Step by step –
A quarterly evaluation of EU Commissions' GDP forecasts

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Motivation

- European Commission's (EC) economic policies rely heavily on annual economic growth projections, particularly under the EU's 2024 fiscal regulations.
- Annual growth forecasts are derived from quarterly estimates and nowcasts.

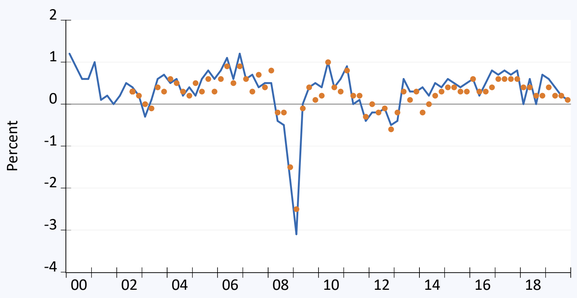
Aim:

- Dataset Establishment: Creating a quarterly GDP real-time data set for European countries.
- Forecast Analysis: Analyzing the EC's GDP forecasts by evaluating updates, accuracy, and uncertainties across European countries and forecast horizons.
- Comparative Analysis: Comparing EC quarterly forecasts with quarterly Consensus Economics forecasts to assess the impact of data revisions on accuracy and the value of real-time data in forecasting.

Data

- The EC's forecast performance is evaluated using seasonally and working-day adjusted GDP growth rates from Eurostat, published in March 2024.
- A unique quarterly real-time dataset for the EU and selected countries is compiled to support analysis of data revisions and improve forecast accuracy assessment.
- Comparing EC forecasts with both first-release data and final data (March 2024) to evaluate forecast accuracy.

Figure 1: GDP growth in the Euro Area



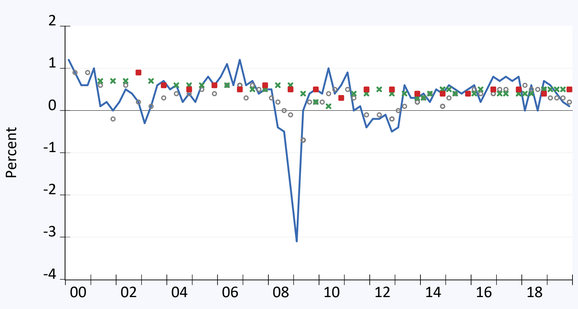
Note: Actual data for GDP growth (line) compared to the initial releases (dots).

- Data Revisions: Measures the difference between the actual data (release in quarter v) compared to the first release y_t^0 for a certain quarter t, i.e. $\Delta y_t^{rev} = y_t^v - y_t^0$.
- Insights on Data Revisions:
  - Revisions are generally higher for individual member states compared to the EU aggregate.
  - Larger data revisions are particularly evident in Scandinavian countries and Central and Eastern European countries.

Forecast Data

- Sample Period: Quarterly GDP forecasts cover the period from 2000Q2 to 2023Q4 (quarter-on-quarter).
- Country Coverage: EC Forecasts include the EU aggregate, euro area aggregate, and 22 individual countries within core EU and Central and Eastern Europe (CEECs).
- Forecast Frequency: The EC publishes up to four macroeconomic forecasts per year, covering both annual and quarterly growth rates.
- Forecast Horizons: Each quarterly forecast covers up to 8 forecast horizons, ranging from the current quarter (nowcast) to eight quarters ahead.

Figure 2: EC's forecasts for Euro Area



Note: EC forecasts for each quarter with horizon h=0 (nowcast, circle), h=4 (one-year ago, cross) and h=8 (2 years ago, square) are depicted with the current-release data by Eurostat (blue line).

- Benchmark Comparisons: Forecast performance is evaluated against previous sample means and Consensus Economics forecasts, that offers quarterly GDP forecasts for a broad range of EU countries, though coverage for CEECs is limited by frequency variations and a lack of real-time data in levels.

Forecast Performance

Forecast Revision

- Forecast revisions at a particular horizon h are defined as the difference between two successive forecasts for the same target quarter t, $\Delta\hat{y}_{t,t-h} = \hat{y}_{t,t-h} - \hat{y}_{t,t-h+1}$.
- Forecast revisions are adjustments to predictions for a specific quarter as new information or changes in economic conditions become available.
- Insights on EC's Forecast Revisions:
  - Up to 60% of forecasts published in the current quarter (h=0) have been updated since the previous forecast round (h=1)
  - Increased updating behaviour closer to the target quarter
  - Forecasts are revised on average downwards in the quarters closer to the target
  - Mean revision is up to 0.2 percentage points from the first forecast conducted until the final forecast

Forecast Evaluation

- Forecast errors for an h-step-ahead forecast are calculated as the difference between the forecast at horizon h for period t and the actual outcome (real-time data and current value data), $e_{t,t-h} = \hat{y}_{t,t-h} - y_t$.
- Evaluation Metrics: Forecast performance is evaluated using mean error (ME), mean absolute error (MAE), root mean squared error (RMSE), and RMSE ratios for comparison across countries
- Test for unbiasedness and optimality: $y_t = \alpha_h + \beta_h \hat{y}_{t,t-h} + \epsilon_{t,t-h}$. Forecasts are both unbiased and efficient if β is equal to one and α equals zero.
- Test for forecast efficiency across horizons (Patton and Timmermann 2012; Arai 2014): intermediate forecast revisions $d_{t|h_1,h_2}...d_{t|h_{H-1},h_H}$ are taken into account in the regression tests, $\hat{y}_{t,t-h_0} \equiv \hat{y}_{t,t-h_H} + \sum_{j=0}^{H-1} d_{t|h_j,h_{j+1}}$. and a set of zero–one equality restrictions on the intercept and slope coefficients are then tested to evaluate the joint consistency of all forecasts at different horizons: $y_t = \alpha + \beta_H \hat{y}_{t,t-H} + \sum_{j=0}^{H-1} \beta_j d_{t|h_j,h_{j+1}} + u_t$.

Results

Forecast Revision

- Frequency and Scope of Revisions: Nowcasts are revised in about 60% of cases, with fewer updates for longer-horizon forecasts; updates occur more frequently in CEECs, particularly for Croatia and Poland.
- Revision Direction and Patterns: While revisions from one forecast to the next are typically small (up to 0.2 percentage points), there's no consistent trend in revision direction. However, slight downward adjustments are common in final forecast rounds.
- Correlation: Forecast revisions show high correlation across major EU countries, particularly for nowcasts (correlation > 0.75).

Forecast Evaluation

- Forecast accuracy differs by country: For most countries, the EC overestimates GDP growth across horizons when using real-time data, though errors are generally not significantly biased. With current-release data, nowcasts tend to be underestimated, except in Italy, where a consistent upward bias is observed across all horizons.

Table 1: EC's Mean Forecast Error (ME) and Bias (real-time data)

	EU	EA	AT	DE	FR	ES	IT	PT	BE	LU	NL	DK	FI	SE
0	0.060	0.040	0.012	0.015	0.021	−0.060**	0.161***	−0.044	0.033	−0.121	−0.023	0.198*	0.204*	0.004
1	0.102	0.127*	0.148*	0.110	0.109**	−0.034	0.252***	0.157	0.077	0.057	0.107	0.154*	0.062	0.040
2	0.173***	0.185***	0.153**	0.232***	0.131**	0.035	0.341***	0.083	0.200**	−0.286	0.065	0.251**	0.298**	0.072
3	0.200**	0.228***	0.178*	0.207*	0.172***	0.116*	0.344***	0.318***	0.126**	0.200	0.212**	0.102	0.178	0.013
4	0.237***	0.238***	0.131**	0.241**	0.198***	0.111	0.340***	0.150	0.231***	0.043	0.124	0.160	0.278*	0.082
5	0.193**	0.217**	0.223**	0.198	0.220***	0.114	0.291***	0.328***	0.161**	0.171	0.239**	0.195*	0.136	0.098
6	0.271***	0.256***	0.216***	0.288***	0.242***	0.137*	0.374***	0.169*	0.237***	−0.136	0.184*	0.268**	0.260*	0.098
7	0.139**	0.175***	0.158*	0.158**	0.225***	0.067	0.229***	0.446**	0.108***	−0.178	0.162	0.191	0.058	0.046
8	0.371**	0.367***	0.272**	0.460***	0.256**	0.178	0.506***	0.544**	0.289*	−0.100	0.222	0.447**	0.278	0.200

Notes: MFE are provided for each country and each horizon (h=0 to 8) in the period 2000Q1–2019Q4 with regard to real-time first release data and current value data. A negative figure indicates an underestimation of GDP growth. ***, **, * indicates whether the null of unbiasedness is rejected at the 10%, 5% or 1% level.

- Forecast Accuracy and Bias: Forecast errors are generally smaller for EU and euro area aggregates compared to major individual countries, with notable overestimation at medium horizons, especially for Italy. Short-horizon forecasts show limited bias, but errors persist slightly at certain horizons for core countries (e.g., Germany, France, and Italy).
- Impact of Economic Synchronization and Volatility: Forecast errors correlate strongly among core EU countries, indicating alignment due to synchronized economic shocks, while correlations are lower for Scandinavian and certain Eastern European countries, reflecting external influences. Adjusting for volatility reduces forecast errors, especially in countries with higher GDP variability like Sweden.
- Sectoral and Regional Variations in Forecast Performance: In CEECs, forecasts display larger errors, influenced by the distinct sectoral makeup (e.g., higher agriculture and industrial shares) and data limitations. EC forecasts typically outperform mean forecasts at short horizons across most countries, with exceptions for Poland, where mean forecasts are more accurate across all horizons, and for certain longer-term forecasts in the Czech Republic and Hungary.
- Nowcast Performance Comparison: The EC's forecasts generally outperform mean forecasts for nowcasts (h=0).

Table 2: Relative Root Mean Squared Forecast Error (Mean), real-time data

	EU	EA	AT	DE	FR	ES	IT	PT	BE	LU	NL	DK	FI	SE
0	0.620**	0.682**	0.890	0.857**	0.769**	0.341***	0.745**	0.813*	0.772*	1.140	0.746**	1.003	0.827**	0.736*
1	0.869	0.873	0.980	1.008	0.843	0.566**	0.945	0.873**	0.899	0.932	0.796***	0.932	0.855*	0.920
2	0.935	0.941	1.041	1.074	0.953	0.634***	1.032	0.820*	1.065	1.200	0.802**	0.941	0.923	0.910*
3	0.978	0.966	0.974	1.057	0.900	0.744**	1.023	0.907*	0.974	0.987	0.864***	1.001	0.892***	0.924
4	1.037	1.049	1.016	1.118	1.012	0.799**	1.073	0.870**	1.090	1.042	0.896**	0.930	0.940	0.964
5	1.023	1.011	1.032	1.070	0.965	0.783**	1.060	0.867***	0.971*	0.945	0.917***	1.096	0.893**	1.046
6	1.045	1.052	1.077	1.128	1.052	0.828**	1.086	0.827**	1.055	1.054	0.933**	0.963	0.937*	0.959
7	1.057	1.052	1.156	1.066	1.027	0.747***	1.216	0.901***	0.857***	1.097	0.943*	1.025	0.956	0.953
8	1.053	1.019	1.108	1.117	1.038	0.856***	1.059	0.883***	1.108	1.107	0.975	1.171	0.923*	0.957

Notes: RMSFE for the EC forecasts (quarter on quarter) in relation to mean forecasts are provided for each country and each horizon (h=0 to 8) for the period 2000Q1–2019Q4. For values lower than one, the EC forecast is superior to the mean forecast. ***, **, * indicates significance at the 1, 5 and 10% level.

- The EC's nowcasts generally underperform compared to Consensus forecasts for all evaluated countries, as Consensus forecasts benefit from incorporating the latest monthly economic data.
- External shocks (COVID-19, energy market changes) and varying business cycle synchronization in EU countries add complexity to forecasting, impacting accuracy and economic policy decisions.

Table 3: Relative Root Mean Squared Forecast Error (Consensus Forecasts)

	DE	FR	IT	EA	NL	ES	SE
	real-time data						
0	1.217	1.126	1.094	1.234	1.003	0.950	0.600*
1	1.115	1.027	1.133	1.122	1.032	1.089	0.726
2	1.053	1.049	1.113	1.138	0.960	0.527	0.892*
3	1.016	0.968	0.974	1.020	0.976	1.011	0.786*
4	1.064	1.004	0.983	1.135	1.055	1.038	0.867**
5	1.027	1.006	1.045	1.019	1.016	0.994	0.981
6	1.047	1.039	0.997	1.07	1.018	0.979	0.843***
7	1.329	1.095	1.215	1.616	1.804	1.378	1.727

Notes: RMSFE for the EC forecasts in relation to Consensus forecasts for the period 2000Q1–2019Q4. For values lower than one, the EC forecast is superior to the Consensus forecast. ***, **, * indicates significance at the 1, 5 and 10% level.

Summary and Conclusion

- Data revisions significantly impact forecast accuracy, especially at the member state level.
- Short-term forecasts are often revised downward in final versions, highlighting the need for stable initial data.
- Forecast accuracy varies by country, with smaller, volatile economies showing greater errors; accuracy does not always improve with shorter horizons.

Further Information

Publication: *Journal of Forecasting*

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