

### Box 1.2: Forecast accuracy revisited

The European Economic Forecasts prepared by the staff of the European Commission are the basis for economic policy analysis and economic surveillance, including fiscal surveillance in the EU. High quality is therefore a must.

Continuing a tradition of regular assessments <sup>(1)</sup>, the Commission will publish in February a detailed study <sup>(2)</sup> of the accuracy of its forecasts, extending the dataset (1969-2011) of its last analysis by including additional data points for 2012 to 2014.

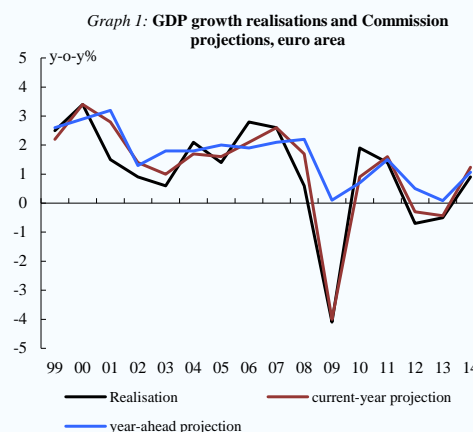
The study, which compares the Commission's track record to that of the IMF, OECD and the consensus of market forecasters, finds that the Commission's GDP growth forecast accuracy over the whole time period and for all forecast horizons tends to be more accurate than the market and very similar to both the IMF and the OECD.

This box summarises some of the main results of the forthcoming study. First, it analyses whether the accuracy of the Commission's real GDP growth forecasts <sup>(3)</sup> has changed in recent years, by looking at the whole sample up to 2014. This is done for all EU Member States as well as for the euro area and EU aggregates. <sup>(4)</sup> It also focuses on a shorter and more recent period (2000-2014) which allows a comparison between the forecasting performance before (2000-2007) and after the Great Recession (2008-2014). Second, it examines to what extent forecast errors can be explained by external or technical assumptions whose realisations turned out to be different. Finally, it updates the comparison of the accuracy of European Commission forecasts

to that of other international institutions and of market participants.

#### Accuracy of Commission forecasts

The forecast accuracy test can be performed using different summary statistics, such as the Mean Error, the Mean Absolute Error (MAE) and the Root Mean Square Error. Only the frequently-used MAE, which measures the average forecast error, is discussed here. <sup>(5)</sup>



The forecast error of current-year GDP growth <sup>(6)</sup>, - as measured by the MAE over the whole sample (1969-2014) - is 0.4 pps. for the euro area (Graph 1) and 0.5 pps. for the EU. This means that the Commission's current-year forecast (forecasts in spring for that same year) for euro-area real GDP growth has, on average, proven to be 0.4 pps. off target. The extension of the observation period to include 2012-2014 leaves unchanged the forecast errors of the current year GDP growth for the euro area and EU aggregates compared to the previous study. At the Member State level, similar conclusions are reached for a majority of 'old'

<sup>(1)</sup> See Keereman, F. (1999). "The track record of the Commission Forecasts". European Commission (DG ECFIN), *European Economy Economic Papers* 137; Melander, A., S. Sismanidis and D. Grenouilleau (2007). "The track record of the Commission's forecasts - an update". European Commission (DG ECFIN), *European Economy Economic Papers* 291, and González Cabanillas, L. and A. Terzi (2012). "The accuracy of the European Commission's forecasts re-examined". European Commission (DG ECFIN), *European Economy Economic Papers* 476.

<sup>(2)</sup> Fioramanti, M., L. González Cabanillas, B. Roelstraete and S. Ferrandis Vallterra, (2016). "European Commission's forecast accuracy revisited: statistical properties and possible causes of forecast errors". European Commission (DG ECFIN), *Discussion Papers* forthcoming.

<sup>(3)</sup> The forthcoming paper also analyses the forecast accuracy of inflation and general government balance, and to a lesser extent that of investment, current account and unemployment.

<sup>(4)</sup> All EU Member States except Croatia due to insufficient number of observations.

<sup>(5)</sup> The *mean absolute error* (MAE) is the absolute difference between the average forecast and the average outcome. Negative errors are treated as positive ones so that errors cannot cancel each other out. The MAE is thus a more accurate measure of the average forecast error than a simple mean error.

<sup>(6)</sup> *Current-year* forecasts refer to the spring forecasts carried out for the current year, whereas *year-ahead* forecasts come from the autumn forecasts carried out for the following year. Current-year forecasts are assessed against the so-called 'first available estimates' of the actual outcome presented in the spring forecast of the subsequent year. Year-ahead forecasts are assessed against the so-called 'first settled estimates' of the actual outcome presented in the autumn forecast following the year to be forecast.

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Box (continued)

Member States (15 EU members before 2004). For the ‘new’ Member States that acceded in 2004 and 2007, however, an improvement in the current-year forecast accuracy of GDP growth was found in all but one Member State; Cyprus where the economic downturn was very sharp and the uncertainty very large.

For year-ahead forecasts (forecasts in autumn for the next year), the MAE is significantly larger compared to current-year forecasts, as less information is available at the time of forecasting. It stands at 1.0 pp. for the euro area and 0.9 pps. for the EU. The extension of the dataset to 2014 shows no change in the accuracy of the forecast for both the euro area and EU aggregates compared to the previous study. At the Member State level, an improvement in accuracy is found for a majority of countries (including all ‘new’ Member States, except Cyprus). However, the MAE for some ‘old’ Member States (Greece, Spain and Italy) did increase.

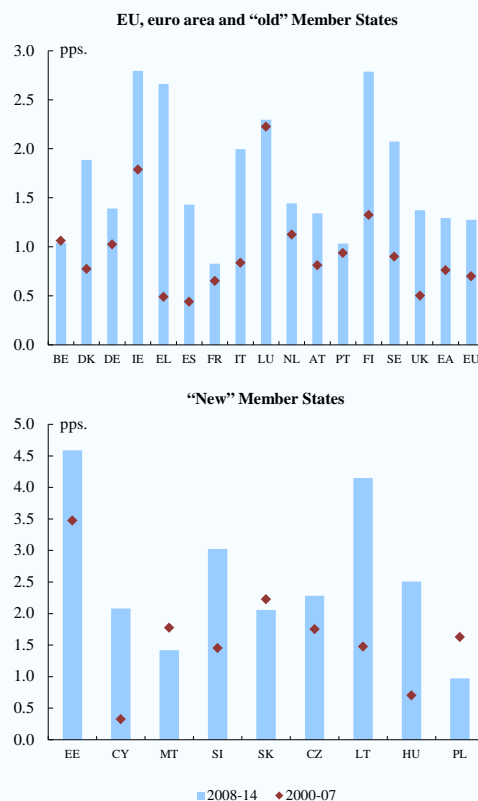
Focussing on more recent years, GDP growth forecast errors appear to be larger in the crisis and post-crisis period (2008-2014) than in the pre-crisis period (2000-2007) for a large majority of Member States<sup>(7)</sup> and for both current and year-ahead forecasts, with a sharper deterioration in the latter (see Graph 2). This mainly results from an anomalously large forecast error in the year 2009, which was on annual terms the dip of the recession. There are, however, some exceptions where forecast accuracy improved in recent years for the current year (euro area, France, the Netherlands, Belgium, Slovakia and Czech Republic) and for the year ahead (Malta and Slovakia). Poland is the only country for which forecast accuracy improved in recent years for both horizons. In the crisis and post-crisis time periods, programme countries generally exhibit among the largest increases in the MAE, compared to the pre-crisis period for both the current and year-ahead forecasts.<sup>(8)</sup>

Based on standard statistical tests, Commission forecasts are found to be largely unbiased meaning that there is no measurable systematic over- or underestimation of GDP growth. A panel data

<sup>(7)</sup> Bulgaria and Romania are not analysed here since the period (2000-2007) only contains one data point.  
<sup>(8)</sup> Programme countries include all Member States that have received financial assistance from the diverse rescue mechanisms, namely Cyprus, Greece, Hungary, Ireland, Latvia, Portugal, Portugal, Romania and Spain (financial-sector programme). The forecast for these countries are agreed among the Troika and with the authorities of the Member States concerned.

approach is also used, which pools the data for all EU Member States in order to circumvent the small size of the shorter observation samples. For the whole sample, it also confirms that there is no evidence of bias for current-year GDP forecasts across EU Member States. According to this test, however, year-ahead forecasts appear to have been slightly overestimating GDP growth. For the shorter samples, this analysis shows that GDP growth tended to be underestimated in the pre-crisis years 2000-2007 while GDP growth was overestimated in the crisis and post-crisis years 2008-2014.

Graph 2: MAE in year-ahead GDP growth forecast



If forecasters repeat the same mistakes, forecast errors will be auto-correlated. No evidence was found of such persistence of errors in the Commission forecast for the EU and euro area aggregates, either for the current year or for the year-ahead projections, and this for the whole sample and the shorter period (2000-2014). At the Member State level, only a few cases of auto-correlation in forecast errors were found.

Additional statistical tests that shed more light on forecasting performance show that Commission forecasts generally beat a naïve forecast which only

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Table 1: Influence of external assumptions on forecast errors

Variables	Current-year forecast			Year-ahead forecast		
	AR Base	AR Progr	AR No-Progr	AR Base	AR Progr	AR No-Progr
SB	0.233** (0.100)	-1.383** (0.559)	0.360*** (0.116)	-0.407*** (0.115)	-0.918*** (0.259)	-0.258* (0.138)
RoW	0.130 (0.200)	3.484 (8.046)	0.310 (0.223)	0.776** (0.328)	-0.198 (0.688)	1.131*** (0.365)
NEER	0.149 (0.115)	-0.242 (0.278)	0.269* (0.138)	0.021 (0.053)	-0.004 (0.121)	-0.001 (0.059)
OIL	-0.026*** (0.009)	0.180 (0.310)	-0.031*** (0.009)	0.051*** (0.014)	0.051 (0.028)	0.030* (0.017)
LTIR	-0.649*** (0.175)	-0.736 (0.672)	-0.450** (0.207)	-0.697*** (0.088)	-0.364* (0.179)	-0.815*** (0.106)
Constant	0.444*** (0.129)	-1.442 (2.829)	0.393*** (0.134)	0.959*** (0.164)	0.115 (0.320)	0.974*** (0.199)
Observations	176	22	146	151	21	123
Number of countries	27	7	27	27	7	26
Overall R <sup>2</sup>	0.133	0.368	0.143	0.686	0.488	0.736
R <sup>2</sup> within	0.195	0.444	0.264	0.758	0.795	0.78
LogLik	-306.2	-29.80	-246	-286.7	-23.01	-226.2
F test	6.958	1.599	8.186	74.72	6.98	65.41

Standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

Note: AR BASE is the model using all EU countries except Croatia due to the very limited observation sample for this country.

AR Progr and AR No-Progr are the same models as AR BASE, but only for programme and non-programme countries respectively.

reproduces the latest GDP growth realisation. Commission forecasts are directionally accurate meaning that a pick-up or a slowdown in GDP growth has been predicted accurately. However, they are not always 'efficient' in using all available information at the time of the forecast.

#### Influence of external assumptions on forecast errors

Macroeconomic forecasts are conditioned by *ex-ante* technical or external assumptions about the future development of exogenous factors linked to the global economy, financial markets, commodity prices or fiscal policy. The *ex-post* accuracy of these assumptions is likely to influence forecasting performance.<sup>(9)</sup> A panel regression is run to analyse the influence of the difference between the assumed value of these exogenous factors at the time of forecasting and their realisation. The forecast error for GDP growth is regressed on the unexpected change in: (i) the structural fiscal balance (SB); (ii) GDP growth outside the EU (RoW); (iii) the nominal effective exchange rate of the euro (NEER); (iv) the oil price (OIL) and; (v) long-term interest rates (LTIR). The sample ranges from 2007 to 2014 and includes all EU Member States except Croatia. Table 1 shows the regression results.

The decomposition of forecast errors shows a limited impact of mistakes in external assumptions on GDP growth forecast errors for the current year. However, more than half of the year-ahead forecast

errors seem to be explained by external assumptions that proved to be incorrect *ex post*.

For current-year forecasts, higher-than-anticipated fiscal consolidation improves the structural balance and leads to lower-than-forecast GDP growth in the short-run for programme countries. By contrast, unanticipated higher fiscal consolidation appears to lead to higher-than-forecast GDP growth in non-programme countries as well as across all EU Member States.<sup>(10)</sup> For year-ahead GDP forecasts, higher-than-expected fiscal consolidation has a large significant impact on the GDP forecast error and has the expected sign for all groups of countries.

Unexpected changes in long-term interest rates play an important role in explaining forecast errors for both current and year-ahead forecasts. As expected, when growth in the rest of the world turns out to be higher than initially projected, GDP growth across EU Member States tends to be underestimated, but the size and significance of the impact varies across different time horizons. Deviations from the technical assumption on the exchange rate are not found to be a systematic driver of forecast errors. Finally, the impact of unexpected changes in the oil price on GDP forecast errors appears to be small.

#### Comparison with other forecasters

In order to compare the track record of the Commission's forecast accuracy with that of the OECD, IMF and Consensus Economics, the MAEs

<sup>(9)</sup> The use of these technical assumptions is common practice across international institutions.

<sup>(10)</sup> Further analysis in the full paper suggests that this counter-intuitive result may be driven by uncertainty surrounding the fiscal outlook.

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are compared for similar observation periods. As already observed in the previous study, the Commission’s forecast accuracy over the whole sample is found to be very similar to that of the OECD and IMF for all forecast horizons. The Commission’s projections, however, have continued to score better than the average of private sector forecasts (compiled by Consensus Economics).

In the short and more recent sample period (2000-2014), however, the accuracy of market forecasters for current-year forecasts appears to have improved and become more similar to those of the Commission, OECD and IMF. For the year-ahead, Commission forecasts come out as more accurate than the IMF or Consensus in the shorter sample but less accurate than the OECD’s (see Graph 3). Informational advantages linked to the different cut-off dates of the institutions’ forecast as well as the assumptions that institutions make<sup>(11)</sup> clearly play a role in the difference of forecasting performance across institutions.

Overall, the European Commission’s forecasts continue to display a reasonable track record, similar to that of the other international institutions. The forecast accuracy, however, seems to have deteriorated somewhat since the Great Recession, mainly due to the anomalously large forecast error in the recession year 2009. Yet, this difficulty applies to all forecasters, both institutional and private.

<sup>(11)</sup> For instance, the strong no-policy-change assumption that only the European Commission makes.

Graph 3: Comparison of MAE with other forecasters (year-ahead GDP growth forecast, 2000-2014) EU, euro area and “old” Member States

