

Box IV-3

Estimating the output gap

The output gap provides monetary authorities with important indications about underlying inflationary pressures. However, estimation of the output gap is fraught with uncertainty. Methods are under continuous review within the Central Bank of Iceland to reflect advances and new knowledge in this field. The following is an account of several changes in both the methodology and presentation of the Bank's estimation of the output gap.

Uncertainty surrounding output gap estimation

The output gap is defined as the difference between actual GDP and potential output as a percent of potential output. Potential output is defined as the level of GDP that is consistent with full utilisation of all factors of production under conditions of stable inflation.

Estimations of the output gap are subject to two uncertainties. The first is data uncertainty. This arises because preliminary figures in the national accounts are often revised extensively before final data are available, as witnessed by Iceland's revised GDP growth estimates in recent years. Second, because potential output is not directly observable, estimates of it are uncertain. Various methods for estimating potential output have been developed but there is no consensus on which is the most suitable.

Economists at Norges Bank have estimated a data uncertainty range for the output gap of $\frac{1}{2}$ - $1\frac{1}{2}$ percentage points. Even greater uncertainty is found in estimates of potential output. The total uncertainty surrounding the output gap estimate is assumed to lie in the range $1\frac{1}{2}$ - $3\frac{1}{2}$ percentage points.¹ This is a high degree of uncertainty, given that the estimated output gap often lies within this uncertainty range.

Methods used so far

The Central Bank of Iceland has for several years estimated the output gap using the production function method.² This involves calculating the potential output of the economy by a Cobb-Douglas production function with constant returns to scale. It has been based on the mean of four variants of the production function using different trend paths for labour input. Annual data have been used with a varying degree of use of a Hodrick-Prescott (HP) filter. Special account has been taken of investments in the aluminium and power sectors. Blind use of an HP filter could lead to an underestimated output gap by creating a trend path for the factors of production in which the additional production capacity of new aluminium smelters and power stations in the coming years is spread backwards in time.

Three changes in methodology

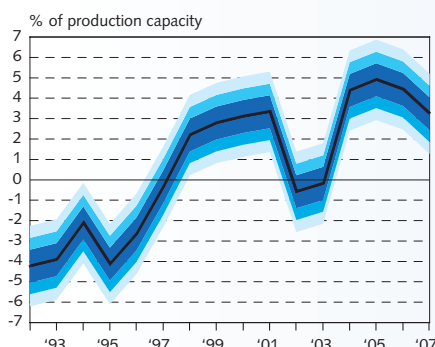
The Central Bank's new quarterly macroeconomic model, described in Appendix 1, and the underlying database enable the evaluation methods to be enhanced. Three main changes are most important.

First, quarterly data are now used instead of annual data. Hitherto, the output gap has been calculated from annual data; quarterly data have only been available since 1997. Alongside the new forecasting model, Central Bank economists have created a database at a quarterly frequency for main aggregates several decades back in time. The evaluation of the output gap published in this edition of *Monetary Bulletin* is based on quarterly data for the first time.

1. See the discussion and references in Norges Bank's *Inflation Report* 3/2005, Box, 36.

2. The most recent account of the Central Bank's method for estimating the output gap was published in *Monetary Bulletin* 2005/1, Appendix 2, 55-58.

Chart 1
The output gap 1992-2007¹



1. Confidence intervals for the output gap showing 50%, 75% and 90% probability that the output gap will lie within them, based on the average standard deviation of various measurement methodologies since 1981.

Source: Central Bank of Iceland.

Second, the estimated output gap using the new macroeconomic model is given a weight in the total calculation. In the new model, the output gap is calculated from a Cobb-Douglas production function, which is estimated for the period 1981-2004, without using an HP filter. The output gap figure is then the conventional difference between GDP and potential output.

Third, several changes are made in the treatment of investments in the aluminium and power sectors. The earlier macroeconomic model estimated the GDP, investment stock, labour use and manpower that would have been created had the investment programme not been made. This has proven increasingly difficult in practice as the investment programmes have worn on. Instead of attempting to produce an alternative scenario excluding investments in the aluminium and power sectors, the output gap measured with the new model is given a larger weight in the total estimate, since it does not use HP filtering. It also takes some account of the impact of imported labour on the potential output of the economy – access to foreign labour has clearly eased pressures in the domestic market which otherwise would have surfaced in the form of even higher inflation.

New presentation of the output gap estimate

The presentation of the output gap estimate is no less important than the methodology itself. It is important to underline the uncertainties surrounding output gap estimation and the undesirability of focusing too closely on point estimations of varying reliability. Accordingly, the output gap estimate is now presented with an uncertainty range with probabilities of 50%, 75% and 90% that the output gap will lie inside them, based on the average standard deviation yielded by different estimates since 1981. The bands on the chart are darker, the narrower the uncertainty range. It should be underlined that this presentation is confined to the uncertainty surrounding estimations of potential output and its effect on the Bank's output gap estimations. No attempt is made to allow for the impact of data uncertainty on output gap estimations.

Chart 1 shows that the output gap is strongly positive at present and the probability that it will turn negative over the forecast horizon is estimated at zero. Thus there is no indication that demand and potential output are close to balance.

Other indicators of the output gap

Monetary authorities in many countries have stepped up their use of surveys in estimates of the output gap. Experience in recent years shows that surveys provide the monetary authorities with useful information about the output gap and a gauge for comparison with the findings of conventional economic research. Surveys can therefore perform an important role in confirming the results of other research as well as serving as a major indicator of trends and movements in the economy.

The Gallup survey of business sentiment in February asked for the first time about companies' capacity for responding to unexpected increases in demand or sales. Interpretation of responses is initially limited by the lack of comparative data. Nonetheless, it is clear that sectors differ widely in their ability to respond to unexpected increases in demand or sales.