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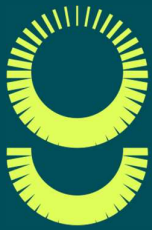


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## DELIVERABLE D4.1

Real time monitoring and forecasting of key macroeconomic and financial indicators, including probabilistic vulnerability indicators

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## Executive Summary

This report provides up-to-date projections and risk assessments of short- to medium-term macroeconomic and fiscal indicators of the Italian economy. We consider not only point and density forecasts but also assess tail risks to macroeconomic and fiscal variables. In this report, we focus on nowcasts and forecasts up to three years ahead for real GDP growth, the debt-to-GDP ratio, the deficit-to-GDP ratio, the unemployment rate, and inflation.

## 1. Introduction

This report provides up-to-date projections and risk assessments of short- to medium-term macroeconomic and fiscal indicators of the Italian economy. We consider not only point and density forecasts but also assess tail risks to macroeconomic and fiscal variables. In this report, we focus on nowcasts and forecasts up to three years ahead for real GDP growth, the debt-to-GDP ratio, the deficit-to-GDP ratio, the unemployment rate, and inflation.

The results are based on a Bayesian vector autoregressive model with stochastic volatility (BVAR-SV). The choice of this model is due to its consistent performance in a comprehensive model evaluation exercise featuring a large set of competing specifications. This evaluation is documented in Boeck et al. (2024). An overview on the related econometric techniques can be found in Marcellino and Pfarrhofer (forthcoming).

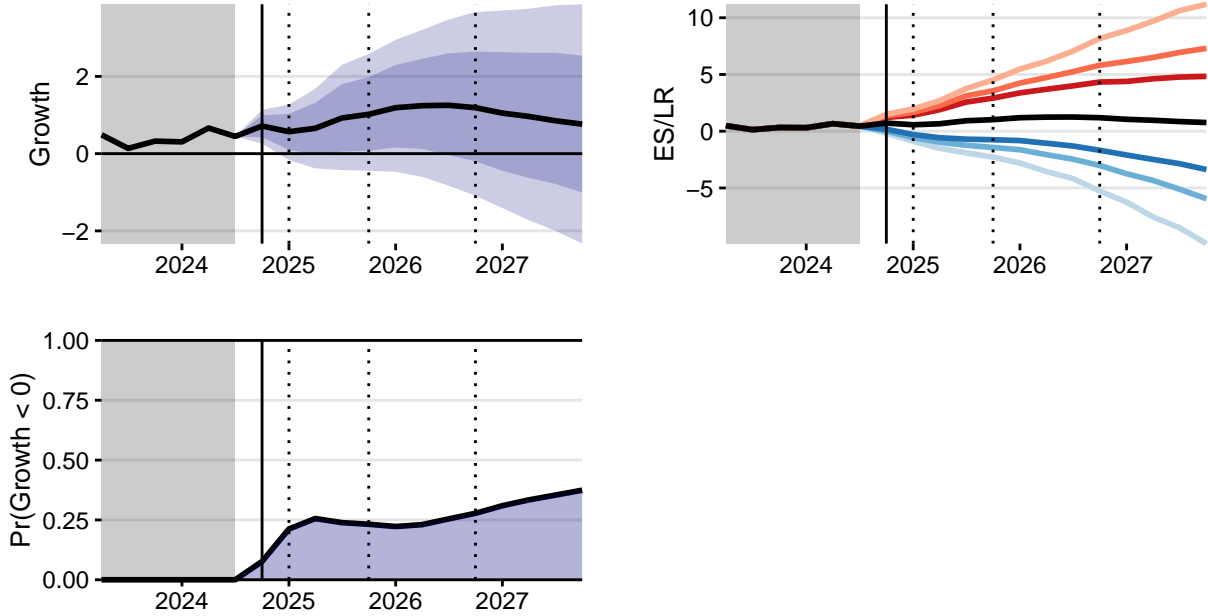
For the construction of the forecasts, we use real-time data on the Italian economy ranging from 2001 Q2 to 2024 Q3. The variables and their sources are listed in Table 1. The evaluation sample ranges from 2024 Q4 to 2027 Q3. For each target variable, we report three charts. The first one (upper-left) shows the point and density forecasts, in which we indicate the nowcast, one-, four-, and eight-step ahead forecasts distinctively. The predictive distribution is given in form of the 16/84 and 25/75 quantiles (i.e., 68% and 50% credible sets) alongside the median. To assess tail performance, the second figure (upper-right) reports the expected shortfall (ES for 10/16/25 percent in shades of blue) and longrise (LR for 75/84/90 percent in shades of) of the respective variable. Additionally, the third figure (bottom) provides the probabilities of interesting scenarios: that real GDP growth turns negative, the change in the debt-to-GDP ratio is positive, the deficit/surplus-to-GDP ratio is below -3%, the change in the unemployment rate is positive, and that inflation is above 2%. The grey shaded area is the backcast period (in case publication lags are longer than the current quarter with analogous credible sets, otherwise, realized values), the solid black vertical line marks the nowcast, and the dotted lines are the one-quarter, one-year and two-year ahead forecast horizons.

Note that the forecasts shown in this report are purely statistical in nature. That is, we do not consider any planned changes in fiscal or monetary policy, and we solely rely on quarterly time series.

## 2. Forecasting Results

### 2.1 Economic Growth (real GDP)

**Figure 1:** Forecasting Results for Real GDP Growth.



Notes: Upper-left panel: predictive density given by the median alongside 68% and 50% credible sets. Upper-right: expected shortfall (ES) for 10/16/25 percent and longrise (LR) for 75/84/90 percent. Bottom: probability for the scenario that real GDP growth is negative.

	Forecast	50%	68%	ES 10%	LR 90%	Pr(Growth < 0)
2024 Q4	0.72	[0.42, 0.99]	[0.26, 1.14]	-0.17	1.5	8
2025 Q1	0.57	[0.1, 1.03]	[-0.17, 1.27]	-0.89	1.96	21
2024	0.72	[0.42, 0.99]	[0.26, 1.14]	0.31	0.73	2
2025	1.02	[0.08, 1.99]	[-0.44, 2.58]	-1.65	3.23	23
2026	1.19	[-0.2, 2.64]	[-1.09, 3.67]	-3.95	6.72	25

**Table 1:** Forecasting Results for Real GDP Growth.

The nowcast of real output growth (year-over-year) for the current quarter 2024 Q4 is 0.72 percent with the 50% probability interval [0.42,0.99] and the 68% interval at [0.26,1.14]. The one-step ahead forecast for 2025 Q1 is 0.57 percent with 50% intervals at [0.1,1.03] and 68% at [-0.17,1.27]. We estimate the annual growth rate for the current year 2024 to be 0.72 percent, with 50 and 68% intervals at [0.42,0.99] and [0.26,1.14].

The estimate for annual growth rates in 2025 is 1.02 with 50% interval [0.08,1.99]; for 2026 we predict a growth rate of 1.19 in an interval of [-0.2,2.64] with a probability of 50%.

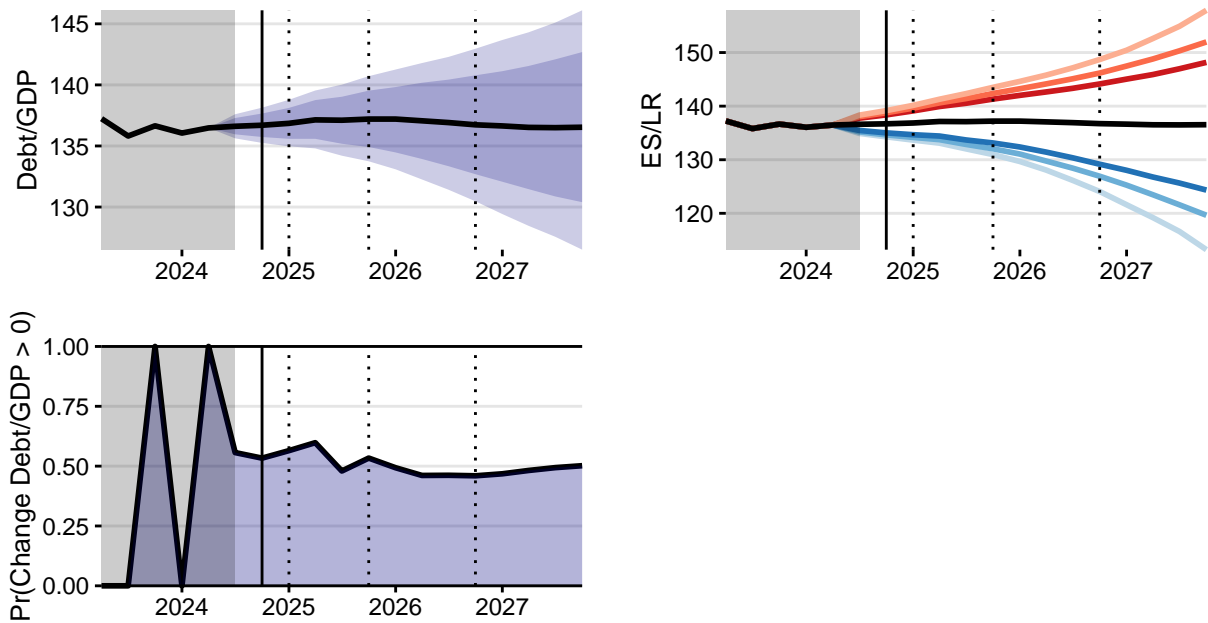
The estimate for the expected shortfall (ES) at 10% is -0.17 and the longrise (LR) at 90% is 1.5 for the nowcast, while the one-step ahead tail risks are at -0.89 (10%) and 1.96 (90%). The estimates of the tail risks in 2025 are ES/LR [-1.65,3.23]; and for 2026 they are [-3.95,6.72].

The last plot reports the probability of the scenario that real output growth is negative. In the current quarter 2024 Q4, this probability is 8 percent, while this scenario has a probability of 21 percent in the next quarter. For the year 2025 the model predicts a probability of 23 percent; for

the year 2026 of 25 percent that real GDP growth turns negative.

## 2.2 Debt-to-GDP Ratio

**Figure 2:** Forecasting Results for Government Debt to GDP Ratio.



Notes: Upper-left panel: predictive density given by the median alongside 68% and 50% credible sets. Upper-right: expected shortfall (ES) for 10/16/25 percent and longrise (LR) for 75/84/90 percent. Bottom: probability for the scenario that the change in the debt-to-GDP ratio is positive.

	Forecast	50%	68%	ES 10%	LR 90%	Pr(Ch. Debt/GDP > 0)
2024 Q4	0.08	[-0.58, 0.74]	[-0.9, 1.08]	134.27	139.17	53
2025 Q1	0.17	[-0.56, 0.89]	[-0.92, 1.24]	133.66	140.15	56
2024	136.7	[135.73, 137.66]	[135.25, 138.14]	135.43	137.5	52
2025	137.2	[134.91, 139.53]	[133.74, 140.72]	132.44	141.82	54
2026	136.73	[132.69, 140.78]	[130.47, 142.96]	126.99	146.56	47

**Table 2:** Forecasting Results for Debt/GDP Ratio.

We expect debt-to-GDP ratio (in percent) to increase by 0.08 percentage points in the current quarter 2024 Q4 with the 50% probability interval [-0.58,0.74] and the 68% interval at [-0.9,1.08]. Next quarter 2025 Q1, it is expected to increase by 0.17 percentage points with 50% intervals at [-0.56,0.89] and 68% at [-0.92,1.24].

The projection for the end-of-year ratio in the current year 2024 is at 136.7 percent with 50 and 68% intervals at [135.73,137.66] and [135.25,138.14]. For 2025 and 2026 we predict debt at 137.2 and 136.73 percent of GDP, respectively. The associated 50% intervals are [134.91,139.53] and [132.69,140.78].

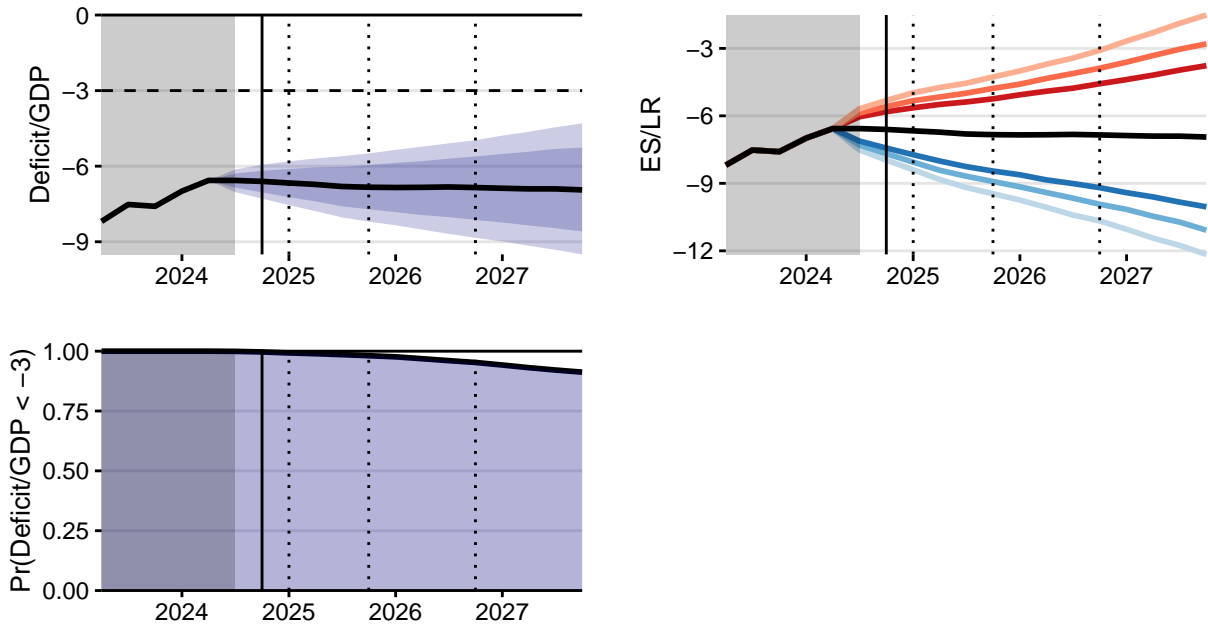
The estimate for the expected shortfall (ES) at 10% is 134.27 and the longrise (LR) at 90% is 139.17 for the nowcast, while the one-step ahead tail risks are at 133.66 (10%) and 140.15 (90%). The estimates of the tail risks in 2025 are ES/LR [132.44,141.82]; and for 2026 they are [126.99,146.56].

The last plot reports the probability of the scenario that there is an increase in the debt-to-GDP

ratio. In the current quarter 2024 Q4, this probability is 53 percent, while this scenario has a probability of 56 percent in the next quarter. For the year 2025 the model predicts a probability of 54 percent; for the year 2026 of 47 percent that the debt-to-GDP ratio increases.

### 2.3 Deficit-to-GDP Ratio

**Figure 3:** Forecasting Results for Government Deficit-to-GDP Ratio.



Notes: Upper-left panel: predictive density given by the median alongside 68% and 50% credible sets. Upper-right: expected shortfall (ES) for 10/16/25 percent and longrise (LR) for 75/84/90 percent. Bottom: probability for the scenario that deficit-to-GDP ratio is below -3%.

	Forecast	50%	68%	ES 10%	LR 90%	Pr(Deficit/GDP < -3)
2024 Q4	-0.03	[-0.31, 0.23]	[-0.47, 0.38]	-7.97	-5.32	100
2025 Q1	-0.06	[-0.34, 0.22]	[-0.5, 0.38]	-8.4	-4.98	99
2024	-6.6	[-7, -6.2]	[-7.3, -5.9]	-7.26	-6.14	100
2025	-6.8	[-7.7, -6]	[-8.2, -5.5]	-8.97	-4.63	99
2026	-6.85	[-8.13, -5.61]	[-8.84, -4.97]	-10.22	-3.56	96

**Table 3:** Forecasting Results for Deficit/GDP Ratio.

We expect deficit-to-GDP ratio (in percent) to decrease by -0.03 percentage points in the current quarter 2024 Q4 with the 50% probability interval [-0.31,0.23] and the 68% interval at [-0.47,0.38]. Next quarter 2025 Q1, it is expected to decrease by -0.06 percentage points with 50% intervals at [-0.34,0.22] and 68% at [-0.5,0.38].

The projection for the end-of-year ratio in the current year 2024 is at -6.6 percent with 50 and 68% intervals at [-7,-6.2] and [-7.3,-5.9]. For 2025 and 2026 we predict deficit/surplus at -6.8 and -6.85 percent of GDP, respectively. The associated 50% intervals are [-7.7,-6] and [-8.13,-5.61].

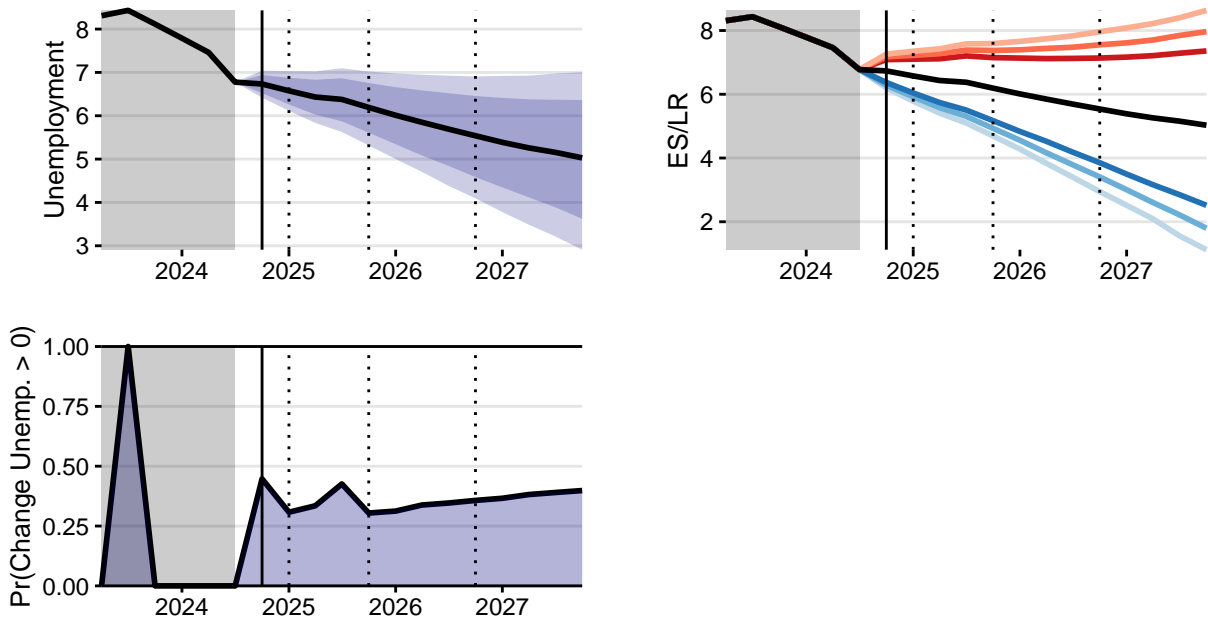
The estimate for the expected shortfall (ES) at 10% is -7.97 and the longrise (LR) at 90% is -5.32 for the nowcast, while the one-step ahead tail risks are at -8.4 (10%) and -4.98 (90%). The estimates of the tail risks in 2025 are ES/LR [-8.97,-4.63]; and for 2026 they are [-10.22,-3.56].

The last plot reports the probability of the scenario that the deficit/surplus-to-GDP is below

-3%. In the current quarter 2024 Q4, this probability is 100 percent, while this scenario has a probability of 99 percent in the next quarter. For the year 2025 the model predicts a probability of 99 percent; for the year 2026 of 96 percent that the deficit/surplus-to-GDP ratio is below -3%.

## 2.4 Unemployment Rate

**Figure 4:** Forecasting Results for the Unemployment Rate.



Notes: Upper-left panel: predictive density given by the median alongside 68% and 50% credible sets. Upper-right: expected shortfall (ES) for 10/16/25 percent and longrise (LR) for 75/84/90 percent. Bottom: probability for the scenario that the change in the unemployment rate is positive.

	Forecast	50%	68%	ES 10%	LR 90%	Pr(Ch. Unemp. > 0)
2024 Q4	6.73	[6.52, 6.94]	[6.42, 7.04]	6.2	7.26	45
2025 Q1	6.58	[6.26, 6.88]	[6.11, 7.03]	5.78	7.35	31
2024	6.73	[6.52, 6.94]	[6.42, 7.04]	7.06	7.32	11
2025	6.19	[5.61, 6.76]	[5.32, 7.02]	5.25	7.49	34
2026	5.54	[4.58, 6.46]	[4.09, 6.91]	3.61	7.8	34

**Table 4:** Forecasting Results for Unemployment.

The nowcast of the unemployment rate for the current quarter 2024 Q4 is 6.73 percent with the 50% probability interval [6.52,6.94] and the 68% interval at [6.42,7.04]. The one-step ahead forecast for 2025 Q1 is 6.58 percent with 50% intervals at [6.26,6.88] and 68% at [6.11,7.03]. We estimate the end-of-year unemployment rate for 2024 to be 6.73 percent, with 50 and 68% intervals at [6.52,6.94] and [6.42,7.04].

Unemployment in 2025 is predicted at 6.19 with 50% interval [5.61,6.76]; for 2026 we predict 5.54 in an interval of [4.58,6.46] with a probability of 50%.

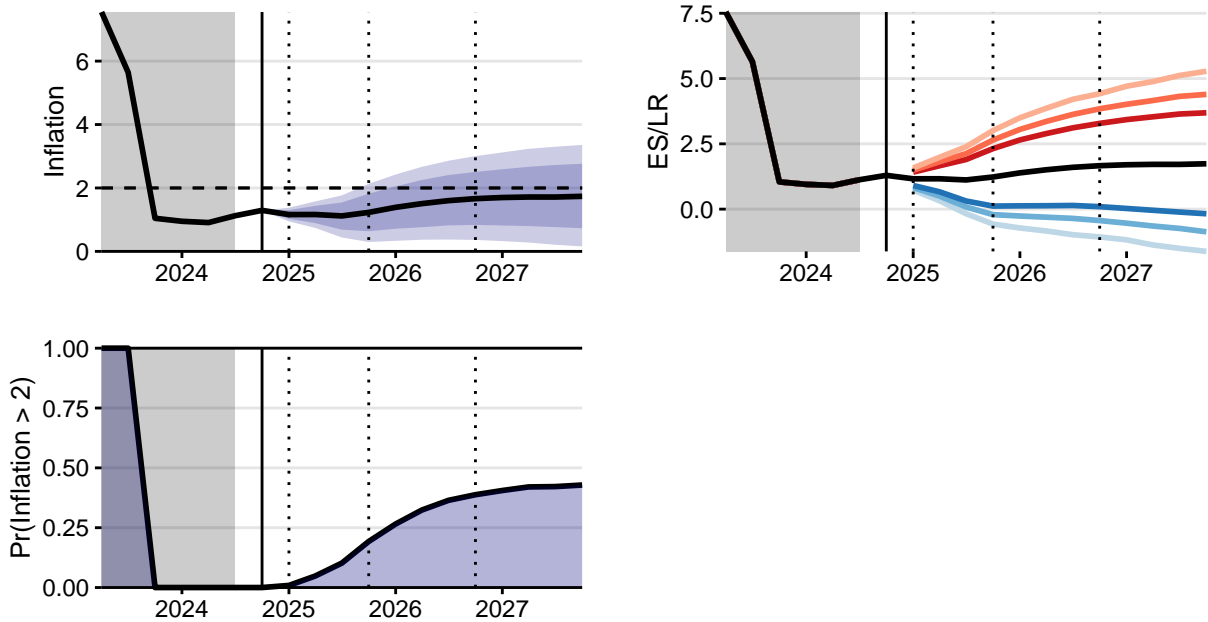
The estimate for the expected shortfall (ES) at 10% is 6.2 and the longrise (LR) at 90% is 7.26 for the nowcast, while the one-step ahead tail risks are at 5.78 (10%) and 7.35 (90%). The estimates of the tail risks in 2025 are ES/LR [5.25,7.49]; and for 2026 they are [3.61,7.8].

The last plot reports the probability of the scenario that the unemployment rate increases. In the

current quarter 2024 Q4, this probability is 45 percent, while this scenario has a probability of 31 percent in the next quarter. For the year 2025 the model predicts a probability of 34 percent; for the year 2026 of 34 percent that the unemployment increases.

### 2.5 Inflation (in the HICP)

**Figure 5:** Forecasting Results for Inflation.



Notes: Upper-left panel: predictive density given by the median alongside 68% and 50% credible sets. Upper-right: expected shortfall (ES) for 10/16/25 percent and longrise (LR) for 75/84/90 percent. Bottom: probability for the scenario that inflation is above 2%.

	Forecast	50%	68%	ES 10%	LR 90%	Pr(Inflation > 2)
2024 Q4	1.29	[1.29, 1.29]	[1.29, 1.29]			0
2025 Q1	1.16	[1.03, 1.3]	[0.95, 1.38]	0.73	1.58	1
2024	1.29	[1.29, 1.29]	[1.29, 1.29]			0
2025	1.23	[0.64, 1.82]	[0.3, 2.13]	0.08	2.24	9
2026	1.66	[0.84, 2.51]	[0.36, 3]	-0.9	4	34

**Table 5:** Forecasting Results for Inflation.

The nowcast of inflation in the HICP (year-over-year) for the current quarter 2024 Q4 is 1.29 percent with the 50% probability interval [1.29,1.29] and the 68% interval at [1.29,1.29]. The one-step ahead forecast for 2025 Q1 is 1.16 percent with 50% intervals at [1.03,1.3] and 68% at [0.95,1.38]. We estimate annual inflation for the current year 2024 to be 1.29 percent, with 50 and 68% intervals at [1.29,1.29] and [1.29,1.29].

The estimate for annual inflation in 2025 is 1.23 with 50% interval [0.64,1.82] and for 2026 we predict 1.66 inflation with a probability of 50% in an interval between [0.84,2.51].

The estimate for the expected shortfall (ES) at 10% is NA and the longrise (LR) at 90% is NA for the nowcast, while the one-step ahead tail risks are at 0.73 (10%) and 1.58 (90%). The estimates of the tail risks in 2025 are ES/LR [0.08,2.24]; and for 2026 they are [-0.9,4].

The last plot reports the probability of the scenario that inflation is above 2%. In the current



quarter 2024 Q4, this probability is 0 percent, while this scenario has a probability of 1 percent in the next quarter. For the year 2025 the model predicts a probability of 9 percent; for the year 2026 of 34 percent that inflation is above 2%.

## Data Appendix

All series were gathered from the sources listed below, including the Federal Reserve Economic Database (FRED) compiled by the St. Louis Federal Reserve, Refinitiv, Eurostat, the Istituto Nazionale di Statistica (Istat), and the Statistical Data Warehouse (SDW) of the European Central Bank (ECB). If necessary, series are seasonally adjusted with the X-13ARIMA-SEATS model. All series are transformed to approximate stationarity.

**Table 6:** Quarterly target variables.

Variable	Details	Source	Transformation
$gov\_debt\_ratio_t$	government debt (consolidated, as % of GDP)	SDW ECB	2
$gov\_deficit\_ratio_t$	government primary deficit/surplus (as % of GDP)	SDW ECB	2
$rgdp_t$	real gross domestic product	SDW ECB	4
$hicp_t$	harmonized consumer price index, overall index	SDW ECB	4
$unrate_t$	unemployment rate	SDW ECB	0
$ltir_t$	long-term interest rate for convergence purposes, 10 years maturity	SDW ECB	0
$sovciss_t$	composite indicator of systematic stress	SDW ECB	0
$baltic_t$	Baltic Dry Index	Refinitiv	0
$ip\_constr_t$	index of production construction	Istat	1
$prodnext3m_t$	production, next 3 months, balance	Istat	0
$oilprice_t$	crude oil prices, Brent, Europe	FRED	0

*Notes:* Transformation codes: 0 = level, 1 = log-differences, 2 = differences, 3 = log-level, 4 = annualized differences.

## References

- Boeck, Maximilian, Massimiliano Marcellino, Michael Pfarrhofer, and Tommaso Tornese. 2024. “Predicting Tail-Risks for the Italian Economy.” Working Paper.
- Marcellino, Massimiliano, and Michael Pfarrhofer. forthcoming. “Bayesian Nonparametric Methods for Macroeconomic Forecasting.” In *Handbook of Macroeconomic Forecasting*, edited by Michael P. Clements and Ana Beatriz Galvao. Edward Elgar Publishing Ltd.