EUROPEAN CENTRAL BANK

EUROSYSTEM

The 2021-2022 Inflation Surges and Macroeconomic Models

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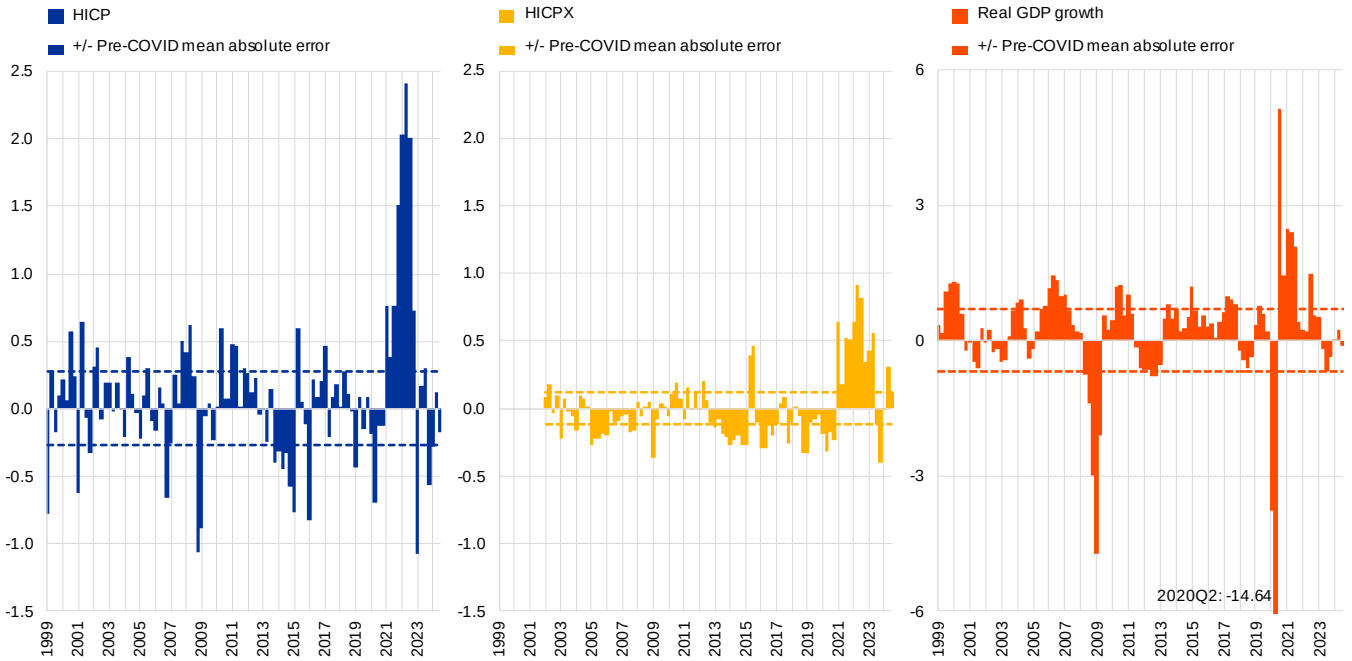
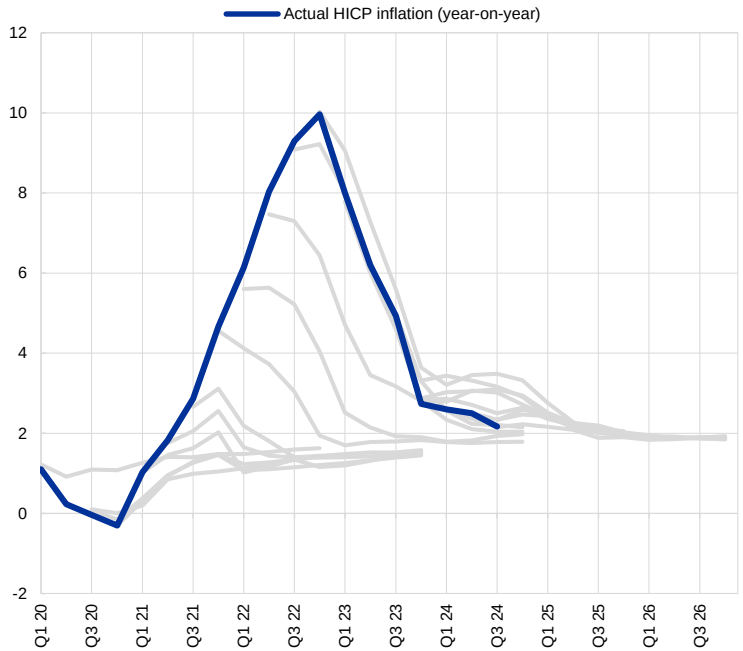
One-quarter-ahead errors in the inflation projections of Eurosystem/ECB staff

(annual percentage changes)



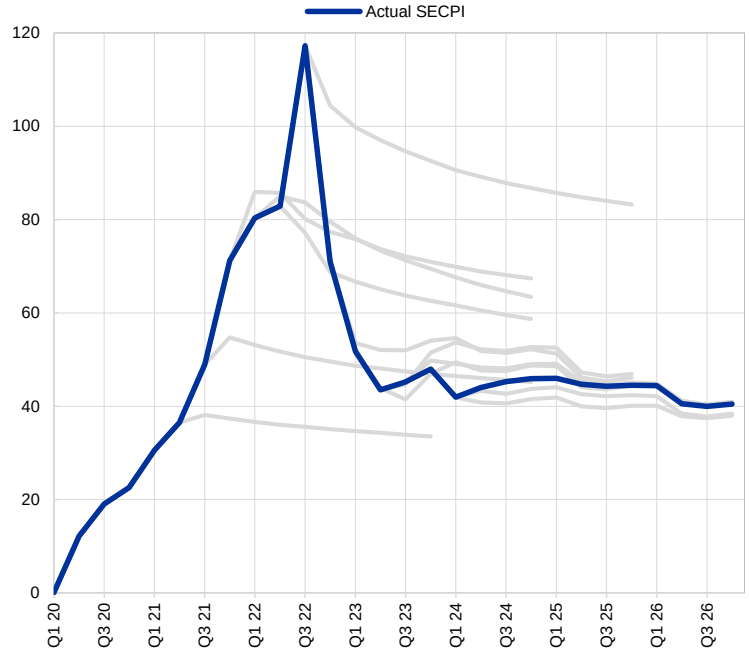
Sources: Eurosystem/ECB staff macroeconomic projections for the euro area and Eurostat.
Notes: An error is defined as the outturn for a given quarter minus the projection made for that quarter in the previous quarter (for example, the outturn for the fourth quarter of 2022 minus the figure projected for that quarter in the September 2022 ECB staff macroeconomic projections).
The latest observation is from the September 2024ECB staff Macroeconomic Projection Exercise (MPE).

HICP inflation projections
(annual percentage changes)



Sources: Eurosystem/ECB staff projections and Eurostat.
The latest observation is from the September 2024 MPE

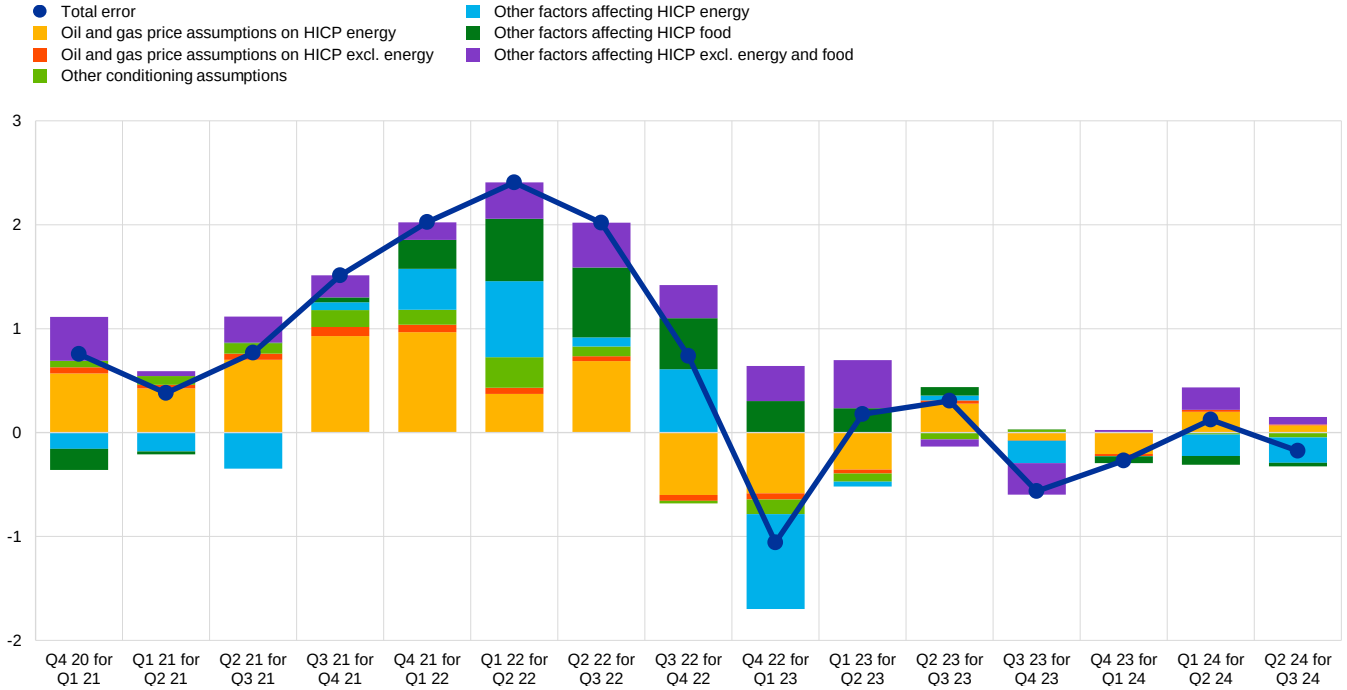
Synthetic energy price projections
(USD per MWh)



Sources: Refinitiv and ECB staff calculations.
Notes: Projections for the synthetic energy price index were introduced in 2021. Its methodology was changed in 2023. To account for this, projections before 2023 are rebased to the new Synthetic Energy Commodity Price Index (SECPI).
The latest observation is from the third quarter of 2024.

Decomposition of recent one-quarter-ahead HICP inflation errors in Eurosystem/ECB staff projections

(annual percentage points; percentage point contributions)



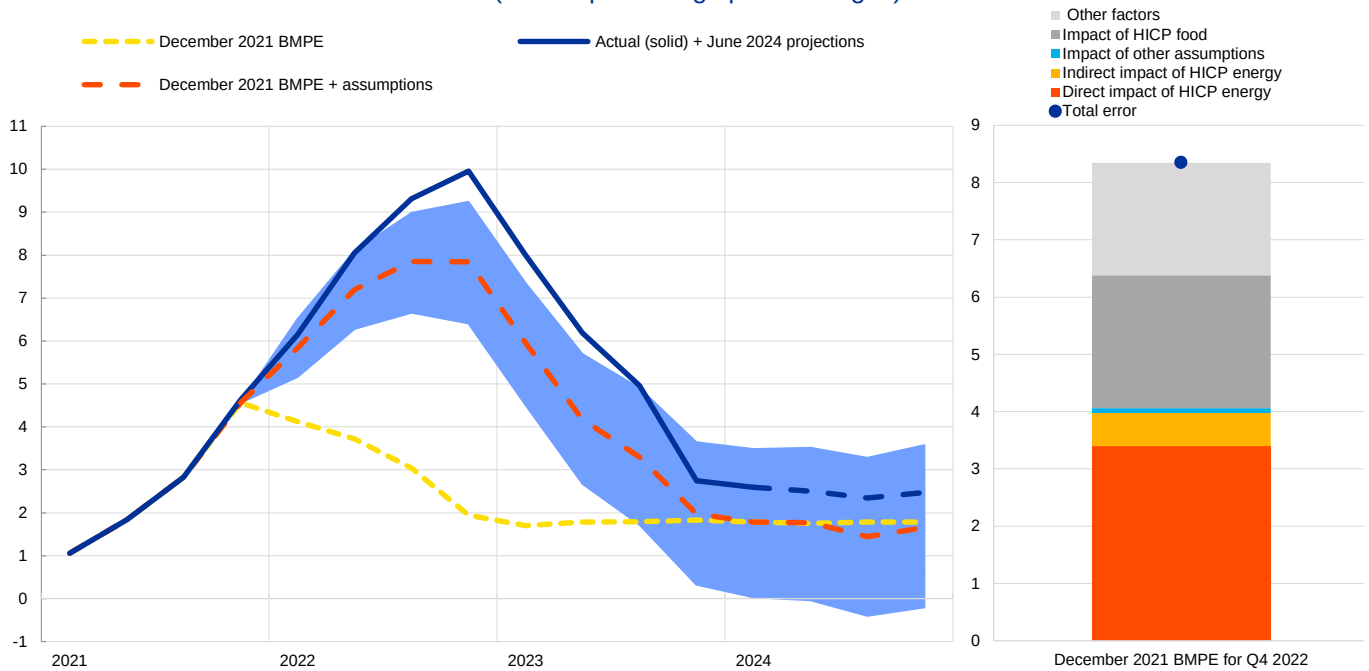
Source: ECB calculations.

Notes: "Total error" is the outturn minus the projection. The labels on the horizontal axis indicate the quarter in which the projections were published and the quarter to which those projections relate (i.e. "Q4 20 for Q1 21" denotes projections for the first quarter of 2021 that were published in the fourth quarter of 2020). The decomposition is based on updated elasticities derived from Eurosystem staff macroeconomic projection models as at late 2023. "Other assumptions" refers to exchange rates, short and long-term interest rates, stock prices, foreign demand, competitors' export prices and food prices".

The latest observation is from the June 2024 Eurosystem staff Broad Macroeconomic Projection Exercise (BMPE).

Decomposition of HICP inflation projection errors in December 2021 BMPE conditioning on December 2022 BMPE assumptions using ECB-BASE

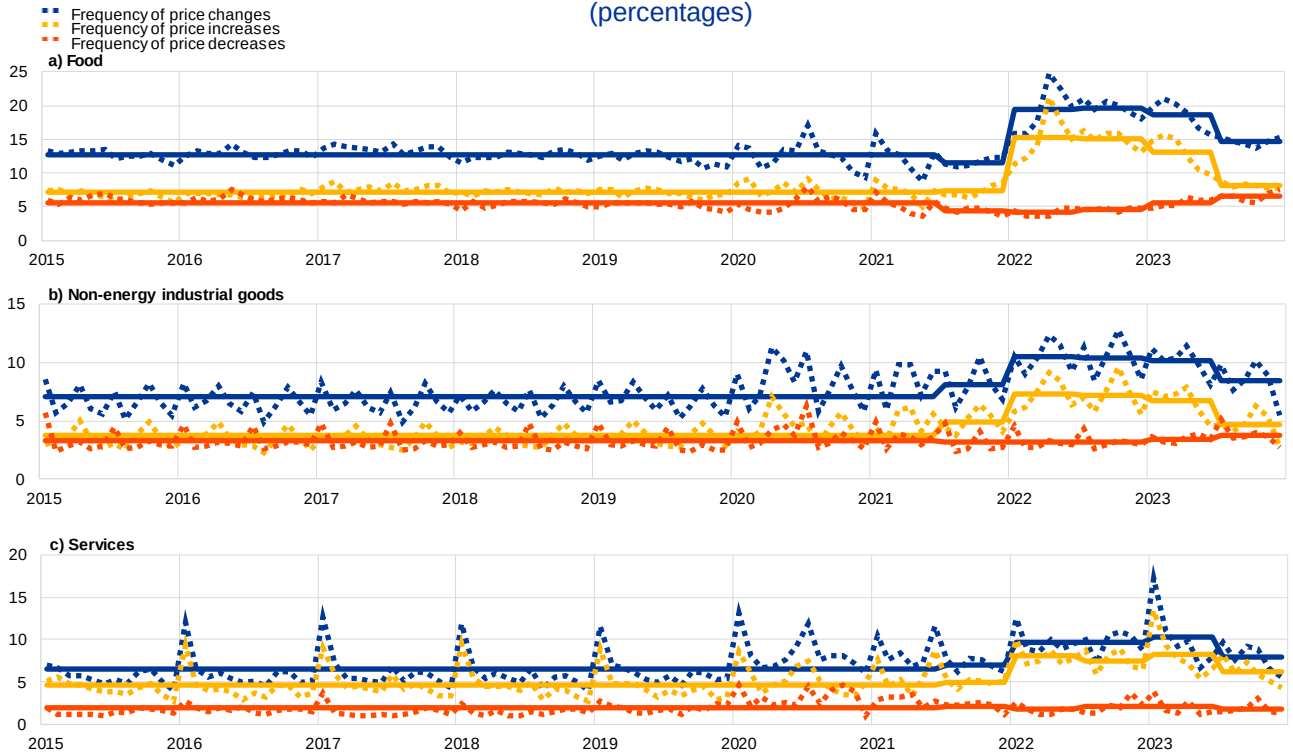
(annual percentage point changes)



Source: ECB-BASE, Eurostat, December 2021 BMPE and June 2024 BMPE.
Note: "December 2021 BMPE + assumptions" is simulated using the December BMPE baseline, but imposing the paths of HICP energy, HICP food and other technical assumptions from the June 2024 BMPE.

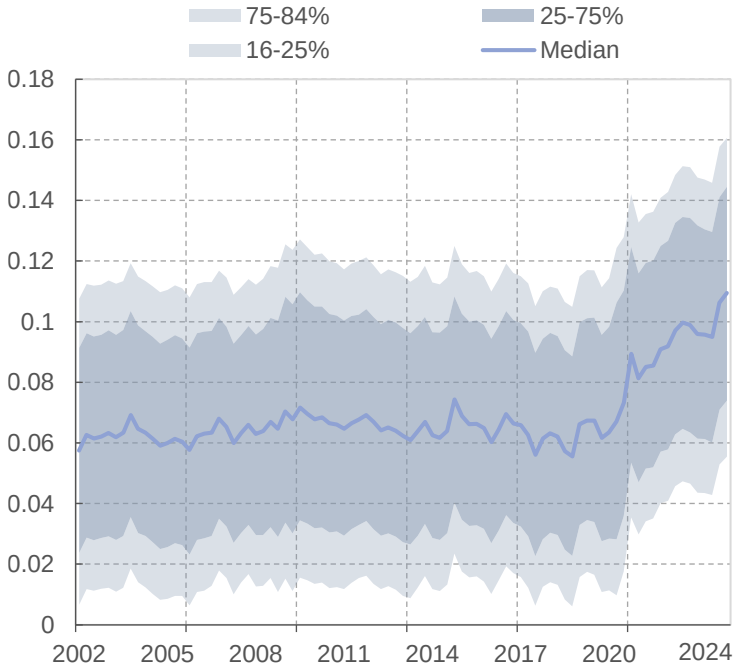
Frequency of consumer price changes over time, by aggregate product category

(percentages)

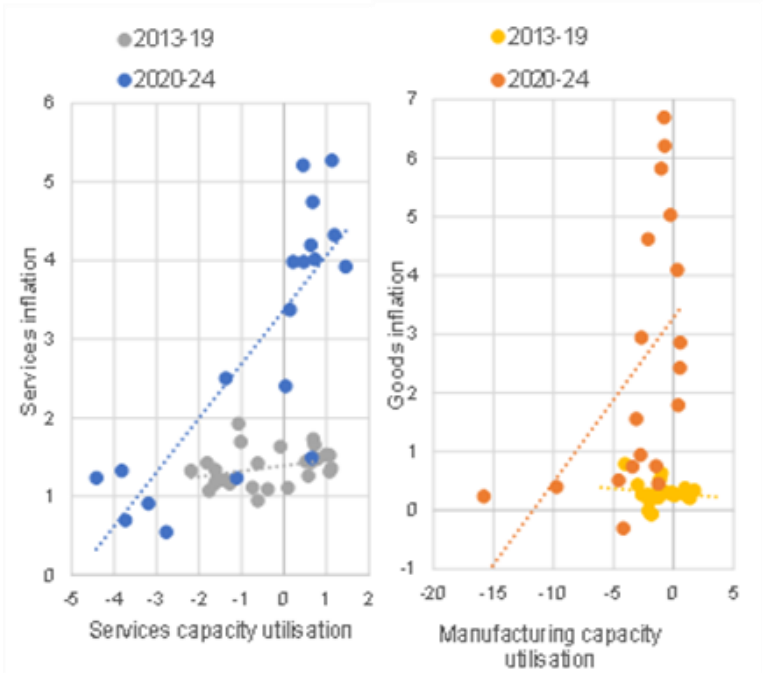


Sources: Consumer price micro-datasets from the national statistical institutes of Germany, Estonia, Spain, France, Italy, Latvia and Lithuania.
Notes: The chart shows the weighted average frequencies of price changes (excluding sales). VAT changes in Germany (2020-21) and Spain (2020-23) have been excluded. The solid lines plot the average over the period 2015-21 and half-year averages over the period 2021-23. The latest observations are for December 2023.

Slope of the Phillips curve
(percentages)



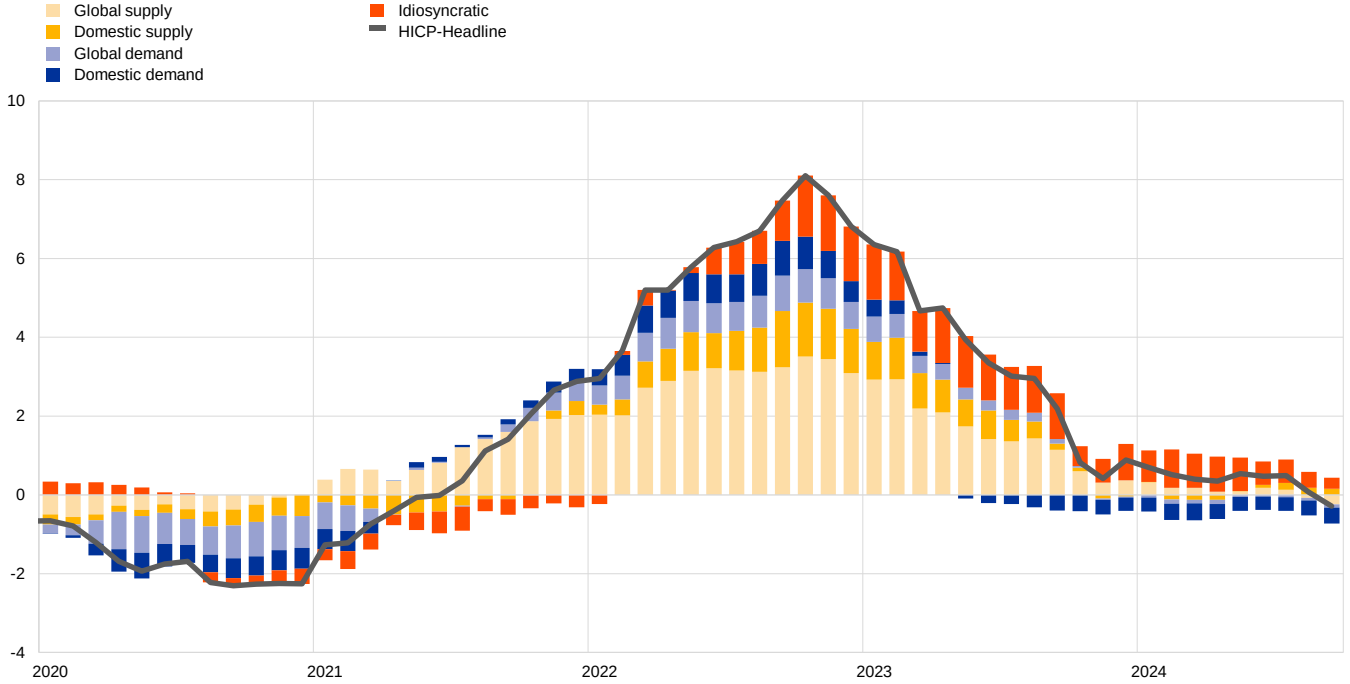
Correlation between sectoral capacity utilisation and inflation
(annual percentage changes; deviation from long-term averages)



Sources: Eurostat, DG-ECFIN and Eurosystem calculations.
Notes: Left chart: the Phillips curve specification relates the quarter-on-quarter growth rate of the seasonally adjusted HICP index to its own lag, capacity utilisation in industry, the lagged growth rate in import prices and medium-term survey-based inflation expectations. Time-varying parameter estimates where coefficients and log variance of residuals are assumed to follow a random walk. Right chart: services and manufacturing capacity utilisation are shown in deviation from the pre-COVID long-term average.

Supply and demand drivers of inflation dynamics

(annual percentage changes and percentage change contributions; deviations from mean)



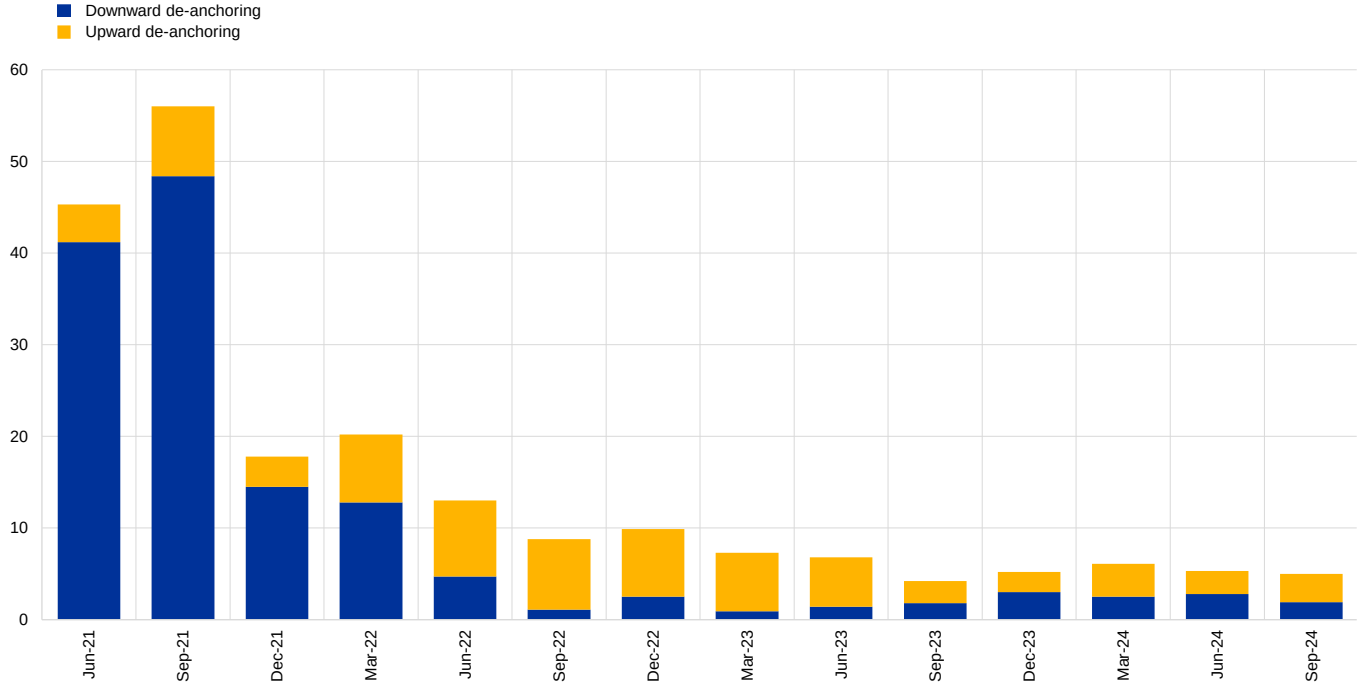
Sources: Eurostat, ECB, Eurosystem, and ECB staff calculations.

Notes: historical decomposition based on a large BVAR model accounting for a rich set of inflation drivers, identified with zero and sign restrictions, see Bańbura, M., Bobeica, E. and Martínez Hernández, C., (2024) "What drives core inflation? The role of supply shocks", ECB Working Paper No. 2875. The chart shows the deviations of HICP inflation from the mean implied by the model.

The latest observation is for September 2024.

Risks of de-anchoring of medium-term inflation expectations

(percentage risk of upside and downside de anchoring risks)

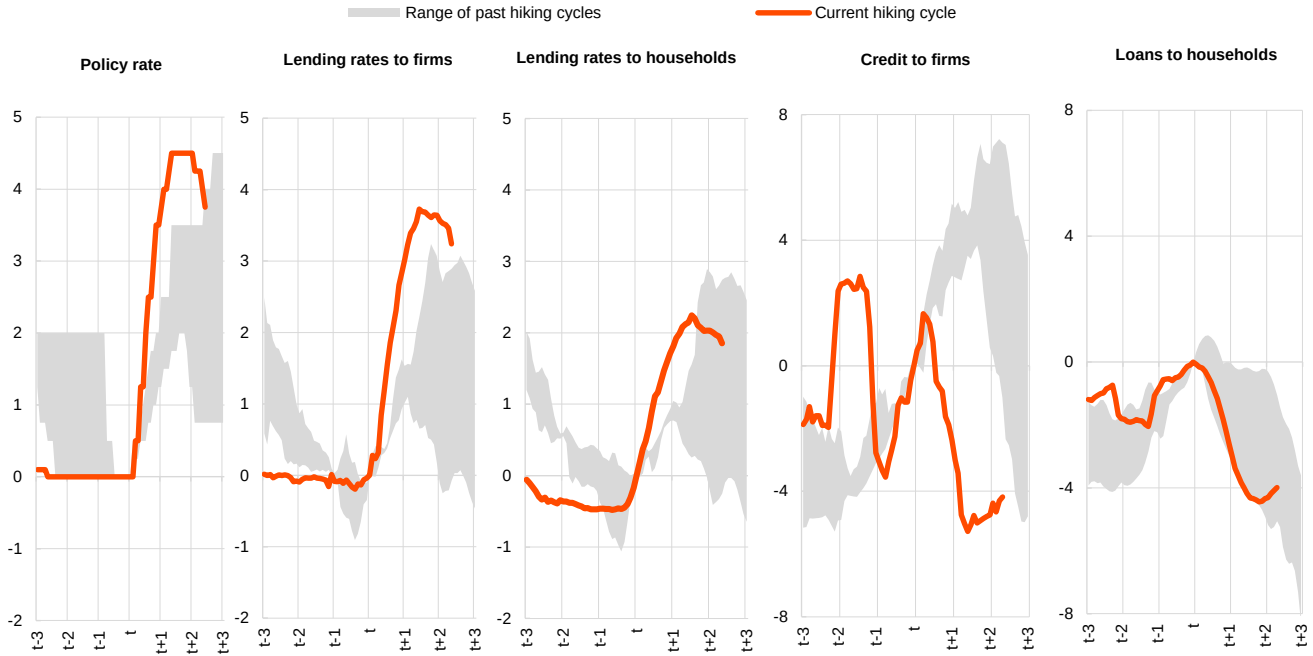


Sources: ECB calculations based on Christoffel, K. and Farkas, M. (2025), “Managing the Risks of Inflation Expectation De-anchoring”, IMF Working Paper Series, 2025, forthcoming.

Notes: The charts show the risk of de-anchoring for the staff projections from June 2021 to September 2024. The simulations are based on a regime switching version of the NAWM I (Christoffel, K., Coenen, G. and Warne, A. (2007)), where the credible regime is defined as the estimated version of the NAWM-I , with a fixed inflation target, the de-anchored regime is characterised by a time varying inflation target. Upward de-anchoring is defined as a situation in a de-anchoring episode, where the perceived inflation target is above 2%. The share of de-anchoring is based on 1,000 simulations over a ten-quarter evaluation horizon. The latest observations are from the September 2024 MPE.

Monetary policy transmission to firms and households compared to past cycles

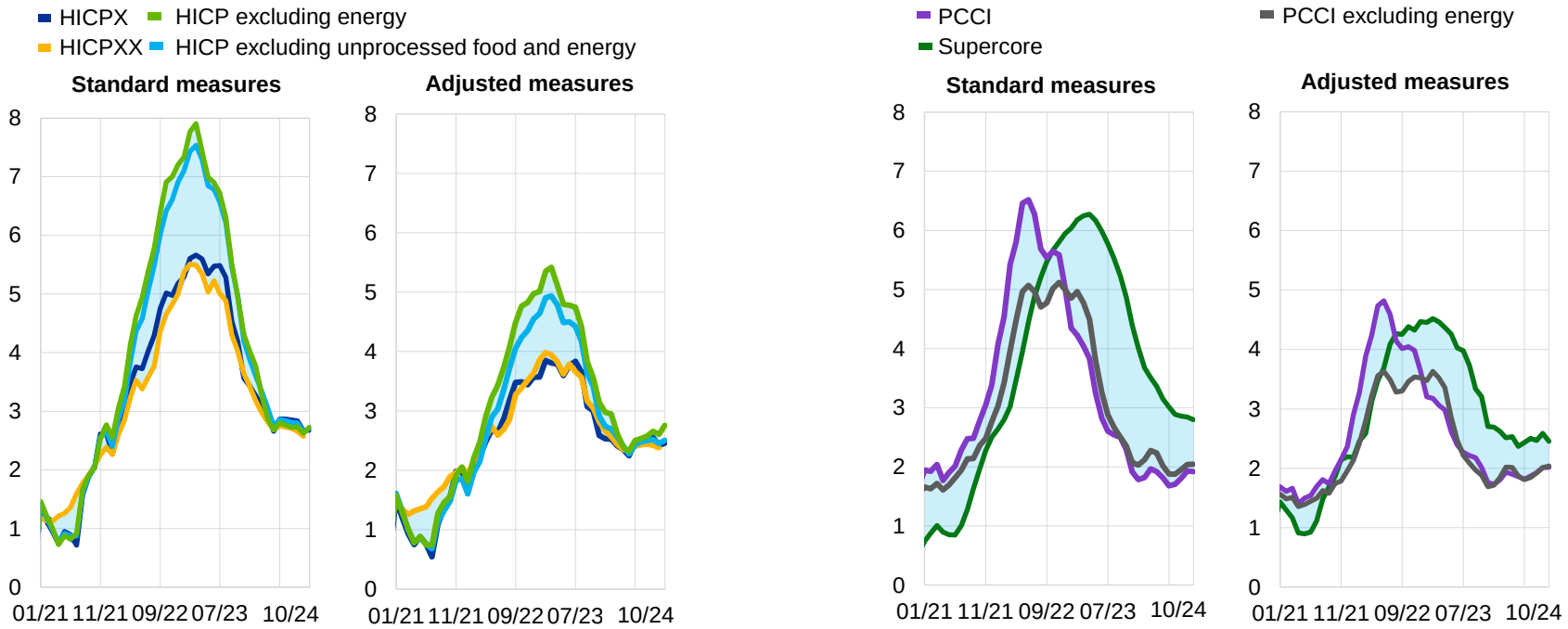
(x-axis: years; y-axis: cumulative changes in percentage points for rates, credit growth in deviation from the start of the cycle (t) in p.p. for credit to firms and loans to households)



Sources: ECB (MIR) and ECB calculations.
Notes: The ECB relevant policy rate is the Lombard rate up to December 1998, the main refinancing operations rate up to May 2014 and the deposit facility rate thereafter. Starting months correspond to the month immediately preceding the first hike, or explicit announcement of the hike, of the cycle. The hiking cycles considered are those starting in June 1988, October 1999, November 2005 and May 2022. Credit to firms is the sum of bank loans and debt securities. Bank loans are adjusted for sales and securitisation and cash pooling. Lending rates refer only to bank loans.
The latest observations are for October 2024 for the policy rate and for September 2024 for lending rates, credit to firms and loans to households..

Euro area underlying inflation measures and their adjusted counterpart

(annual percentage changes)



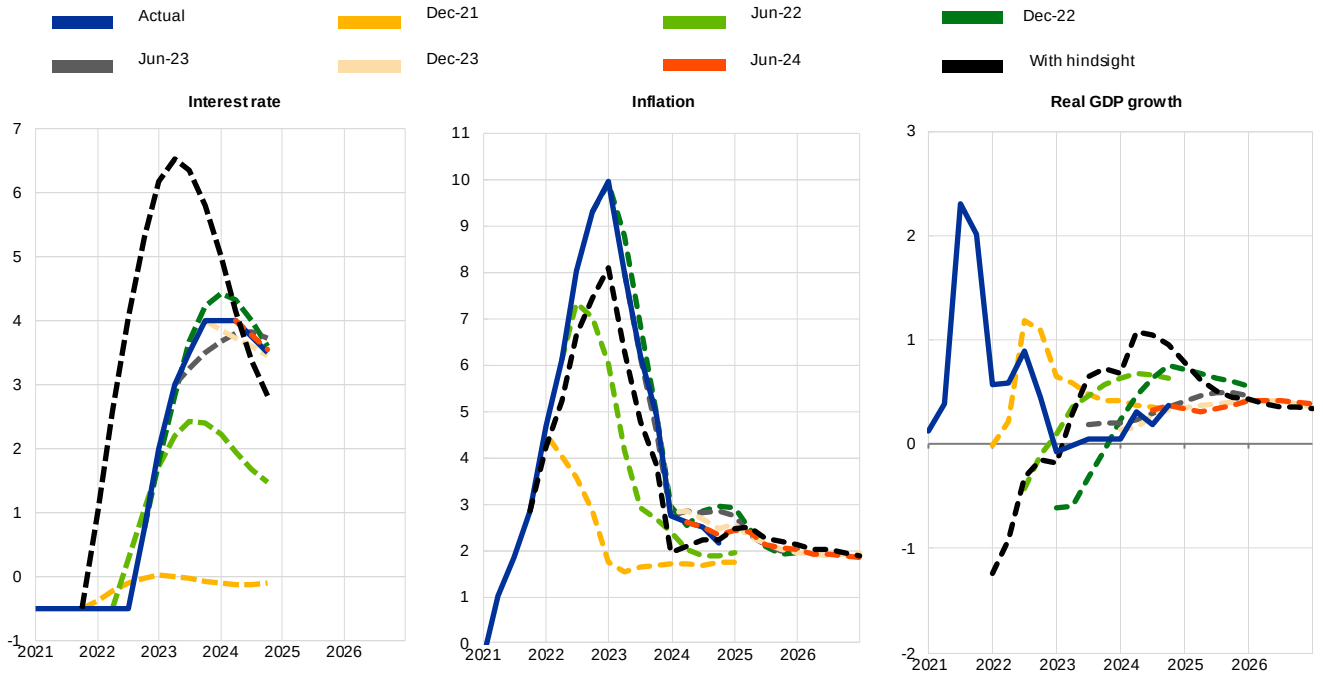
Sources: Eurostat and ECB staff calculations.

Notes: HICPX stands for HICP inflation excluding energy and food; HICPXX for HICP inflation excluding energy, food, travel-related items, clothing and footwear; PCCI is the persistent and common component of inflation, while Supercore aggregates HICPX items sensitive to domestic business cycle. See also Bańbura et al. (2023), "Underlying inflation measures: an analytical guide for the euro area", Economic Bulletin, Issue 5, ECB. The "adjusted" measures abstract from energy and supply-bottlenecks shocks using a large SVAR, see Bańbura, M., Bobeica, E. and Martínez-Hernández, C. (2023), "What drives core inflation? The role of supply shocks", Working Paper Series, No 2875, ECB, November.

The latest observation is for October 2024 (flash estimate) for HICPX, HICP excluding energy and HICP excluding unprocessed food and energy and September 2024 for the rest.

Optimal policy in real time and with hindsight - MMR

(left panel: percentage per annum; middle panel: annual percentage changes; right panel: quarterly percentage changes)

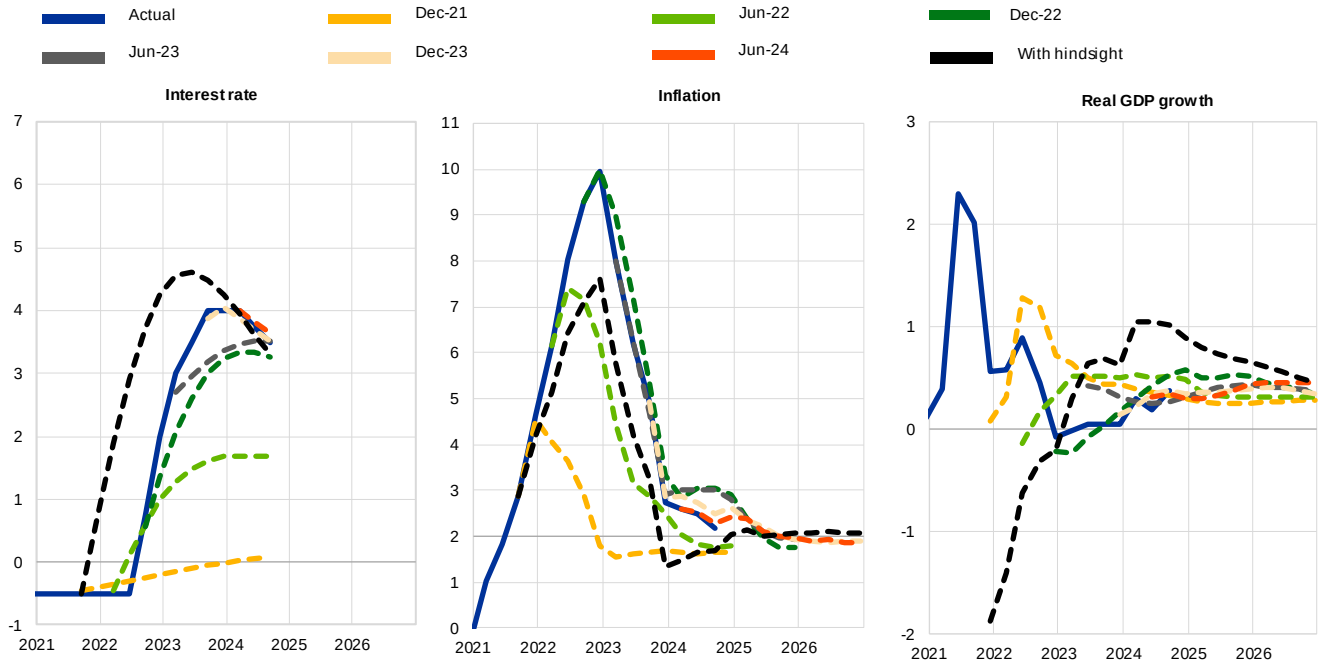


Source: ECB calculations based on the MMR model (see Mazelis, F., Motto, R., Ristiniemi, A. (2023), op. cit.) with the exercises documented in the Handbook on Inflation (Coenen, Mazelis, Motto, Ristiniemi, Smets, Warne, Wouters (forthcoming)).

Notes: The optimal policy rate path simulations beyond the third quarter of 2024 are not shown for confidentiality reasons. "Actual" denotes historical data. The other dashed lines on the left graph are a sequence of optimal policy counterfactuals computed in real time at each projection vintage from the fourth quarter of 2021 to the second quarter of 2024. The "With hindsight" lines denote the optimal policy counterfactual computed in the fourth quarter of 2021 with the benefit of hindsight by assuming that the same information that we now have on subsequent inflation and output developments was already available in the fourth quarter of 2021. The middle and right panels show implied inflation and output growth respectively.

Optimal policy in real time and with hindsight - NAWM

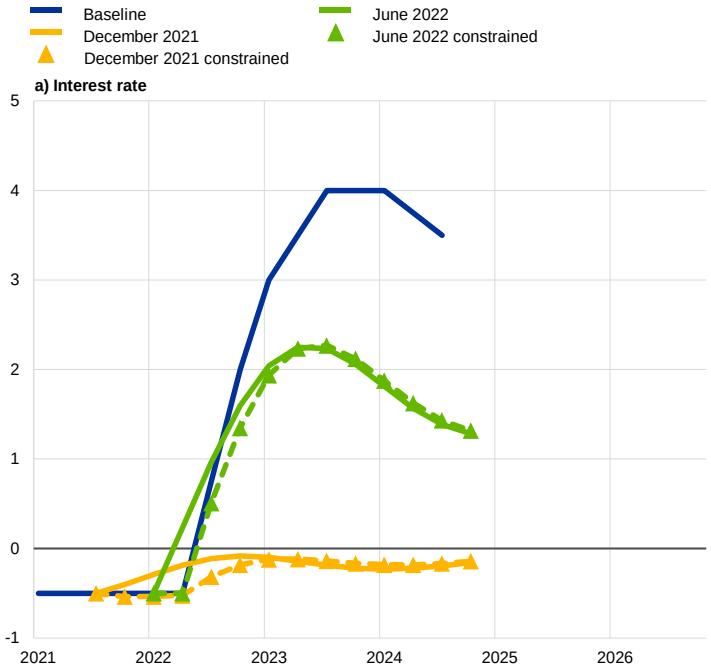
(left panel: percentage per annum; middle panel: annual percentage changes; right panel: quarterly percentage changes)

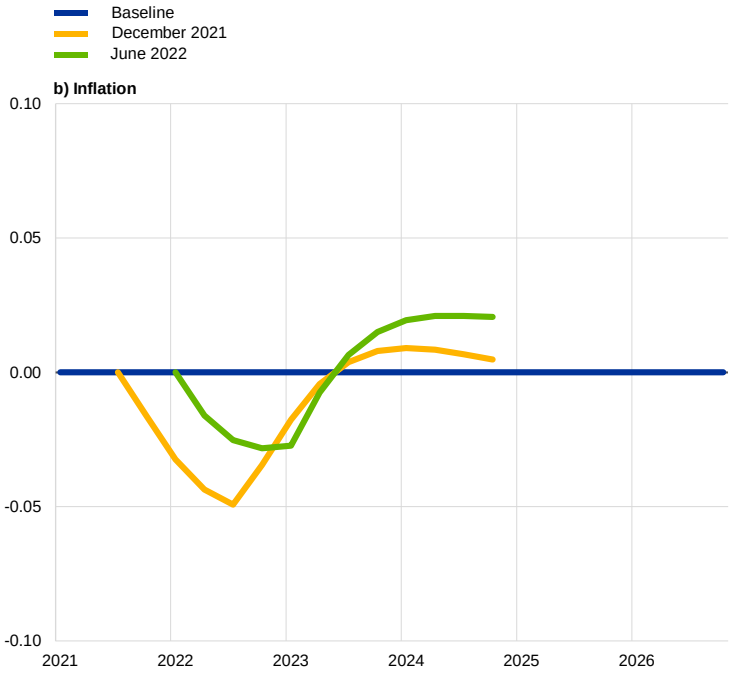


Source: ECB calculations based on the NAWM II model (see Darracq Pariès, Kornprobst, Priftis (2024), op. cit.).
Notes: The optimal policy rate path simulations beyond the third quarter of 2024 are not shown for confidentiality reasons. “Actual” denotes historical data. The other dashed lines on the left graph are a sequence of optimal policy counterfactuals computed in real time at each projection vintage from the fourth quarter of 2021 to the second quarter of 2024. The “With hindsight” lines denote the optimal policy counterfactual computed in the fourth quarter of 2021 with the benefit of hindsight by assuming that the same information that we now have on subsequent inflation and output developments was already available in the fourth quarter of 2021. The middle and right panels show implied inflation and output growth respectively.

Early tightening counterfactual

LHS : (percentage per annum) ; RHS : (annual percentage changes of the unconstrained case relative to the constrained counterfactual)

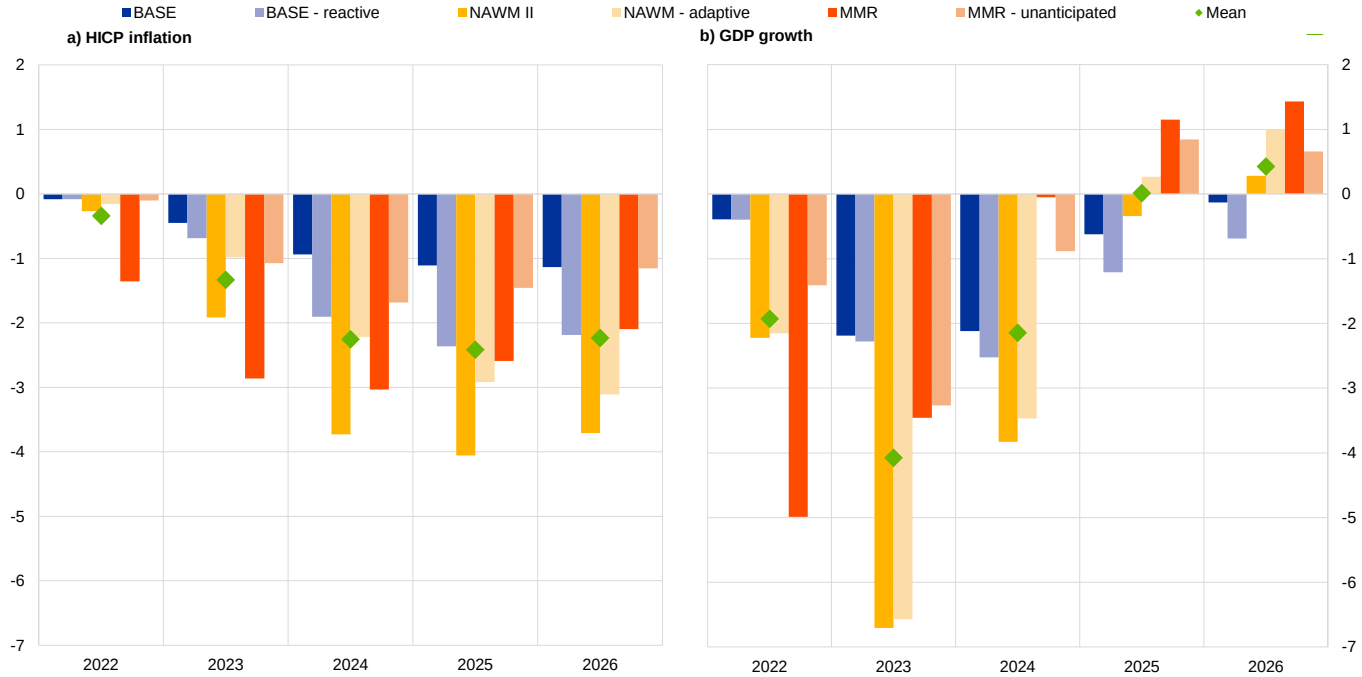




Source: ECB calculations based on the MMR model (see Mazelis, F., Motto, R., Ristiniemi, A. (2023), op. cit.) with the exercises documented in the Handbook on Inflation (Coenen, Mazelis, Motto, Ristiniemi, Smets, Warne, Wouters (forthcoming)).
Notes: “Baseline” denotes historical data available in the third quarter of 2024. The solid lines in the left-hand side chart are the counterfactuals in Q4 2021 and Q2 2022 from Slide 12. Each of the lines with a marker on the left panel is a counterfactual rate path computed by constraining the lift-date to match the actual one and letting policy evolve optimally afterwards. The lines on the right panel are the difference in impact on inflation between the unconstrained and constrained case.

Impact of monetary policy tightening according to a suite of models

(annual percentage changes)



Sources: ECB calculations based on the NAWM II model (see Coenen, G., Karadi, P., Schmidt, S., Warne, A. (2018), "The New Area-Wide Model II: an extended version of the ECB's micro-founded model for forecasting and policy analysis with a financial sector", Working Paper Series, No 2200, ECB, November), the MMR model (see Mazelis, F., Motto, R., Ristiniemi, A. (2023), op. cit.) with the exercises documented in the Handbook on Inflation (Coenen, Mazelis, Motto, Ristiniemi, Smets, Warne, Wouters (forthcoming)) and the ECB-BASE model (see Angelini, E., Bokan, N., Christoffel, K., Ciccarelli, M., Zimic, S. (2019), "Introducing ECB-BASE: The blueprint of the new ECB semi-structural model for the euro area", Working Paper Series, No 2315, ECB, September).
Notes: This chart reports the results of a simulation involving changes to short-term rate expectations between December 2021 and September 2024 and changes to expectations regarding the ECB's balance sheet between October 2021 (to account for anticipation) and September 2024. "Mean" denotes the average across the six model variants.
The latest observation is for 16 August 2024 for the underlying short rate expectations from MP-dated ESTR forward contracts