omega(i_t - \mathbb{E}_t \pi_{t+1} - a_t)$$

$$i_t = \bar{\pi} + \phi(\pi_t - \bar{\pi}) + \phi_y y_t$$

- Three equation (TA)NK model
- Supply shocks: z and a, both iid
- All parameters in Greek letters are positive

Solution under rational expectations

$$\pi - \bar{\pi} = \frac{\kappa a + (\phi_y + 1/\omega) z}{\phi_y + 1/\omega + \kappa\phi}$$

- Expected inflation:
  - Stays on target, only short-lived shock.
- In response to supply shocks to potential (*a*):
  - divine coincidence achieved if very high ϕ
- In response to supply shocks to the gap between efficient and potential (*z*)
  - let inflation rise, how much determined by ϕ_y, if very high, only inflation

Measures of expected inflation affecting policy

$$\pi_t = \mathbb{E}_t \pi_{t+1} + \kappa y_t + z_t$$
$$y_t = \omega_y \mathbb{E}_t y_{t+1} - \omega(i_t - \mathbb{E}_t \pi_{t+1} - a_t)$$
$$i_t = \bar{\pi} + \phi(\pi_t - \bar{\pi}) + \phi_y y_t + \theta \pi^e$$

- Policy responds to imperfect noisy measures.
- But say it is just noise, does not reflect any choices
- Excessively tighten policy, would have been better to have $\theta=0$

$$\frac{\partial \pi}{\partial \pi^e} = -\frac{\kappa\theta}{\phi_y + 1/\omega + \kappa\phi}$$

Even if they are wrong, they act on it…

$$\pi_t = \bar{\pi} + \pi^e + \kappa y_t + z_t$$
$$y_t = \omega_y \mathbb{E}_t y_{t+1} - \omega(i_t - \bar{\pi} - \pi^e - a_t)$$
$$i_t = \bar{\pi} + \phi(\pi_t - \bar{\pi}) + \phi_y y_t + \theta\pi^e$$

- Expect higher inflation: demand higher wages, set higher prices.
- Expect higher inflation: perceive lower returns to savings, spend more, multiplier
- Both push inflation up, want positive θ to offset it.

$$\frac{\partial \pi}{\partial \pi^e} = \frac{\kappa(1-\theta) + 1/\omega + \phi_y - \kappa\theta}{\phi_y + 1/\omega + \kappa\phi}$$

What if they are over-reacting to supply shock

$$\pi^e = \beta z$$

$$\frac{\partial \pi}{\partial z} = \frac{(1/\omega + \phi_y)(1+\beta) + \kappa(1-\theta)\beta}{\phi_y + 1/\omega + \kappa\phi}$$

- Extra push up of inflation through the expectations channel
- In dove-ish limit, to keep *y* unchanged want to have $\theta \geq \beta$ at least.
- Otherwise, always higher. If people over-react in expectations data, then the central banks wants to over-react more in its policy

What if long-run credibility?

$$\kappa = 0, \quad \phi_y = 0, \quad z_t = a_t = 0$$

$$i_t = \bar{\pi} + \phi(\pi_t - \bar{\pi}) + \theta(\pi_t^e - \bar{\pi})$$
$$\mathbb{E}_t(\pi_{t+1}) = (1-\delta)\pi_{t+1} + \delta\pi_t^e$$
$$\lim_{j\to\infty} \pi_{t+j}^e = \bar{\pi}$$

- Want to respond to expectations in full force to regain credibility.
- Otherwise, end up with prolonged period of inflation, as expectations drift

$$\pi_t - \bar{\pi} = \left(\frac{\delta - \theta}{\phi}\right) \sum_{j=0}^{\infty} \left(\frac{1-\delta}{\theta}\right)^j (\pi_{t+j}^e - \bar{\pi})$$

Reactions to expected inflation shock

Case	Policy
just noise	ignore
noise driving actions	tighten
noise arising from markup shocks	tighten beyond over-reaction
doubts on credibility	tighten aggressively immediately

Conclusions

- **Can we measure expected inflation accurately?**
  - No. And yet households and market prices give coherent account of drift of last 12 months.
- **What is the best measure of expected inflation?**
  - Better to combine them. Suggests 5y anchor at 3-4%, one hand fine, other hand concerning. Upside risk
- **At longer horizon, is the ECB inflation target still credible?**
  - Yes, but rise in right-tail probability of doubts in December-January (steady since). Upside risk
- **Should a CB respond to noisy upside risk in measured expected inflation?**
  - Unless very confident they are noise that not even the respondents will act on, then suggests tightening, with differing vigor depending on what you think is driving the measures up.

Measured expectations matter for monetary policy