Box 5

RECENT EVIDENCE ON THE UNCERTAINTY SURROUNDING REAL-TIME ESTIMATES OF THE EURO AREA OUTPUT GAP

Measures of potential output growth reflect the rate of growth that can be achieved on the basis of available production factors without creating inflationary pressures. The output gap, defined as the percentage deviation of the actual level of output from the potential level, measures the degree of utilisation of production factors in the economy and can be regarded as an indicator of both the state of the business cycle and inflationary pressures.

Since potential output is an unobservable variable, its measurement, as well as measures of the output gap, can only be estimated with uncertainty. For current revised estimates of potential output relating to past years, the uncertainty can be reduced by taking into account both past and actual outcomes for future economic development that were not known at the time. By contrast, the information regarding future economic development that is available for real-time estimates of potential output can only include forecasts, rather than actual outcomes. Therefore, real-time measures of potential output are particularly uncertain and may be revised substantially ex post.

This box reviews revisions to real-time estimates of measures of potential output and the output gap, with a particular focus on how the financial and economic crisis may have reshaped assessments of potential output and inflationary pressures of the euro area economy for the years before the crisis.

Revisions to real-time estimates of potential output growth in the euro area

Major events such as the recent financial and economic crisis can give rise to sizeable reassessments of estimates of potential output, even for years in the distant past. In some euro area countries, the recent financial and economic crisis brought a period of exceptionally high GDP growth to an end and gave rise to a particularly sizeable and persistent slump in economic activity. While the impact of the crisis on the level and rate of growth of potential output in the years since the crisis is still uncertain,[1] measures of potential output growth in the years prior to the crisis can now be seen to embody a higher degree of uncertainty. A comparison with updated measures of potential output growth estimated immediately before the crisis may therefore provide insights into the possible sources of error in the pre-crisis measures of potential growth.

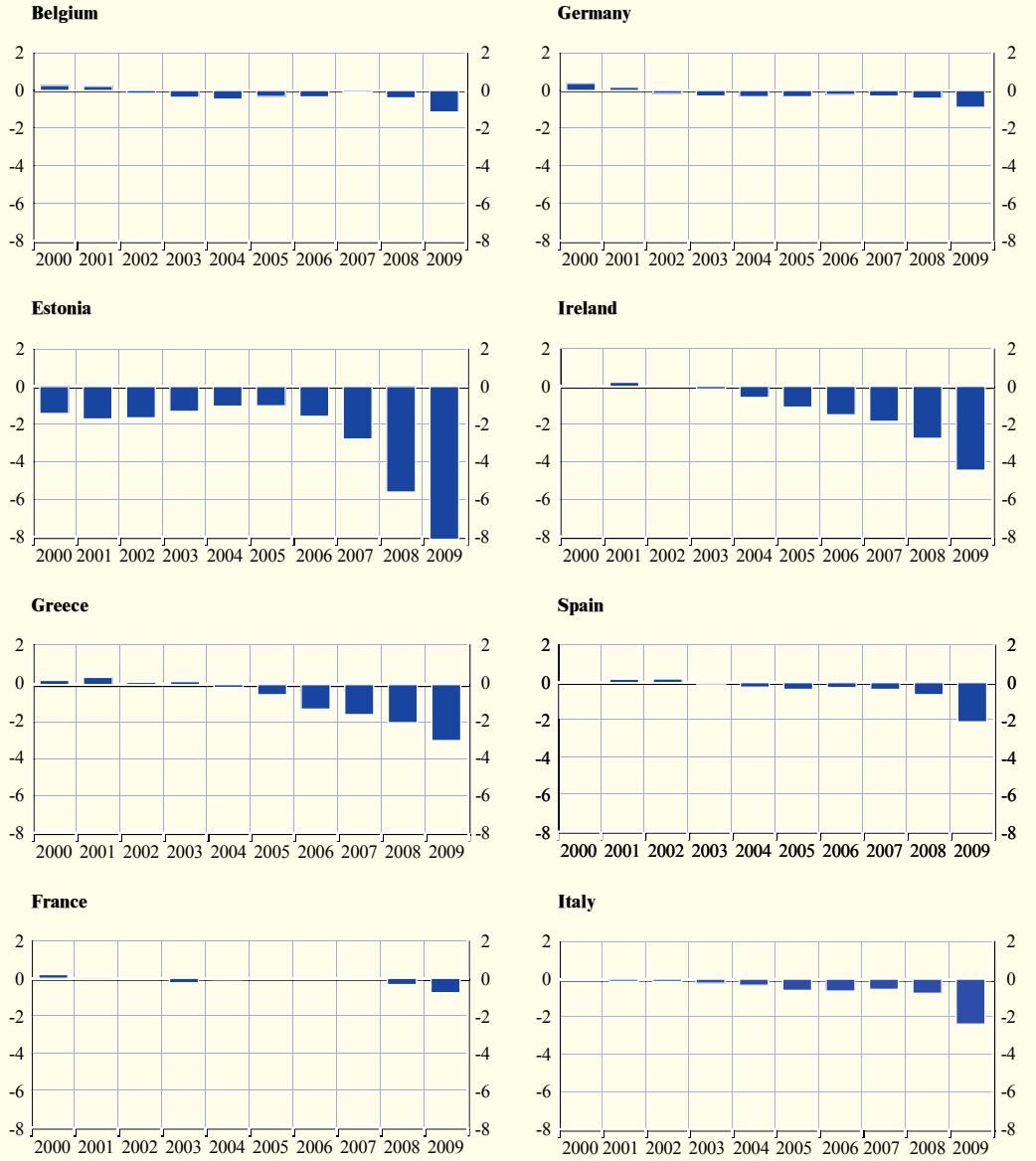
Chart A compares revisions to estimates of potential growth in the euro area countries in the period from 2000 to 2007 that are based on estimates carried out in the spring of 2011 with measures estimated for the same period in autumn 2007. Notably, the revisions reveal that the rate of potential growth for the whole period was overestimated for almost all euro area countries. The revisions to potential growth estimates for the period from 2009 to 2011 are particularly marked. This was to be expected as the autumn 2007 estimates for this period had to rely on forecasts that had not anticipated the crisis and its significant impact on potential output growth. For years in the more distant past, revisions are generally small, but significant revisions can be observed for the immediate pre-crisis period in the case of

1 For the impact of the financial and economic crisis on potential output, see "Trends in potential output", *Monthly Bulletin*, ECB, January 2011, and "Potential output in the euro area", *Monthly Bulletin*, ECB, July 2009.

some countries (Greece, Estonia, Ireland, Slovakia and Slovenia), perhaps reflecting significant overheating in some sectors of the economy such as financial services and/or construction, but possibly also an unsustainable growth of the government sector.

Chart A Average revisions to international organisations' estimates of potential output growth in the euro area and euro area countries

(percentage points)



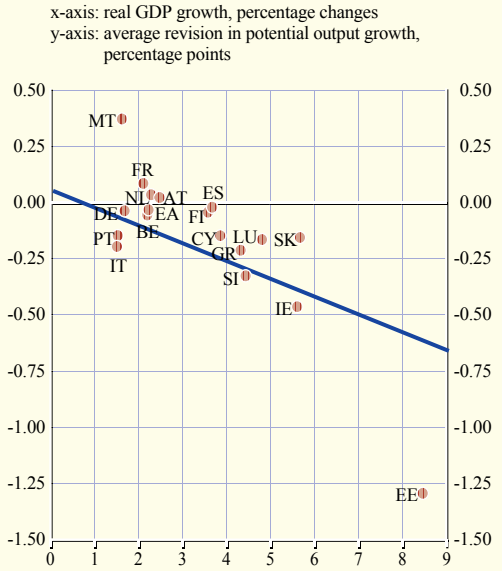
Sources: IMF, OECD and European Commission.
Notes: Revisions to potential output growth are computed as the differences between growth estimates of spring 2011 and those of autumn 2007, using the average of estimates provided by the OECD, the IMF and the European Commission.

Chart A Average revisions to international organisations' estimates of potential output growth in the euro area and euro area countries (cont'd)

(percentage points)

Sources: IMF, OECD and European Commission.
Notes: Revisions to potential output growth are computed as the differences between growth estimates of spring 2011 and those of autumn 2007, using the average of estimates provided by the OECD, the IMF and the European Commission.

Chart B Average real GDP growth rates and average revisions to potential output growth in the period from 2000 to 2007



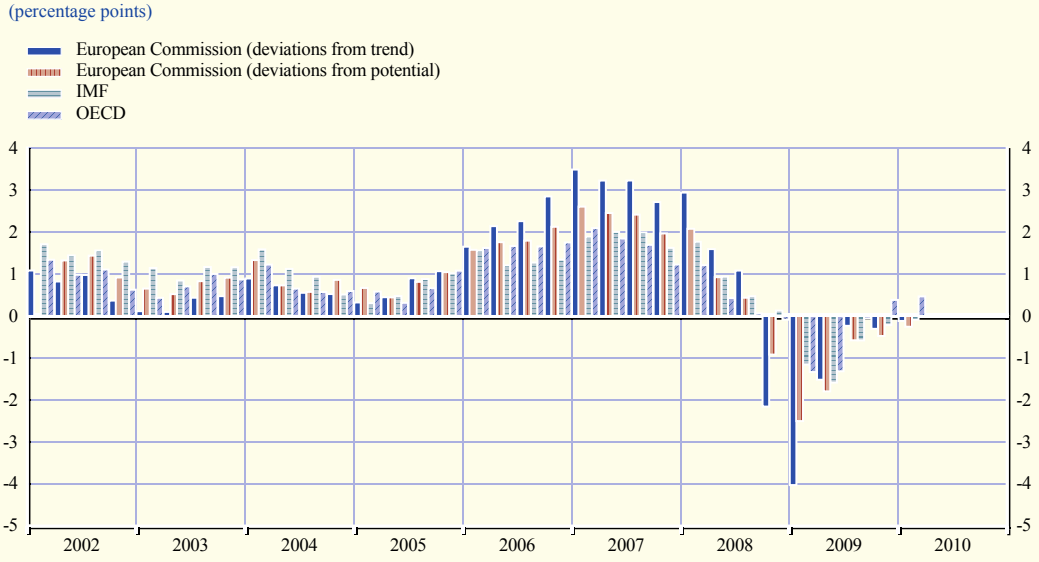
Sources: IMF, OECD and European Commission.
Notes: Revisions to potential output growth are defined in Chart A. The regression line has been computed by excluding the outlier for Estonia, and by excluding the figures for the euro area.

Chart B relates these revisions, averaged over the pre-crisis period from 2000 to 2007, to average growth rates of real GDP over the same period. It is noticeable that there is a tendency for ex post revisions to potential growth to be higher in those countries in which real GDP grew relatively faster than those for countries that experienced average (or below-average) real GDP growth over this period. Within the former group are some countries that have subsequently become subject to economic adjustment programmes, such as Ireland and Greece. In general, the results suggest that the relatively high growth performance experienced by some countries over the period from 2000 to 2007 was not sustainable.

Revisions of real-time euro area output gap estimates

The uncertainty of euro area real-time potential output and output gap estimates arises from various sources, including model uncertainty,

Chart C Revisions to real-time estimates of the euro area output gap by international organisations



Sources: European Commission, IMF, OECD and ECB calculations.
Notes: The bars represent the difference between estimates available at end-2010 and real-time estimates (see Marcellino, M. and Musso, A., "The reliability of real-time estimates of the euro area output gap", *Economic Modelling*, Vol. 28, 2011, pp. 1842-56).

parameter instability and data revisions.[2] This uncertainty is reflected in the extensive revisions associated with real-time estimates of potential output. As an example of these revisions, Chart C shows the revisions to real-time euro area output gap estimates by international organisations (European Commission, IMF and OECD) at the end of 2010. It is notable that these revisions are often in the same order of magnitude as, or even higher than, the estimated gap itself, as had already been ascertained for the United States by Orphanides and van Norden.[3] Marcellino and Musso show that this also holds true for several other estimates derived on the basis of various methods, ranging from simple filters to more complex econometric models.

Importantly, revisions to the output gap appear to be systematically more extensive (and positive) in the case of the 2007 real-time estimates, particularly in comparison with the more distant years, suggesting that most measures underestimated in real-time the level of the output gap just before the crisis started. This corresponds to the aforementioned finding that potential output in the period immediately before the crisis has previously been overestimated significantly.

Real-time estimates of the euro area output gap and inflation forecasting

Recent evidence suggests that real-time estimates of the euro area output gap may embody only limited information in terms of forecasting inflation, as had already been found to hold true for the United States.[4] Indeed, Marcellino and Musso provide some evidence for the euro area pointing to an only marginal usefulness of real-time output gap estimates for inflation forecasting both in the short term (one quarter and one year ahead) and the medium term (two and three years ahead). This is in line with the evidence of instability and non-linearity characterising the relationship between the output gap and inflation in the euro area, as well as of the declining importance of the output gap in explaining price developments in recent years.[5]

2 Marcellino, M. and Musso, A., "The reliability of real-time estimates of the euro area output gap", *Economic Modelling*, Vol. 28, 2011, pp. 1842-56. See also the box entitled "A cross-check of output gap estimates for the euro area with other cyclical indicators", *Monthly Bulletin*, ECB, June 2011; and the box entitled "The (un)reliability of output gap estimates in real time", *Monthly Bulletin*, ECB, February 2005.

3 See Orphanides, A. and van Norden, S., "The unreliability of output-gap estimates in real time", *The Review of Economics and Statistics*, Vol. 84, 2002, pp. 569-83.

4 See Marcellino, M. and Musso, A., "The forecasting performance of real time estimates of the euro area output gap", *CEPR Discussion Paper*, No 7763, Centre for Economic Policy Research, March 2010. For the United States, see Orphanides, A. and van Norden, S., "The Reliability of Inflation Forecasts Based on Output Gap Estimates in Real Time", *Journal of Money, Credit and Banking*, Vol. 37, 2005, pp. 583-601.

5 See for example Musso, A., Stracca, L. and van Dijk, D., "Instability and nonlinearity in the euro area Phillips curve", *International Journal of Central Banking*, Vol. 5, 2009, pp. 181-212; Anderton, R., Galesi, A., Lombardi, M. and di Mauro, F., "Key elements of global inflation", in *Challenges to inflation in an era of relative price shocks*, Reserve Bank of Australia, 2010; and the article entitled "Trends in potential output", *Monthly Bulletin*, ECB, January 2011.