

The Output Gap – Recent Estimations

The output gap, defined as the difference between actual and potential output, is an important variable to indicate inflationary pressures in the economy. Positive values of the output gap indicate that actual output is above potential and suggests the possibility of a future rise in price levels, and vice versa. By functioning as an indicator of economic fluctuations, the output gap, among other variables, gives policymakers the ability to anticipate potential demand pressures on prices.

But since the output gap cannot be directly measured, ie, an unobservable variable, it must be estimated, involving a high degree of uncertainty.¹ There is no consensus regarding the most appropriate method for the estimation of the potential output and, hence, the output gap. Thus, the Banco Central do Brasil, similar to what occurs in most major economies, uses several methods to measure the output gap: i) the extraction of a linear trend (LT); ii) the Hodrick-Prescott filter (HP); iii) the production function approach (PF);² iv) the Kalman filter (KF).³ Methods i) and ii) are univariate, while (iii) and (iv) are multivariate.

The objective of this box is to assess the recent evolution of the different measures of the output gap calculated by the Banco Central, updating the estimates presented in the Inflation Report of March

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- 1/ In the literature on the methodology for estimating the output gap, there are basically two components. One is based on simpler models, in general univariate, which employs statistical filters to extract potential output, and the output gap as a residual. Another, more complex, makes use of multivariate models that seek greater economic fundamentals for estimating the output gap. The advantage of the first approach is the simplicity of the estimation process, while the multivariate lies on the imposition of economic relations or economic characteristics.
 - 2/ Calculated with data on unemployment rate and data on Installed Capacity Utilization (UCI), using either the UCI prepared by the Confederation of Industry (PF-CNI) as well as the UCI from the Getulio Vargas Foundation (PF-FGV).
 - 3/ The estimation methods based on the extraction of a linear trend and on the HP filter are described in the *Inflation Report* of September 1999. The method was associated with the production function approach is described in the December 2000 and December 2003 *Inflation Reports*, and have been refined in recent years with changes in methodology and variables. The method that uses the Kalman filter with restrictions arising from economic theory was presented in the *Inflation Report* of December 2007.

Figure 1 – Output Gap Dynamics – 2007-II to 2010-IV
Production Function, Linear Trend, HP Filter, Kalman Filter

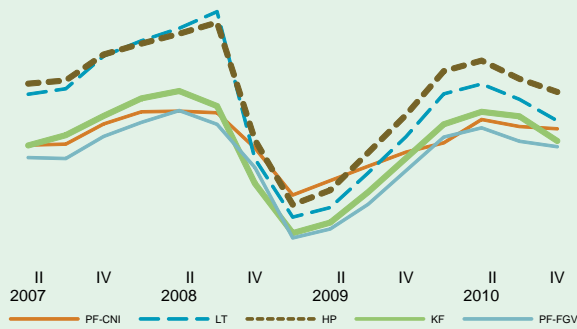
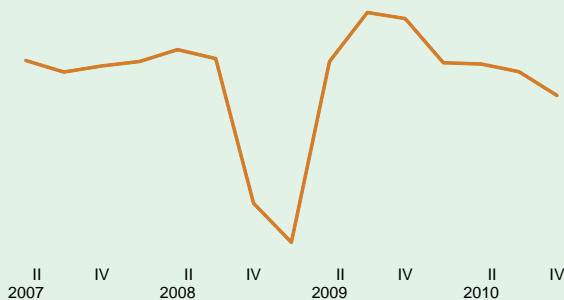


Figure 2 – Gross Fixed Capital Formation – 2007-II to 2010-IV
Quarterly growth rate



2010. Additionally, we present recent developments in the Gross Fixed Capital Formation (GFCF) of the Brazilian economy.

Using the sample that goes from the second quarter of 2007 to the fourth quarter of 2010, as seen in Figure 1, the various output gap measures are quite correlated, although they differ in level. The different levels mainly reflect the different economic models used at Banco Central for forecasting inflation.⁴

Regarding the recent evolution of the different measures of output gap, the strong fall between the third quarter of 2008 and the first of 2009 is due to the 2008/2009 financial crisis. It's important to point out that this reduction of the output gap was not restricted to the Brazilian economy, but also occurred in other emerging economies, as well as in developed economies.⁵ As shown in Figure 1, from the second quarter of 2009 on, all output gap measures gradually increase. This movement goes until the second quarter of 2010 and is compatible with the observed increase in the utilization of production factors in the economy. Finally, in the third and fourth quarters of 2010, all measures of output gap begin to decline.

Each measure of the output gap generates a corresponding measure for the potential output of the Brazilian economy. By the way, in the exercises presented here, despite the fact that information on aggregate investment is not directly used in the calculation of the potential output, there is a correlation between the growth rate of potential output and the growth rate of the GFCF. Figure 2 shows the growth rate of the Brazilian GFCF. After achieving growth of around 4.5% in the third quarter of 2008, its rate fell to -10.6% and -14.6% in the next two quarters, reflecting a sharp decline caused by the 2008/2009 financial crisis. The GFCF starts to recover around the second quarter of 2009, posting a 9.3% growth rate in the third quarter of 2009. Since then, as with many other economic indicators, the change in GFCF has cooled down, ranging from 3.1% in the third quarter of 2010 and 0.7% in the

4/ Considering the different Phillips curves based on the different measures of output gap, the measure calculated by the production function approach does not imply inflation projections that are consistently lower, or higher, than the projections obtained with the other measures.

5/ See, for example, IMF (2010) and Cardenas and Levy-Yeyati (2010).

fourth quarter. It is plausible to conjecture that over the same period, the growth rates of potential output have depicted similar trajectory.

To sum up, good practice in the conduct of monetary policy requires adequate measurements of the output gap. In this regard, it is important to monitor indicators produced by different methodologies, as well as closely monitor the consistency of the data. It is also important to improve constantly the methodologies used, given the inherent difficulties in the estimation process of the output gap. In a sense, when different methodologies for computing the output gap end up producing similar trajectories, this tends to give more confidence to the analysis of economic fluctuations.

References

IMF. (2010). *World Economic Outlook*. October.

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