

Questioni di Economia e Finanza

(Occasional Papers)

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APPROACHING THE TERMINAL RATE AND THE WAY FORWARD: A MODEL-BASED ANALYSIS

by Anna Bartocci*, Alessandro Cantelmo*, Martina Cecioni*, Christian Hoynck*, Alessandro Notarpietro* and Andrea Papetti*

Abstract

Using as a baseline a macroeconomic scenario consistent with the key interest rate path implied by market-based expectations, we evaluate the economic implications and risks of two alternative, illustrative tightening paths for the ECB policy rates that, as in the baseline, bring inflation toward 2 per cent by the end of 2025. We consider a prudent path (labelled 'persistent'), where policy rates are kept at current levels for a prolonged period and subsequently reduced more slowly, and a more pro-active approach ('peak') in which policy rates reach a higher terminal level, but decrease faster. Model-based simulations show that, relative to the baseline scenario, the persistent path would leave inflation and output unchanged in 2023-24, while the peak path would lower inflation at the cost of output losses. The persistent path would be preferable over the period 2023-25 according to a quadratic loss function penalizing inflation and output volatility. The risks of an excessive worsening of financing conditions and the amplification effects attached to the peak scenario are assessed to be greater than those of an upward de-anchoring of inflation expectations and of second-round effects associated with the persistent path.

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1. Introduction¹

Thanks to the rapid sequence of policy rates increases started in July 2022, monetary policy in the euro area is currently in restrictive territory. At its June 2023 monetary policy meeting, the Governing Council reiterated that "*future decisions will ensure that the key ECB interest rates will be brought to levels sufficiently restrictive to achieve a timely return of inflation to the 2% medium-term target and will be kept at those levels for as long as necessary*".

In this paper, we assess the macroeconomic implications and the risks of two paths for the relevant policy rate (the Deposit Facility Rate, DFR) alternative to that expected by analysts and market participants (as of 24th of May, 2023). Both would lead to a return of inflation toward the 2% target by the end of 2025. Specifically, we consider a path that keeps the policy rate at the current level (as of June 2023) for a more prolonged period than in the baseline ("persistent" scenario), and one such that the policy rate reaches a higher peak level ("peak" scenario), but remains there for a shorter period, falling sharply afterwards (Figure 1). The first scenario implies a terminal rate of 3.5%, 25 basis points (bp) below expectations in the baseline. In the second case, the policy rate is increased by 25 bp at the Governing Council meetings of July, September, October, and December, reaching a terminal level of 4.5% (around 75 bp more than expected in the baseline); subsequently, the DFR is held constant for a shorter period and then reduced at a faster pace than implied by market expectations.

These policy rate paths are purely illustrative and are meant to capture, in an admittedly stylized way, the trade-off between the length and the magnitude of the monetary tightening, recently emphasized by some ECB Governing Council members.²

¹ We thank Fabio Busetti, Michele Caivano, Paolo Del Giovane, Giuseppe Ferrero, Alessandro Secchi, and Stefano Neri for helpful comments. All errors remain our own. The views expressed are our own and do not necessarily reflect those of the Bank of Italy, the ECB, or the Eurosystem. Email addresses: <u>anna.bartocci@bancaditalia.it;</u> <u>alessandro.cantelmo@bancaditalia.it;</u> <u>martina.cecioni@bancaditalia.it;</u> <u>christianandre.hoynck@bancaditalia.it;</u> <u>alessandro.notarpietro@bancaditalia.it;</u> <u>andrea.papetti@bancaditalia.it</u>.

² See Visco (2023a), Panetta (2023) and Villeroy (2023).

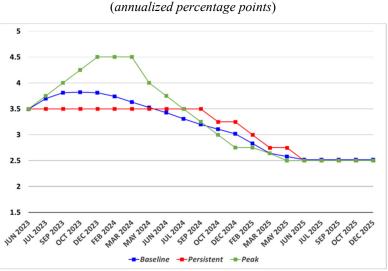


Figure 1. Policy rate paths under alternative scenarios (annualized percentage points)

Note: for the baseline path, expectations are taken from the \in STR swap curve on 24th of May and adjusted for the DFR- \in STR spread (around 10 bp).

The rationale for the "persistent" scenario would be the desire for a cautious action given policymakers' uncertainty about the speed and strength of policy transmission (the Brainard's conservatism principle).³ During the recent phase of sharp rise in inflation, the policymaker's decisions had to simultaneously address both the upward risks on the inflation outlook associated with the possibility of second-round effects and expectations de-anchoring, and the downward risks related to larger than warranted repercussions on economic activity and, in turn, prices. More recently, as underlying pressures on inflation are showing signs of a reversal, the latter risks have gained more prominence. First, most of the impact of key rates hikes is still to be felt by the real economy and then transmitted to inflation.⁴ Second, and more importantly, the uncertainty on the strength of the monetary transmission and, in turn, on the ultimate impact of policy tightening on economic activity and inflation is very large. This is even more true in the current context, given the exceptionally rapid increase in policy rates, both in the euro area and globally, and the remarkable shocks that have hit the euro area economy in recent years. For what concerns credit conditions, the evidence suggests

³ A monetary policy strategy based more on the persistence than on the level of the terminal rate has been suggested by Panetta (2023) in a recent <u>interview</u>: "the policy debate will soon shift away from "how high?" to "how long?". There is substantial scope for fighting inflation by keeping rates high for as long as necessary". A persistent action of monetary policy has also been advocated by Villeroy (2023).

⁴ Empirical evidence for the euro area suggests that, on average, a change in policy rates exerts its maximum impact on GDP growth after about one year and a half and its maximum impact on inflation after one to two years, see e.g. Visco (2023b) and Lane (2023).

that the uncertainty around the evolution of lending rates to firms is large and that there are real risks of a further strong increase in the cost of credit.

Furthermore, a patient and persistent action would improve the predictability of the ECB reaction function and, by reducing the risks of "bumps in the road" and the likelihood of policy reversals, would help reinforcing credibility. Literature dating back to the era in which central bank communication was scarcer and forward guidance was not in the set of policy instruments suggests that a certain degree of persistence in short-term rates could make the monetary policy action more predictable. The central bank can leverage this improved predictability to exert an impact on longer-term rates and, ultimately, on macroeconomic conditions, limiting volatility in interest rates.⁵ Large interest rate increases followed by swift policy reversals, instead, could blur the signal about future policy rate moves and lead to a deterioration in central banks' ability to effectively stir long-term rates by reducing anticipatory policy effects.

The rationale for the "peak" scenario would rest on the need to dispel risks of relevant indirect effects in the form of upward de-anchoring of inflation expectations and second-round effects on wages. Proactivity in monetary policy could also be motivated in an economy where current inflation takes centre stage and is a strong focal point in price setting and wage negotiations, leading in turn to a self-reinforcing high-inflation regime absent sufficiently strong monetary policy interventions (Borio et al., 2023). A proactive approach might also reflect the confidence that, due e.g. to the strength of the labour market, restoring price stability will not require a recession, i.e. a "hard landing" can be avoided (Nagel, 2023).

In the rest of the paper, we first analyse the implications of the two alternative policy rate paths for the macroeconomic outlook, and rank the outcomes in terms of GDP and inflation stabilization by means of a quadratic loss function. Then, we discuss the risks that each of the two paths bears.

The baseline macroeconomic scenario of the analysis is the June 2023 Eurosystem staff Broad Macroeconomic Projections Exercise (BMPE). According to such projections, inflation would reach 5.4% in 2023, 3.0 in 2024 and 2.2 in 2025. GDP growth would be 0.9% in 2023, 1.5 in 2024 and 1.6 in 2025. The year-on-year quarterly inflation rate would approach the 2% target at the very end of the projection horizon (2025:Q4). We assume that the evolution of the policy rate in the baseline scenario is consistent with market expectations for short-term interest rates derived from the OIS term structure

⁵ Woodford (2003)has shown that interest rate smoothing can enhance the monetary policy conduct via an expectations channel. Because financial markets are forward looking, inertial behaviour by the central bank can translate a small change in the current policy rate into meaningful changes in longer-term rates. Coibion and Gorodnichenko (2012) provide empirical evidence that confirms the Fed's desire for interest-rate smoothing.

as of May 24, which foresee a 25 bp increase in policy rates in the July Governing Council meeting (terminal DFR at 3.75%).⁶ Moreover, in the baseline scenario it is assumed that inflation expectations are anchored at the 2% target over the three-year horizon, in line with the most recent evidence on wage and price dynamics discussed in Section 3.

Starting from this baseline scenario, we run DSGE model-based simulations to compute the macroeconomic effects implied by two alternative monetary policy paths.⁷

2. Policy scenarios analysis

The two macroeconomic scenarios that we analyse are characterized by a markedly different evolution of the policy rate compared to the baseline; under each of them, the policy rate path is constructed in such a way to guarantee that the inflation rate would be close to the 2% target in 2025:Q4, as in the baseline.⁸

In the "persistent" interest rate path, the DFR is held at 3.5%, as set in the June 2023 Governing Council meeting (which is about 25 bp lower than the market-based expectations in the baseline), until 2024:Q3; subsequently it starts decreasing.

In the "peak" path, the central bank increases the DFR by 25 bp in July, September, October, and December, reaching a terminal level of 4.5% (around 75 bp higher than market-based expectations in the baseline). The policy rate remains at that level until 2024:Q1, and subsequently decreases at a faster pace than in the baseline and the "persistent" scenarios.

We first evaluate the macroeconomic effects implied by each alternative policy rate path by looking at the evolution of inflation and output over the projection horizon. The alternative scenarios differ from 2023:Q3 onwards, consistent with the alternative assumptions on the policy rate path. Table 1 reports the results. In both scenarios, the annual inflation rate would be 2.2% in 2025, and inflation would be even closer to the target of 2% in 2025:Q4, as in the baseline (June 2023 BMPE).

⁶ Market expectations are consistent with the assumptions underlying the June 2023 BMPE.

⁷ For a description of the DSGE model, see Burlon et al. (2015). The model is simulated under the assumption that wage and price inflation expectations are forward looking (model-consistent), and wages and prices are mainly anchored to the central bank inflation target, which is in line with the evolution of wages and prices in the baseline scenario (see Section 3). The policy rate paths are replicated by sequences of unexpected monetary policy shocks (to the Taylor rule). Hence, the forward guidance puzzle does not affect our analysis.

⁸ While in principle a multiplicity of policy rate paths could deliver such result, we select two rather stylized policy rate paths to characterize a relatively patient and persistent or, instead, a more proactive approach. Hence, the design of the policy rate paths in the two scenarios is to be read as illustrative.

	"Baseline"		"Persistent"		"Peak"	
	HICP	GDP	HICP	GDP	HICP	GDP
2023	5.4	0.9	5.4	1.0	5.3	0.9
2024	3.0	1.5	3.1	1.6	2.8	1.1
2025	2.2	1.6	2.2	1.5	2.2	1.9
Cum. diff. (2023-25)*			0.0	0.0	-0.3	-0.3

 Table 1. Alternative monetary policy strategies

 (percentage changes)

* GDP growth rate is reported. Cumulative differences are reported with one-digit precision, possible discrepancies reflect rounding errors.

Under the "persistent" policy rate path, inflation would be virtually unchanged compared to the baseline scenario. Real GDP growth would benefit from the less restrictive stance in 2023. The "peak" path would instead imply lower inflation especially in 2024, consistent with a stronger policy rate tightening, with some costs in terms of real GDP growth, which would only partially be recovered in 2025. Thus, this rate path would achieve an earlier reduction of inflation, which would nonetheless converge towards 2% no sooner than in the baseline, and only by weighing on economic activity.

We rank the macroeconomic outcomes that would be achieved under the two alternative policy strategies using a quadratic loss function, in line with a large amount of literature.⁹ We assume that such function penalizes deviations of inflation from the central bank's target and of GDP from its steady-state level. Conditional on each policy rate path i_j , with $j = \{$ "persistent", "peak" $\}$, the quadratic loss function is:

$$L(i_j) = \sum_{t=1}^{10} \beta^{t-1} \left\{ \left(\pi_t(i_j) - 2\% \right)^2 + \omega_y \left(100 * (y_t(i_j)/y_t^* - 1) \right)^2 \right\}$$

where $0 < \beta < 1$ is the agents' discount factor, π_t is the year-on-year quarterly inflation rate, y_t and y^* are GDP and its steady-state level, respectively. For each policy path, the corresponding quarterly paths of inflation and output are computed starting from the baseline, consistent with the results reported in Table 1. The parameter $\omega_y \ge 0$ measures the weight attached to GDP deviations from its steady-state level, relative to the weight assigned to inflation deviations from the target (with the latter normalized to 1).¹⁰ The squared deviations are computed over ten quarters, i.e. from 2023:Q3 to

⁹ On the use of *ad hoc* quadratic loss function see, among the others, Levin and Williams (2003).

¹⁰ The specification of the loss function is meant to be illustrative and does not aim at characterizing the ECB's objective function in detail. Results reported in Table 2 are obtained by assigning a value of 0.9994 to β . The ranking is robust to changes in β , as long as the latter is in between 0 and 1. Results reported in this paper are also confirmed if a third term is added to the loss function, penalizing the volatility of interest rate changes ($\omega_{\Delta i} (\Delta i_t)^2$), with a relative weight $\omega_{\Delta i}$ that varies from 0 to 1.

2025:Q4, consistent with the medium-term orientation of monetary policy, and in order to assess trade-offs along the three-year horizon. We study the outcomes of the different policy strategies allowing the relative weight on real GDP, ω_y , to take the values {0, 0.5, 1, 2}. Table 2 reports the values of the loss function under each policy rate path, for the different combinations of parameter values attached to the weights.

One main result clearly emerges: the "persistent" policy rate path provides a better performance (i.e. a smaller loss) than the "peak" path. The latter is only preferred in the extreme and unrealistic case in which the central bank does not care about the output gap ($\omega_y = 0$). Once deviations in real GDP are also taken into account with a positive weight, the performance of the "peak" scenario deteriorates, reflecting the different properties of the two alternative policy rate paths. The "persistent" path does not require any further increase in the policy rate holding it at the level reached in June 2023, and commands a relatively gradual reduction once the first decrease is implemented in 2024:Q4. As such, it generates moderate volatility also in the second part of the horizon. To the opposite, the "peak" profile initially implies a higher policy rate, which yields lower inflation via GDP losses, and also brings about some volatility in the future, when the policy rate starts declining at a relatively fast pace. Hence, according to our quadratic loss function, a central bank that wants to minimize the squared deviations of inflation and output from the target and steady state levels, respectively, would choose to reach a lower terminal level, and keep the policy rate there for a prolonged period, instead of aiming at a higher level and remaining there for a shorter time.¹¹

¹¹ We have also considered two more extreme versions of these two policy rate paths, one that displays more patience and persistence than the "persistent" path, and one that reaches the terminal level of 4.5% via larger and more rapid increases than in the "peak" path. In both cases, the macroeconomic performance (and the loss function ranking) would worsen compared to the "persistent" and "peak" paths, respectively. In the first case, assuming that the policy rate remains unchanged at 3.5% until 2025:Q2 (as opposed to 2024:Q3) and is thereafter more rapid increase in the policy rate would still bring inflation close to 2% in 2025:Q4, but with larger cumulative deviations of inflation and GDP growth from the baseline.

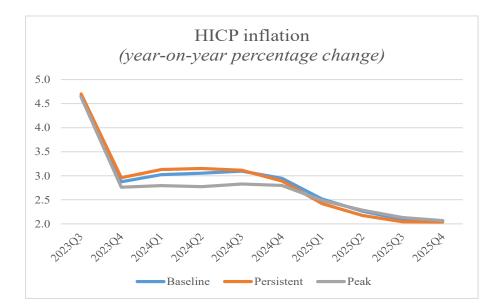
Central bank preferences	$L(i_j)$		
$\boldsymbol{\omega}_{y}$	"Persistent"	"Peak"	
0	13.1	10.4	
0.5	14.3	14.8	
1	15.6	19.1	
2	18.1	27.8	

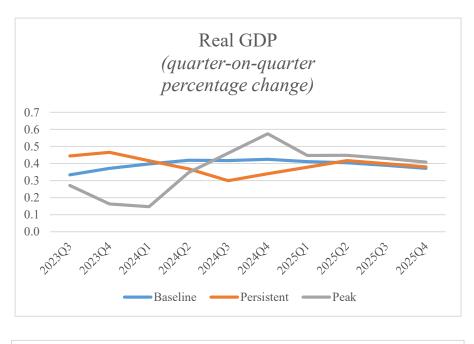
Table 2. Performance of alternative monetary policy strategies

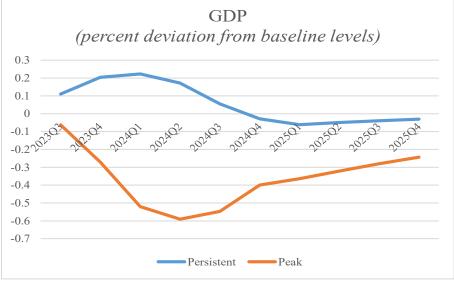
Note: the loss function $L(i_j)$ includes squared percentage point deviations of inflation from the target and squared percent deviations of GDP from its long-run level. Parameter ω_y measures the relative weight on GDP deviations. The weight on inflation deviations is normalized to 1.

It is worth stressing that the results from a loss function analysis should be taken with a grain of salt, as they mayreflect the specification of the objective function. , This is even more true when initial conditions (in particular in the case of inflation) are far away from long-run values. A complementary assessment focuses on the implications of each alternative policy rate path for the evolution of inflation and GDP growth over the considered horizon, by looking at some "heuristic" measure of the sacrifice ratio. Figure 2 reports the path of inflation and real GDP under each alternative policy rate path.

Figure 2. Macroeconomic variables under alternative scenarios







As the first panel shows, most of the heterogeneity of the impacts on inflation is concentrated in 2024, since the simulations start in the second half of 2023, and all policy rate paths converge by assumption to similar levels by mid-2025 (Figure 1). In particular, the "peak" path is more effective than the "persistent" one in bringing inflation closer to the 2% target during 2024. However, this comes at a sizeable cost in terms of real GDP growth. The latter is persistently lower than in both the baseline scenario until mid-2025 and the "persistent" path between mid-2023 and mid-2024; it is higher than in both scenarios after mid-2024, although the higher growth is not sufficient to bring the level of real GDP close to the baseline, as shown in the third panel. Given the profile of real GDP growth in the baseline scenario, the timing of the relatively more pronounced contractionary effects under the "peak" path may therefore be particularly unfortunate, as it would prolong the weakness of real GDP

growth into the second half of 2023 and early 2024, to achieve the inflation target no sooner than in the baseline and in the "persistent" case. To the opposite, the more gradual reduction in inflation achieved under the "persistent" path has the advantage of keeping the quarter-on-quarter real GDP growth closer to the baseline scenario, thus avoiding large deviations in the level of GDP compared with the baseline. The average reduction in inflation observed in 2024 under the "peak" path, which amounts to 0.3 p.p. relative to the "persistent" path (0.2 p.p. relative to the baseline), implies a sizable output loss. The percent deviations of real GDP from the baseline levels would be on average -0.5 p.p. in 2024, with a trough of -0.6.

An additional important consideration concerns the uncertainty about the effects on inflation and real GDP growth of previous monetary policy decisions, which are yet to be fully observed. As noted above, the typical transmission lag from a policy rate change to inflation and growth is in between 4 and 8 quarters, although these estimates may be surrounded by heightened uncertainty at the current juncture. As the tightening cycle enters its first year since the first policy rate increase in July 2022, it is reasonable to expect further effects from previous policy rate hikes to materialize in the next year, sustaining the convergence of inflation to the target via lower aggregate demand, even in the absence of additional policy rate changes. Against this background, the "peak" path may entail the risk of excessively weighing on economic activity, without anticipating the return of inflation to the target in a sizable way. To the opposite, the "persistent" path may deliver a more balanced inflation and growth outcome.

3. **Risks in the two scenarios**

The two proposed scenarios differ from the baseline only as regards the underlying policy rate paths. However, these different paths could lead to the materialization of specific risk events.

In the "peak" scenario, risks pertain mostly to possible amplification effects of the monetary policy restriction through banks and financial markets, which may lead to an excessive tightening of financing conditions, with unwarranted consequences on the economic outlook and possibly an undershooting of the inflation target. In particular, a higher terminal rate could exacerbate the actual and expected tightening of credit supply as the pass-through of additional policy rates hikes to firms' and households' borrowing costs and its impact on macroeconomic conditions may increase borrowers' risk and fears about the sustainability of their debt. This could result, in an extreme case, in a rationing by banks of the supply of credit, i.e. a "full-blown credit crunch".

A prolonged increase in policy rates would raise the risks of triggering forms of financial instability or a disorderly credit crunch. In particular, the credit supply effects may be particularly strong if they take place in conjunction with sharp increases in the cost of banks' funding. Upside risks could arise from possible tensions in both the retail and the wholesale funding markets, potentially triggered by the more sustained and unexpected increase in the DFR. Larger than expected outflows of retail deposits would put further pressure on deposit remuneration, which in turn is estimated to induce a material tightening of credit conditions. An additional source of strains with potential amplification effects, which is estimated to have a more limited effect on credit conditions, comes from the wholesale banks' funding markets: in the next few months, banks may experience upward pressures on the costs of funds due to the need to raise funds to replace the maturing TLTRO funding and to issue instruments suitable for the MREL requirement. While these factors are already taken into account in the baseline, a concentration of funding needs, coupled with the discontinuation of the reinvestments under the APP monetary policy portfolio as of July 2023, heighten the risks of generating a congestion in the bond market and sudden spikes in banks' funding costs. The growing relevance of the non-bank financial sector, which is particularly exposed to asset price corrections and credit risk that might originate from higher interest rates (De Guindos, 2023), adds to the heightened financial instability risks.

The main risk associated with the "persistent" scenario is that prolonged above-target inflation dynamics become entrenched in expectations and wage-setting processes either because agents become relatively more "backward looking" or because a patient and persistent monetary action is interpreted as lack of determination in tackling inflationary pressures in a timely fashion. Should those risks materialize, the convergence towards the 2% inflation target would be much harder, moving further away the achievement of price stability.

Evidence suggests, however, that survey and market-based long-term inflation expectations are wellanchored at the 2% target (see Neri et al., 2022). Thanks to the increases of policy rates occurred during the last year, the risks of a de-anchoring of long-term inflation expectations are assessed to be limited and are lower than at the beginning of the normalization phase. Although market-based measures of medium- to long-term inflation have recently slightly surpassed 2%, estimates based on Cecchetti et al. (2022) identify rising and positive risk premia as the main driver and suggest that genuine expectations are well anchored to the target.¹² The anchoring of long-term inflation expectations is also supported by the results of the June 2023 ECB Survey of Monetary Analysts and the ECB Survey of Professional Forecasters for 2023:Q2.

 $^{^{12}}$ The estimates based on Cecchetti et al. (2022) – that find support in the estimates by the ECB's staff – suggest that the inflation risk premia at the medium- to long-term horizons have increased since 2021 turning systematically positive since mid-2022, hovering at levels that prevailed before 2013-14.

While the risk of a wage-price spiral is currently limited, the possibility that a too-lenient monetary policy could feed a too strong acceleration in wages should be carefully considered, also taking into account that labour markets in some jurisdictions of the euro area are showing signs of increasing tightness. Current indicators suggest that the peak in wage inflation has been reached in 2023:H1 at a level which does not seem worrisome (in the proximity of 5% according to certain measures, see Deutsche Bank (2023), and at a lower level, below 4%, according to the ECB's euro-area wage tracker, see Lane (2023)). Moreover, according to the June 2023 Eurosystem's staff projections, the total increase of nominal compensation per employee in 2022-25 would be similar to that of consumer prices, implying that the loss in real wages experienced in 2022 would be broadly recovered by 2025, and thus leaving limited scope for stronger wage increases than those currently envisaged. In light of the aforementioned considerations, the evaluation of risks surrounding the two alternative policy paths should take into account that there are no reasons to infer that the "persistent" path is more likely to trigger an abrupt change of the dynamics of wage increases than the "peak" one. While the expected return of inflation towards 2% is slower under the "persistent" path, the evolution of inflation over the projection horizon in this path compared to the "peak" one is very similar (inflation is higher by 0.3 p.p. in 2024).

The risk of substantial amplification effects through banks and financial markets is assessed to be larger than the risk of inflation becoming entrenched in expectations and wage-setting processes. This judgement calls for prudence in setting policy rates and for patience so as to carefully assess the transmission of past monetary policy decisions to aggregate demand and, ultimately, to inflation. Headline inflation is coming down as the adverse supply shocks unwind. The risks of a de-anchoring of inflation expectations have been largely dispelled thanks to the fast policy rate hikes. These have transmitted forcefully to credit conditions and loan volumes. While tighter financial conditions may already be constraining households' total spending and firms' investments, the full impact of the monetary policy tightening on economic activity and inflation is still in the pipeline.

4. Conclusions

This paper has provided an assessment of the macroeconomic effects of ECB policy rate paths alternative to those inferred from market participants' expectations and a discussion of the associated risks. Compared with the June 2023 BMPE scenario, a more proactive path would allow inflation to be somehow more decisively affected over the next year, at the cost of output losses. At the same time it could also lead to an unwarranted and marked worsening of financing conditions. A more patient and persistent path would have similar macroeconomic effects as in the baseline scenario, which is consistent with the achievement of price stability in the medium-term, but it could fuel risks

of de-anchoring inflation expectations and of second-round effects, which, however, appear contained at this stage.

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