Expected Inflation in the Euro Area: Measurement and Policy Responses

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Abstract

Measures of expected inflation from both surveys and market prices provided valuable signals during the 2021-22 rise in euro area inflation. Combining these measures, as opposed to picking just one, and looking at distributions, as opposed to only measures of central tendency, showed a sustained drift upwards in inflation expectations since the middle of 2021. In June of 2022, these measures point to an expected gradual decline in inflation over the next two years, and a small risk to the credibility of the ECB's inflation target. A baseline model suggests that a central bank should respond to these measures by raising interest rates. How much and how fast depends on how it assesses the source of the shock and how expectations are linked to actions.

[1] I thank Marina Feliciano, Salomé Fofana, and Borui Zhu for research assistance. This paper was written for the ECB Forum in Central Banking, Sintra, June 28-29, and is forthcoming in the 2022 Sintra proceedings. A companion paper "Four Mistakes in the Use of Measures of Expected Inflation" discusses a complementary set of issues.

1. Introduction

Both academics and policymakers closely follow measures of expected inflation. Yet, it is sometimes argued that these measures are too noisy to be useful, that surveys reflect the cluelessness of the population about inflation, and that market prices are driven by liquidity factors and distortions. This paper provides some answers to three related questions:

- Did measures of expected inflation foreshadow, or did they at least sensibly follow, the large increase in euro area inflation in 2021-22?
- What is expected inflation in the euro area in June of 2022, and what challenges does it pose for the ECB?
- Given the noise in measures of expected inflation, should monetary policy ignore these measures when choosing nominal interest rates?

Section 2 looks at data to answer the first two questions, while section 3 writes a simple canonical model to answer the third. Section 4 concludes with general answers to questions on the role of inflation expectations in monetary policy.

2. Measuring expected inflation

There are three well-established alternative ways to measure inflation expectations.[2]

The first is to ask ordinary people in surveys. For the euro area, the best source of publicly available data today is the Bundesbank online survey of consumers, conducted since January of 2019, which has expectations for inflation 1, 3, 5, and 10 years ahead. In survey data, you always worry about biases coming from personal experiences, overreaction to news, and inattention, especially after twenty years of stable inflation. The signal-to-noise ratio is small. Moreover, while

[2] Aside from surveys of households and professionals, research over the last few years has made great advances in surveying firm managers as well (Candia et al, 2021). These surveys are not publicly available yet, and still have short time samples, but soon they should become a reliable fourth source of data.

people seem to make the distinction between 1-year ahead and longer horizons, the forecasts for 3, 5, or 10-years ahead are often the same, as people do not really distinguish between them.

Second, you can ask people whose job is, at least in part, to forecast inflation. The best euro area data probably comes from the ECB's survey of professional forecasters, available since the first quarter of 1999. This has more signal to noise and usually provides better forecasts than household's answers. However, it suffers from the strategic behaviour of the respondents, who do not want to be so far off from others that they are branded as out of touch, while still wanting to be slightly different to signal they have private information. It also suffers from conformism, as many of these professionals spend much time in conferences with policymakers listening to common arguments. More worryingly, if we look at the record of the large turning points in US inflation---the great inflation of the 1970s, and its sharp reduction during Volcker---both times, professionals were way off, adding little to the central bank's poor forecasts at the time.[3]

Third and finally, you can turn to asset prices. In the euro area, there are data on both inflation swap contracts and options. One difficulty here is how to extract compensation for risk, especially since we know from other asset prices that the price of risk fluctuates widely. Another problem is that the signal from prices is polluted by trading frictions and liquidity factors, while measuring payoffs and horizons takes some care.

2.1 One-year ahead euro area inflation expectations

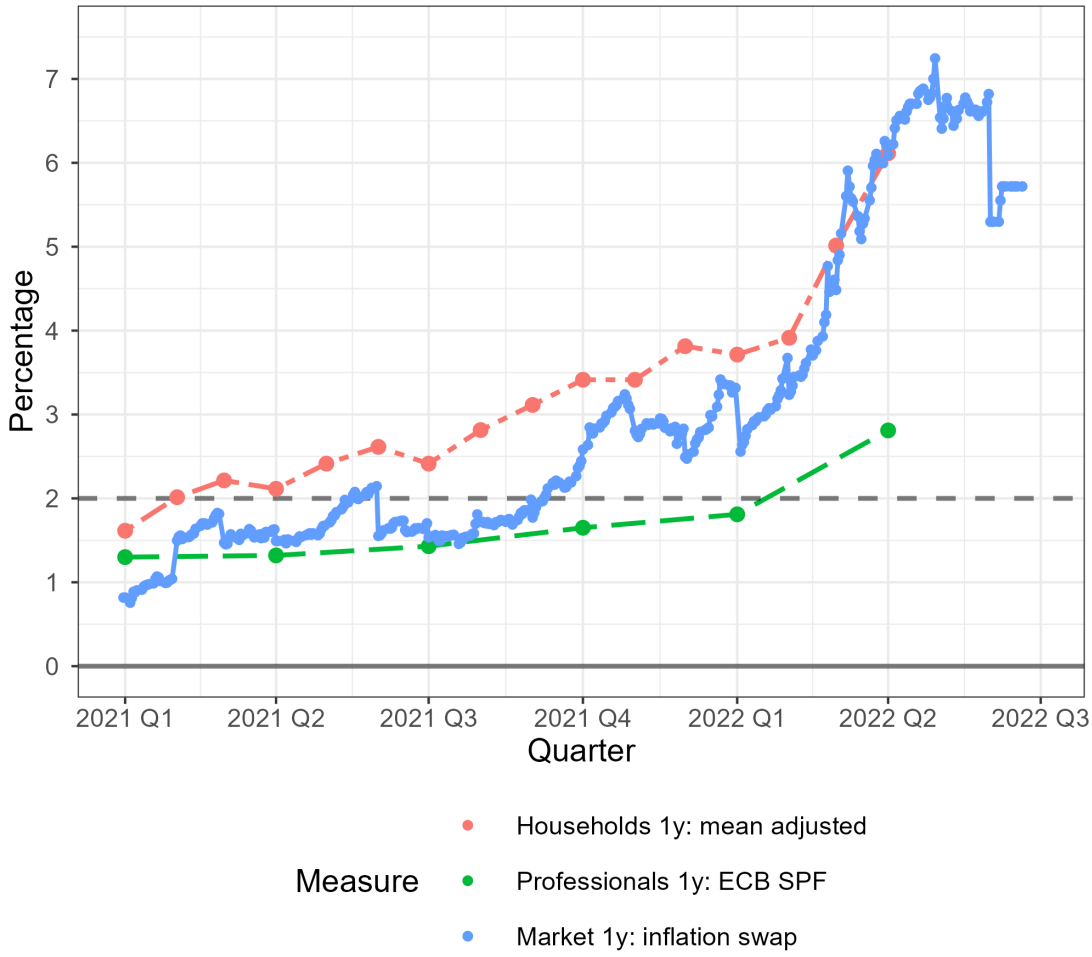
Chart 1 plots euro area inflation expectations data one-year ahead, since the start of 2021 and until June of 2022. The household expectations, which have their level adjusted for biases and overreaction using a formula from Reis (2020), were the first to start drifting upwards. They were rising already in the middle of 2021 and have gone up ever since. Markets were close behind, and since the start of 2022 have risen more aggressively, perhaps because the Russian invasion of the Ukraine has increased the chances of a recession at the same time as inflation is high, raising risk compensation. The professionals have been, for the most part, useless in keeping up with the increase in inflation that happened in the last twelve months.

[3] See Reis (2021) for a discussion of expectations around these turning points.

Chart 1. One-year ahead euro area inflation expectations

Central tendency measures

(%, Households: months; Professionals: quarters; Market: daily)



Sources: Bundesbank household panel survey, ECB Survey of Professionals, Bloomberg for 1-year inflation swap rate

Notes: The household adjusted mean is given by the formula: Average – StandardDeviation (0.5 Skewness)^0.5, where the moments are calculated using the whole sample, so this shifts the series downwards relative to the original data.

We already know how much inflation has risen in these past eighteen months, and what it will likely be over the next six months. Therefore, we can already conclude that household surveys and market prices were quite useful in spotting the extraordinary rise in inflation during this period. Policymakers, academics, or commentators that ignored or undermined the value of

these data, were wrong to do so, especially as they were more on track than were the forecasts from many central bank models or from surveys of professionals.

What do the data suggest for the next twelve months? In May and June, as European monetary policy started talking of tightening, market expectations have stabilized, or slightly reverted. The data on household expectations has still not been released. Only in a few months, looking at these two series, will we be able to see if this is a true inflection, but at least the data tentatively suggests that the upward drift has halted.

2.2 Five-year ahead euro area inflation expectations

Chart 2 shows data for the harder, but perhaps more useful, question of what inflation will be over the next five years. These data can tell us whether inflation expectations are anchored, because averaging over five years may take out conflicting interpretations of current events and transitory shocks.

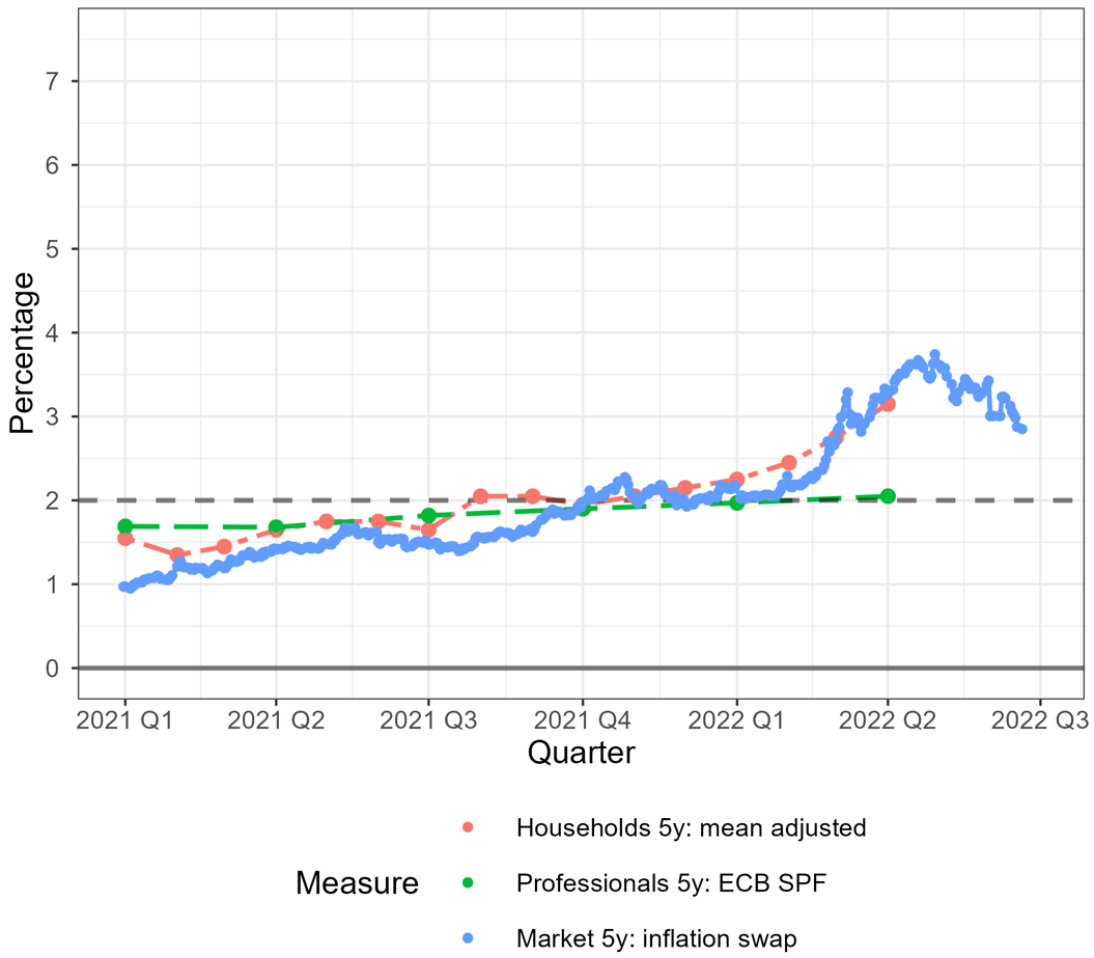
The pattern in the household survey data is quite similar to the one-year ahead data. It started rising in the second half of 2021 and, once it did, it rose steadily and persistently for many months in a row. Markets again followed closely behind, especially since January of 2022, and have stabilized or reverted since May of 2022. Again, professionals' forecasts barely changed. Altogether, there seems to have been a de-anchoring upwards starting towards the end of 2021, with the more recent data faintly suggesting that the worst may have been reached.

2.3 Combining measures

Which of these three measures is the best? In my view, this is the wrong question to ask. Instead, one should rather ask how to combine them to obtain more accurate signals than those from each individual series. Chart 3 does so by using the statistical model developed in Reis (2020). This model treats the data from the surveys as being biased, over-reacting to events, and sluggish on average; it treats the professional medians as being potentially far from the marginal informed agent; and it treats the market data as being sensitive to news but filled with noise. The model adjusts the data on averages for these features, complementing it with data on second and third moments to capture disagreement. Aside from parameters measuring the extent of

each of these properties of the data, it produces a measure of underlying fundamental expected inflation. Chart 3 plots 5-year ahead expected inflation for the euro area.

Chart 2. Five-year ahead euro area inflation expectations
Central tendency measures
(%, Households: months; Professionals: quarters; Market: daily)

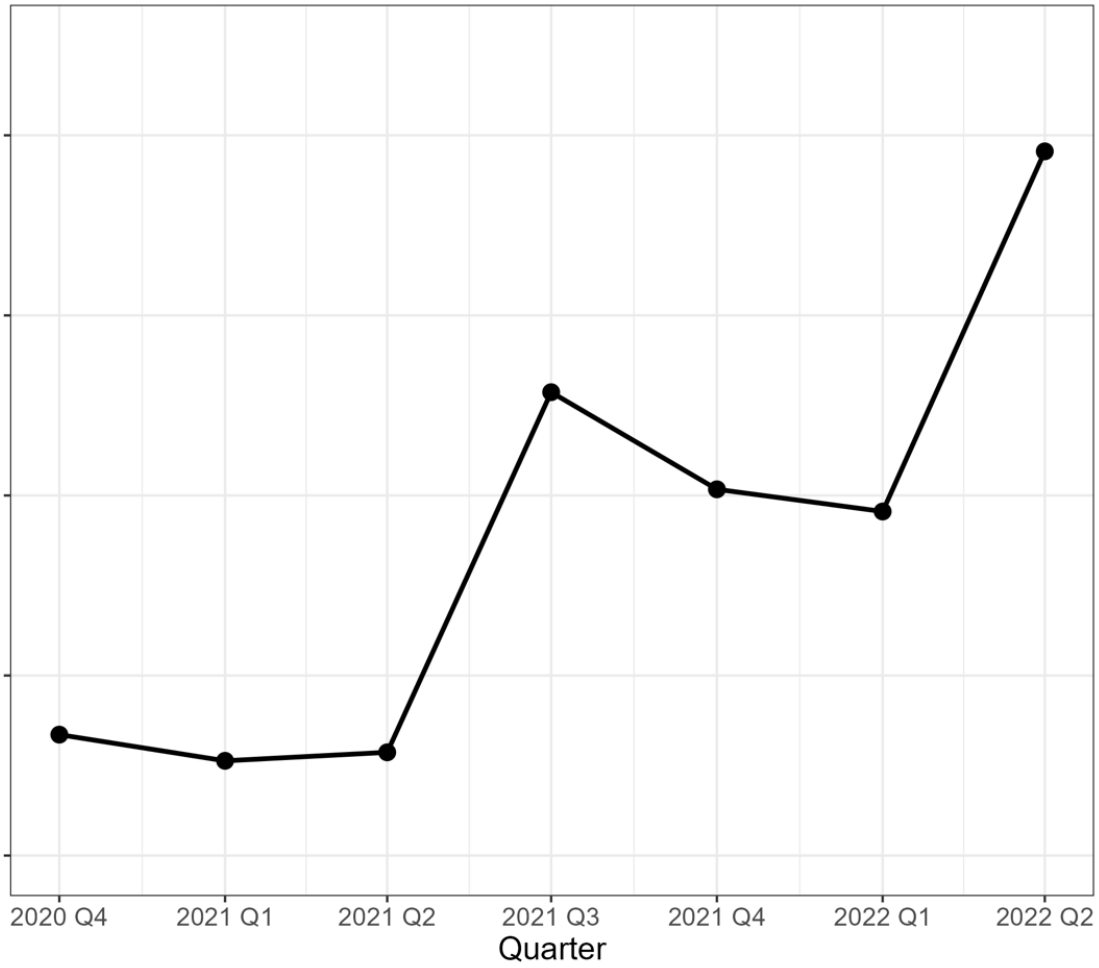


Sources: Bundesbank online panel of households, ECB Survey of Professionals, Bloomberg for 1-year inflation swap rate
Notes: The household adjusted mean is given by the formula: Average – StandardDeviation (0.5 Skewness)^0.5, where the moments are calculated using the whole sample.

Purposefully, the chart does not include a label in the vertical axis, even if each tick and gridline indicate 1% units. The reason is that the measurement model delivers estimates of how expected inflation has changed from the starting point, but not of what that starting point is. So,

if you think that, at the end of 2020, inflation expectations in the euro area were firmly anchored at the 2% inflation target of the ECB, then the chart says that in 2022Q2 they are now about 5%. If instead you think they were anchored at 1% in 2020, following the undershooting of inflation of the previous years, then, in mid 2022, they are about 4%. Even discounting for a possible increase in compensation for inflation risk of 1%, which seems to me like an upper bound, then the expected inflation anchor is today between 3% and 4%, uncomfortably above the 2% target.

Chart 3. Fundamental expected euro area inflation five years ahead
Combining survey and market data using the Reis (2020) model
(%, quarters)



Sources: Own calculations.
Notes: Each horizontal gridline corresponds to 1% inflation.

The chart shows that there were two key periods in this rise: in the Fall of 2021 and in the Spring of 2022. Looking at the data inputs behind these estimates, in the Fall of 2021 there was an increase in disagreement within households, measured by both standard deviation and skewness, even as the median was only slightly higher. At first, the model puts some weight into this being noise, or an over-reaction. But as soon as the median started rising and, especially, market prices started rising as well, the model revises sharply upwards the view that expected inflation was now higher. In the Spring of 2022, market expected inflation jumped upwards, while disagreement in household surveys fell. The model interprets this as expectations becoming anchored at a higher value.

2.4 Inspecting the distributions and the plausibility of the estimates

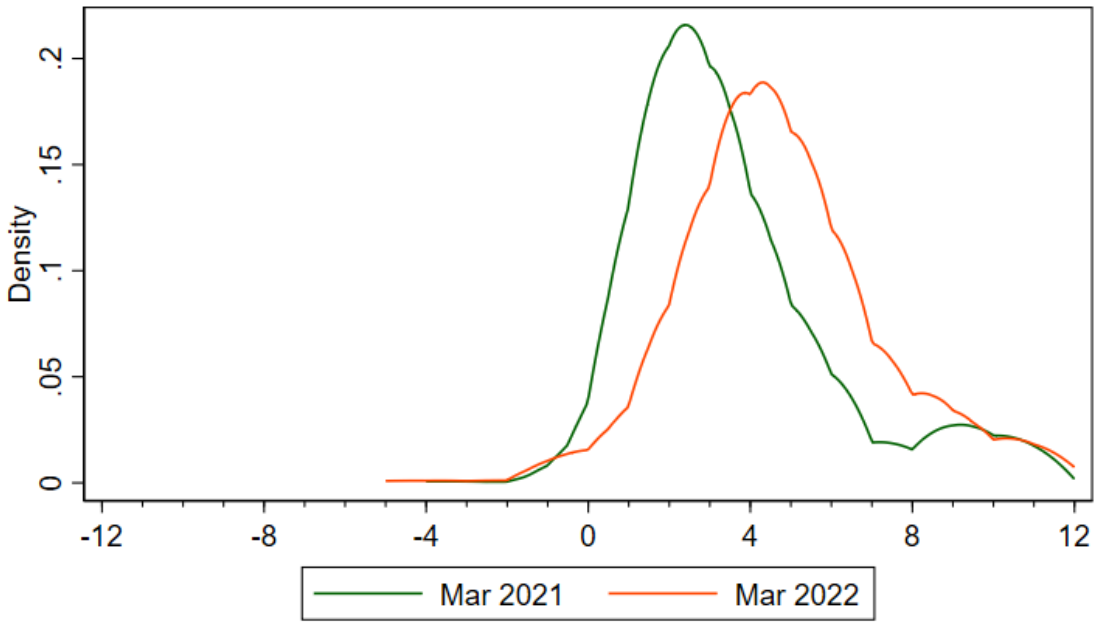
Finally, digging a little deeper into the data, chart 4 plots histograms of the Bundesbank online household survey data one year apart, in March of 2021 and March of 2022. Expectations are unanchored in two senses. First, because the distribution in 2022 is more spread out than in 2021. Second, because the distribution has decisively shifted to the right by 1.5% to 2%. The glass half full is that we do not see the elevated disagreement that presages further increases in expectations. The glass half empty is that they seem anchored near 4%.

We already saw how the 1-year ahead expectations of households were sensible and useful over the past 18 months; what about these longer-horizon forecasts? Take the following forecast for the path of inflation between 2022 and 2026: 8%, followed by 5%, then 3%, and finally two years of 2%. Since 8% this year already seems likely, this is a plausible forecast of the persistence of inflation shocks. The corresponding average over 5 years is 4%, precisely what households are expecting.

If inflation is 8% this year, then a 4% average may be as good as it gets for a central bank that targets inflation (as opposed to the price level) and that does not want to overshoot the inflation target on the way down. Under the inflation path of the previous paragraph, expectations of 5-year ahead inflation would come down quickly to be back on target by the end of 2023. However, as I noted, in their answers to the surveys, people do not distinguish well between 5-years ahead and 10-years ahead. If they expect 4% inflation on average over, say, the 5-year-5-year period,

this would be a disaster for the ECB given its inflation target and it would have lost its credibility. To evaluate if it is so, we must move away from survey data and towards market prices.

Chart 4. Five-year ahead expected euro area inflation by German households
Frequency distribution of responses
(density, %)



Source: Bundesbank online panel of households
Notes: inflation indicators truncated to values in range [-12,12], weighted data.

2.5 Measuring the credibility of the inflation target

Chart 5 shows a measure of the ECB's credibility, the 5-year-5-year expected inflation from inflation swaps. After 5 years, all transitory effects of current shocks should be gone. In theory, this measure should be close to a horizontal line at 2%, with a variance due solely to changes in the price and quantity of inflation risk. Arguably, it was so before the pandemic, although there was a shift down around 2014, which I would interpret as a slight decline in expectations under the 2% target.

Throughout the last eighteen months, this measure has risen by 1.2%. Some of it may be welcome, if it involves a re-anchoring at 2%. Some of it is surely an increase in compensation for risk, as even a short period of stagflation became likely. (If so, this should not be treated as noise

to filter out, since it has important consequences for monetary policy.) Overall, this figure does not support a panic about inflation, but a moderate concern.

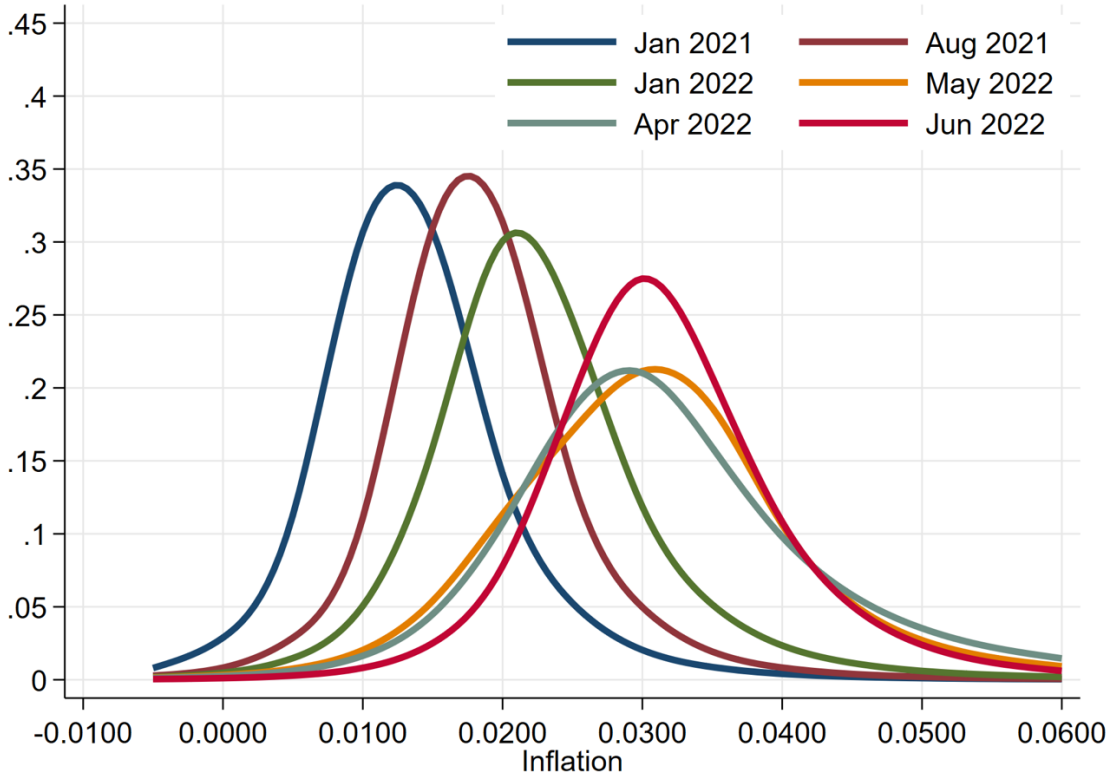
Chart 5. Expected euro area inflation 5-year-5-year ahead
From market prices on inflation swaps
(%, months)

Sources: Bloomberg.
Notes: These are not adjusted for risk compensation.

Chart 6 digs deeper by looking at the distributions of outcomes, extracted from option prices in markets. Two large caveats to these numbers are that: (i) because the options are for the 10-year horizon, not 5-year-5-year, they confuse the persistence of the current shock with the credibility of the ECB, and (ii) compensation for inflation risk is included. Still, the shift in the mean mirrors the one in chart 5. More interesting, the shift to the right in the distribution over

the last eighteen months came also with an increase in its spread. Uncertainty seems to have risen. From the perspective of the ECB, of particular concern is the right-tail of this distribution.

Chart 6. Probability densities for 10-year-ahead euro area inflation
Extracted from option prices
(density, units)

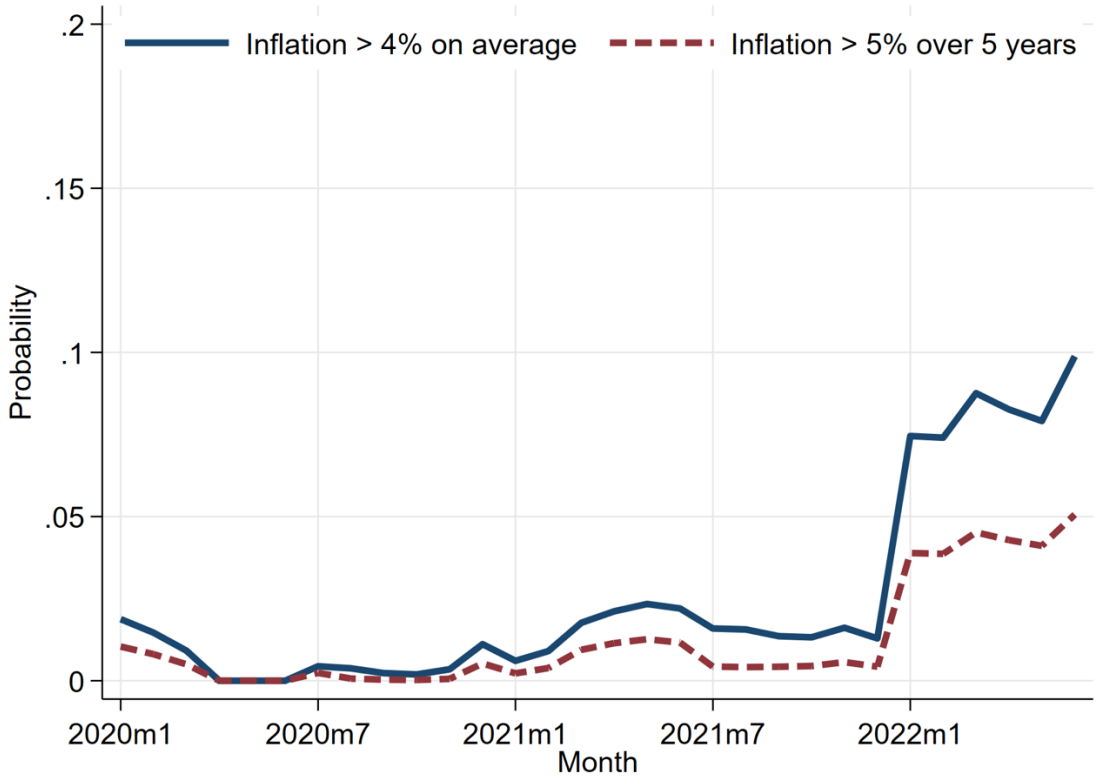


Sources: Bloomberg data on prices of inflation swaption contracts.
Notes: See Hilscher, Raviv, and Reis (2022) for details.

Chart 7 looks at the right tail only and deals with these two caveats by adjusting for horizon and risk using the methods in Hilscher, Raviv and Reis (2022). There was a clear increase in the probability of a high-inflation disaster around December of 2021 and January of 2022, from 0% to around 5-10%. Since then, there has been little change. Month-to-month fluctuations in these estimates of a few percentage points are likely best ignored, given measurement error and liquidity shocks to these markets. Instead, a clear change in regime, almost like a step-function,

should be paid close attention to as a sign of cracks in the ECB's credibility. On the one hand, chart 7 is worrying: any self-respecting central bank would want those estimates to be close to zero. On the other hand, with all the shocks of the past twelve months to inflation, maybe 5-10% is as good as one could hope for.

Chart 7. Probability of a 5-year-5-year high-inflation disaster
Inflation above 4% or 5% on average over 5 years
(%, months)



Sources: Hilscher, Raviv, and Reis (2022).
Notes: See Hilscher, Raviv, and Reis (2022) for details.

2.6 Conclusions from the data

It is unfortunately still too common to dismiss data from household surveys because the data are noisy, and people have little idea of what inflation is or what is going on with monetary policy. Likewise, data from market prices can be dismissed by concerns about the liquidity of markets or

about the irrationality of the traders behind them. Yet, the experience of the last year confirms that noise, biases, and inattention may all be present, and yet survey data is very useful. The data gave sensible estimates throughout this period, and points to clear dangers ahead. Even if in normal times, the data adds little to other sources of information, during turning points in inflation dynamics, survey data become invaluable.

Market prices likewise gave sensible estimates in the last twelve months. Combining them with surveys delivered solid estimates of expected inflation. Looking forward, the probabilities of inflation disasters point to people being willing to put money to insure against the possibility that the ECB's inflation target is not credible. For the near future, the data suggests concern, but not panic.

3 Should a central bank act in response to estimates of inflation expectations?

An inflation-targeting central bank should, of course, care about expectations as a measure of its performance. A different question is whether it should change policy in response to these data. Answering it requires a model with which to study policy. This section uses the textbook simple new Keynesian model to do so, although the points I will make are broad enough that they probably extend to other models of monetary policy.[4]

The model has three equations, a Phillips curve, an Euler equation, and a monetary policy rule:

$$\pi_t = E_t(\pi_{t+1}) + \kappa y_t + z_t$$

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

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

[4] See Eusepi and Preston (2018) and Angeletos and La'O (2020) for studies of the interaction between inflation expectations and optimal monetary policy.

Where the three variables are inflation (π_t), the output gap (y_t) and the nominal interest rate (i_t). There are also two exogenous, mean zero, i.i.d. supply shocks: to productivity (a_t) and to markups (z_t). All parameters are in Greek letters and are positive. A slight change relative to the textbook model is that $\omega_y < 1$, as in TANK models (Bilbiie, 2021). The inflation target is $\bar{\pi}$, and the parameters ϕ and ϕ_y define how policy is conducted, in terms of the policy rate's reactions to inflation and the output gap, respectively.

3.1 Solution under rational expectations

With rational expectations, the solution for inflation is:

$$\pi_t - \bar{\pi} = \frac{-\kappa a_t + \left(\phi_y + \frac{1}{\omega}\right) z_t}{\phi_y + \frac{1}{\omega} + \kappa\phi}$$

Since the supply shocks, a_t and z_t, are short-lived, so is the deviation of inflation from target. Expected inflation, one or many periods ahead, is solidly anchored, equal to the inflation target.

A supply shock that lowers the productive capacity of the economy temporarily (a lower a_t) will raise inflation above target. Central bankers that are very committed to their target, in the sense of being very responsive to rises in inflation in setting interest rates (a very high ϕ), would prevent this increase in inflation. In this model, because of the "divine coincidence," this would also keep the output gap close to zero. Tighter monetary policy lowers output, but since potential output is also lower, both stay in line.

A supply shock that instead raises the gap between the efficient and the potential output in the economy (a higher z_t) also raises inflation above target. However, it comes now with a recession, a negative y_t. The key parameter is ϕ_y on how dovish the central bank is. A higher ϕ_y, or a more output-focused central bank, will keep interest rates close to unchanged, and let inflation rise almost one to one with the shock, while output stays high, near potential. A hawkish central bank instead would tighten, keeping inflation nearer the target but with a potentially large recession.

From the lenses of rational expectations, the ECB's choice to keep interest rates unchanged over the last year would reflect both: (i) being very resolute that the supply shocks hitting the

economy are of the z_t kind, and (ii) being exceptionally dovish.[5] But expectations play no role in this story, because this is what rational expectations dictates: only fundamental shocks matter.

3.2 Expectations affect policy but do not drive the private sector

Consider now instead the case where there is a measure of inflation expectations, call it π_t^e, and that the central bank responds to it. The monetary policy rule is now:

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

Where the new policy parameter is $\theta > 0$. If our measurements of expectations were perfect, then this new term would always be zero in the economy with rational expectations. However, it is surely the case that the measurement of inflation expectations discussed in the previous section are not perfect and are contaminated by, at least, some i.i.d. measurement errors. Policy in this economy with rational expectations is therefore responding solely to noise in measurement. Worse, this noise is not affecting the choices of households or firms, as it does not show up in the other two equations in the model. Therefore, responding to it is clearly a poor policy, and policy should set $\theta = 0$.

How poor is it doing otherwise is shown by the equation:

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

If the central bank responds to an increase in these noisy measures of inflation expectations, then it will tighten, and deliver too low inflation. Ignoring the expectations data is the right thing to do.

3.3 Expectations that drive the private sector

However, consider instead the case where expectations affect the private sector. People may be wrong, misguided, or foolish in their expectations, but these are the same people who then choose how much to spend, work, and charge. In that case the model can be modified to have:

[5] Reis (2022) discusses the monetary policies that contributed to the rise in inflation in 2021 and 2022.

$$\pi_t = \pi_t^e + \kappa y_t + z_t$$

$$y_t = \omega_y E_t(y_{t+1}) - \omega(i_t - \pi_t^e + a_t)$$

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

Starting with the first equation, if people now expect higher inflation, then workers demand higher wages, and firms choose higher prices, both leading to higher inflation. Turning to the second equation, if some consumers perceive higher inflation, they think the returns to savings are lower, and spend more, which the other hand-to-mouth consumers then amplify.

Now the response of inflation to a rise in measured inflation expectations is:

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

The central bank wants to pay close attention to measured inflation expectations. If it ignores them ($\theta = 0$), then inflation will rise when expectations rise. In that case the Taylor principle plays an important role. If it is not satisfied ($\phi < 1$) then an increase in π_t^e raises π_t by more than one-to-one. This validates the exogenous increase in expectations (animal spirits), and potentially leads to a spiral of self-validating higher and higher inflation. With the Taylor principle, then expectations rising by 1% increases actual inflation by less than 1%.

To stabilize inflation further, the central bank would want to set θ above zero. By how much would depend on the weight that the central bank puts on stabilizing inflation versus output. But the more important lesson is that even if households are forming expectations with biases, inattention, and over-reactions, and even if market prices reflect liquidity shifts or herding, these are still the prices and beliefs that determine how people behave, so they are a source of shocks to inflation that the central bank cannot afford to ignore.

3.4 Over-reaction of expectations to supply shocks

Another valid criticism to measures of inflation expectations is that they are an over-reaction to supply shocks. People fixate on the price of gas at the pump, or on the prices of bread and

beer, and these have moved more than the overall price index, leading to too volatile expectations. Imagine then that:

$$\pi_t^e = \beta z_t$$

Where $\beta > 0$, so what drives and distorts inflation expectations from the rational-expectations target is this over-reaction to supply shocks. In that case, the responsiveness of inflation to the supply shocks is now:

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

Compared with the solution with rational expectations, there is now an extra positive effect on inflation from the supply shocks because of the over-reaction of expectations.

Policy can fight that extra push again by having a positive θ. Even in the dovish limit, where policy wants to keep the output gap unchanged after the shock, θ has to equal β. A higher θ will trade off some recession for a less dramatic increase in inflation. Therefore, θ should be, not only positive, but at least as high as the over-reaction of expectations. More, this over-reaction leads policy to respond more to the expectations, rather than dismiss them. Central banks operate in the real economy and must adjust to it: if people over-react, so should the central bank, not because of irrationality, but because the shocks hitting the economy are amplified.

3.5 Expectations and credibility

Finally, consider the use of measures of credibility, like the 5-year-5-year measures shown in chart 7. To analyse these more clearly, consider a special case of the model where: $\kappa = \phi_y = z_t = a_t = 0$. In other words, assume away an inflation-output trade-off, so as to focus solely on inflation, and assume away shocks, so we can focus solely on keeping inflation exactly on target. The model therefore reduces to two equations to solve for nominal interest rates and inflation.

$$E_t(\pi_{t+1}) = i_t = \bar{\pi} + \phi(\pi_t - \bar{\pi}) + \theta(\pi^e - \bar{\pi})$$

To study credibility, assume now that expected inflation is given by the equation:

$$E_t(\pi_{t+1}) = (1-\delta)\pi_{t+1} + \delta\pi_t^e \;\; with \lim_{j\to\infty} \pi^e_{t+j} = \bar{\pi}$$

Rational expectations map to the case where $\delta = 0$, since without shocks, expectations match realisations, and the unique determinate equilibrium would then be inflation equal to $\bar{\pi}$ at all dates. In contrast, setting $\delta > 0$ captures the doubts that private agents might have about the inflation target, and which the noisy measures of expected inflation π_t^e will reflect. These doubts dissipate over time, but they persist, as it takes time to earn credibility.

The solution of the model is given by:

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

Inflation can deviate very significantly from target, and by much more than the initial drift of expected inflation if the loss of credibility persists over time. The central bank is always fighting through its Taylor coefficient ϕ to keep inflation on target but while it takes time for people to believe it, inflation will stay stubbornly high. A higher ϕ lowers these deviations, but such aggressive raise in interest rates for many years would surely have side effects.

Instead, the central bank can respond to the drift up in credibility by raising interest rates by $\theta = \delta$, that is by as much as it thinks that doubts on the credibility of the inflation target will persist. This may well be a modest amount. But if it is done right, through what appears like excessively hawkish policy that raises interest rates more aggressively in a pre-emptive way, above their neutral long-run values, it will succeed in keeping inflation on target right away and forever after. Responding decisively to any doubts about credibility as measured in inflation expectations is what is required of a central bank that wants to succeed.

3.6 Conclusion: policy responses to higher measurements of expected inflation

Table 1 lists the different cases considered above for the central banker who sees measures of expected inflation rising, as documented in section 2. If the central banker strongly believes that the measures of expected inflation in the first part of this piece are complete noise, which affects no one's economic choices, then they should ignore them. That would be a drastic choice

and, dare I say, a reckless one. In every other case, policymakers should adjust the path for interest rates upwards in response to the current expectations data. Sometimes it should change the path for policy only by little, sometimes by a lot. But, higher expected inflation data should almost always lead to tighter monetary policy even if the policymaker, from her highchair, thinks people are foolish to hold these beliefs in the first place.[6]

Table 1. **Response of policy rates to higher measured expected inflation suggested by theory**

Source of rise in expectations	Policy for interest rate
Just noise	Ignore
Noise that drives people's actions	Tighten
Noise from over-reaction to supply shock	Tighten beyond over-reaction
Doubts about credibility	Tighten pre-emptively and aggressively

4 Conclusion

Taking the perspective of the challenge facing the ECB to control inflation in 2022, this note provided some answers to four more general questions:

1. Can we measure expected inflation accurately?

No, measures are riddled with noise, biases, and conflicts between different sources of data. And yet, both household surveys and market prices give a coherent account of the drift in inflation over the last 12 months. Unlike professionals or many econometric models, the measures of expected inflation did well in seeing the inflation coming.

2. What is the best measure of expected inflation?

[6] The model above leaves several other mechanisms out. To name two, Pfauti and Seyrich (2022) find that the interaction of precautionary savings and cognitive discounting justify an even stronger response of interest rates to a supply shock, and Gallegos (2022) suggest that if this spike in inflation might make economic agents more attentive in their beliefs, which would make inflation more persistent and the Phillips curve steeper, this would also call for tighter monetary policy.

None of them, but that is the wrong question to ask. It is better to combine them, so as to correct each measure for its flaws, and extract as much as possible of the signal from each one. From this perspective, expected inflation over the next 5 years in the euro area today is around 4%. On the one hand, that is a plausible forecast, that would reflect the very high inflation of 2022, as well as a view that it will take two to three years for it to come down. On the other hand, it is worrying that it is so above the 2% target, giving little room for the ECB to tolerate any further upward shocks to inflation.

3. At longer horizon, is the ECB inflation target still credible?

Yes, as the 5-year-5-year-ahead expected inflation is still quite close to 2%, and the probability of a disaster is still not too high. At the same time, that probability went from 0% to somewhere between 5% and 10% in January of 2022 and it has stayed there. This right-tail probability has to be a source for concern.

4. Should a central bank respond to noisy upside risk in measured expected inflation?

Yes, unless it is very confident that the increase in the measure of expected inflation is purely noise that not even the respondents will act on. Otherwise, the central bank should respond by raising interest rates, with differing vigour depending on what it thinks is driving the measures up.

More generally, the main point in this article is that measured expectations matter for monetary policy. They were useful in detecting the turning point in inflation dynamics in 2021-22, they point to clear dangers in the year ahead, and they give guidance on how to change interest rates in response.

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