

## Box 6

## THE MEASUREMENT AND PREDICTION OF THE EURO AREA BUSINESS CYCLE

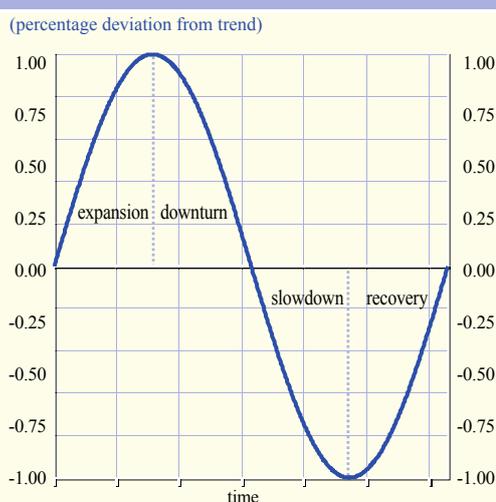
Accurate information on the current and future state of the business cycle is a valuable input into the decision-making process of policy-makers and businesses. For this reason various academic, commercial, government and policy institutions use coincident and leading business cycle indicators as instruments to measure and predict business cycle developments. These indicators all aim at describing and forecasting the business cycle, but differ in terms of the methodology applied and the choices made regarding the concept used for the identification of the cyclical pattern; the variables selected and their lead times; and the weighting of the series used to compile a single index. For example, the Conference Board and the Organisation for Economic Co-operation and Development (OECD) calculate business cycle indicators for the euro area.<sup>1</sup> Based on coincident and leading business cycle indicators recently developed by ECB staff, this box illustrates how such indicators can be used to measure and predict the euro area business cycle.<sup>2</sup>

## Measurement

A common way to measure the business cycle is by using the concept of the deviation or growth cycle. This approach defines the business cycle as cyclical fluctuations in overall economic activity around its long-term trend. Using the OECD terminology, four phases of the deviation cycle can be distinguished: i) expansion: economic activity is above the trend level and the cycle is upward sloping, i.e. the level of economic activity is growing faster than the trend; ii) downturn: economic activity is above the trend, but deteriorating; iii) slowdown: economic activity is below the trend and the cycle is downward sloping, which ends in a business cycle trough; iv) recovery: economic activity is below the trend, but improving (see Chart A).

Chart B plots deviation cycles in the euro area derived from real GDP and industrial production excluding construction by applying a one-sided band pass filter. It shows the percentage deviation of these two cyclical components from their corresponding trends. In this representation developments in the cyclical deviation from trend may arise from changes in the strength of growth in both the cyclical component and the trend component. For instance, rises in such indicators represent a strengthening of growth in the cyclical component relative to the trend component and could be due to a strengthening of growth in the cyclical

Chart A Stylised business cycle phases



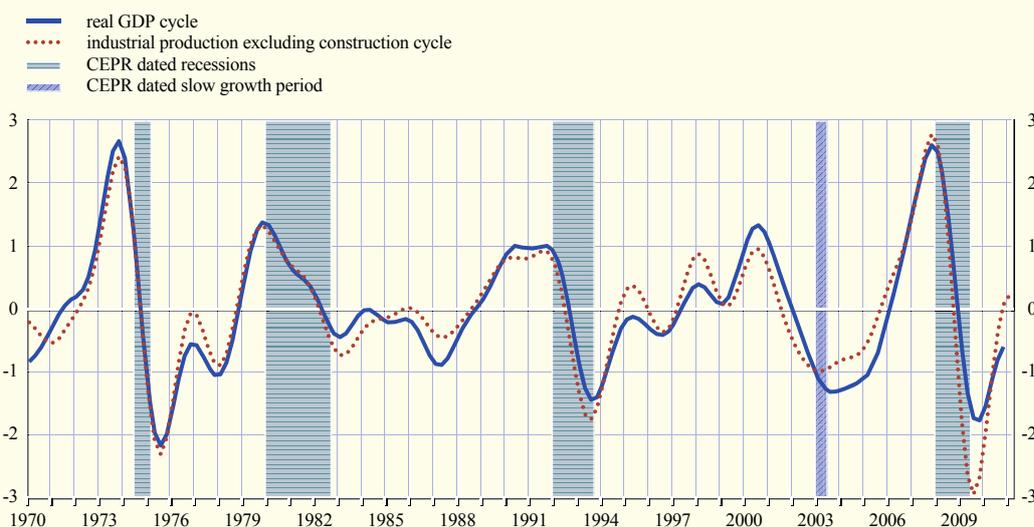
Source: ECB calculations.

1 For more information on the Conference Board indicators and the OECD indicators, see <http://www.conference-board.org/data/bci.cfm> and <http://www.oecd.org/dataoecd/22/47/44728410.pdf> respectively.

2 For more details, see de Bondt, G. and Hahn, E., "Predicting recessions and recoveries in real time: the euro area-wide leading indicator (ALI)", *Working Paper Series*, No 1246, ECB, Frankfurt am Main, September 2010.

**Chart B Euro area business cycle indicators derived from industrial production (excluding construction) and real GDP**

(percentage deviation from trend; standardised, quarterly data)



Sources: ECB, Eurostat, the euro area-wide model database and ECB calculations.

Notes: The horizon of the indicator based on real GDP extends to the fourth quarter of 2010 and that of the indicator based on industrial production excluding construction extends to the first quarter of 2011. For the first quarter of 2011 the latter indicator is based on data for January and February only. The indicators are derived by applying a one-sided band pass filter.

component or to a weakening of trend growth. The chart shows that the business cycle indicator based on industrial production excluding construction is very similar to the cycle derived from real GDP. This suggests that the first indicator, for which data are available on a monthly and more timely basis (production data are released with a 1½-month delay, whereas real GDP data are only available at a quarterly frequency and are released 1½ months after the end of the quarter to which they relate), is able to track developments in overall economic activity well and can therefore be used as a coincident business cycle indicator for the euro area. Chart B also highlights the fact that these two business cycle indicators typically peak before the start of recessions in the euro area, as dated by the Centre for Economic Policy Research (CEPR), and reach a trough around the end of these periods.<sup>3</sup> These features underline the relevance of these deviation cycle indicators.

### Prediction

Using the monthly business cycle indicator derived from industrial production excluding construction as a reference for the euro area business cycle, a euro area-wide leading indicator (ALI) that aims to predict movements in this business cycle indicator well in advance has been developed. The ALI is derived as a composite index of a number of leading series, which are carefully selected from a large pool of data that have shown a comparatively strong and stable lead with respect to the indicator derived from industrial production excluding construction. Moreover, emphasis is put on ensuring that a broad economic mixture of leading series is used to derive the ALI in order

<sup>3</sup> The CEPR business cycle dating refers, in contrast to the derived business cycle indicators, to the concept of the classical business cycle, which defines the business cycle in terms of the level of economic activity. A comparison of the results is nevertheless useful, as the CEPR dating is probably the most widely used business cycle dating for the euro area and there is a close link between the classical and deviation cycle developments (see Marcellino, M. (2006), "Leading indicators", in Elliott, G., Granger, C.W.G. and Timmerman, A. (eds.), *Handbook of Economic Forecasting*, Elsevier, Vol. 1, Chapter 16, pp. 879-960).

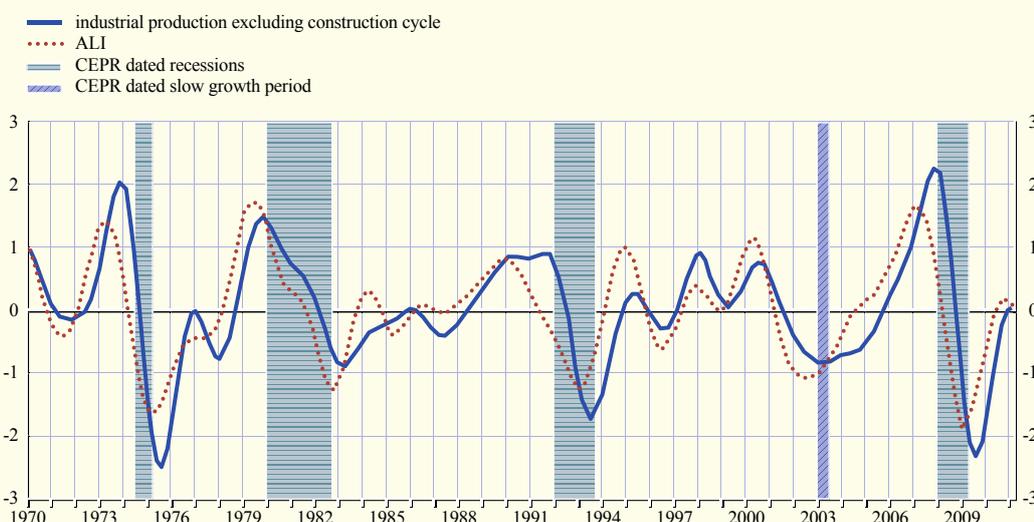
to guarantee that information on different parts of the economy and from different data sources is exploited, which should also help to enhance the robustness of the ALI. It is calculated as the unweighted average of nine leading series, all of which are measured as the percentage deviation from trend and are shifted when included in the composite index according to their respective lead times. These series are the ten-year government bond yield, the stock price index, real M1, building permits granted, consumer confidence, the economic sentiment indicator, the manufacturing new orders/stocks ratio obtained from the Purchasing Managers' Survey, the US unemployment rate and the Institute for Economic Research (Ifo) business expectations indicator for Germany.<sup>4</sup> The ALI projects the development of the business cycle indicator derived from industrial production excluding construction five months ahead and, since the series included in the index have earlier release times than data on industrial production, it effectively leads the industrial production-based business cycle indicator by six months.<sup>5</sup>

Chart C plots the development of the monthly business cycle indicator derived from industrial production excluding construction together with that of the ALI.<sup>6</sup> The chart underlines the fact that the ALI generally accurately leads the industrial production cycle and signals cyclical turning points before and after euro area recessions.<sup>7</sup> With regard to the latest cyclical developments, the

- 4 The leading properties of the expectations reported in a survey of around 7,000 businesses in Germany for the euro area business cycle are probably largely due to Germany's considerable importance as a motor for the euro area economy given its size and the high share of the manufacturing sector in total value added in Germany compared with other euro area countries. The article entitled "Predictive power of leading indicators for euro area GDP growth" in the June 2008 Quarterly Bulletin of De Nederlandsche Bank shows that the Ifo business expectations indicator for Germany appears to be the best predictor for euro area real GDP growth out of a set of 130 series.
- 5 By successively dropping series with the shortest lead times from the overall composite index, indicators with even longer lead times can be derived, but at the cost of declining reliability.
- 6 The industrial production cycle shown in Chart C may deviate from that plotted in Chart B, because Chart B is based on monthly rather than quarterly data and uses data as of January 1960.
- 7 An analysis for the period 2007 to 2009 shows that the indicators signalled the latest trough and upturn well in real time (see the reference cited in footnote 2).

**Chart C Euro area business cycle indicator derived from industrial production (excluding construction) and the euro area-wide leading indicator (ALI)**

(percentage deviation from trend; standardised, monthly data)



Sources: Thomson Reuters, ECB, European Commission, Eurostat, Ifo Institute for Economic Research, Markit, US Department of Labor and ECB calculations.

Note: The latest observation for the industrial production cycle refers to February 2011 and the latest observation for the ALI refers to March 2011.

business cycle indicator derived from industrial production excluding construction returned to an expansion phase around the turn of this year, a move that had been consistently predicted by the ALI. This movement to an expansion phase is also consistent with the latest developments in the capacity utilisation rate in the euro area, which returned to its long-term average in April. Looking ahead, the ALI projects ongoing positive cyclical developments in the euro area at a stabilising or slightly declining rate over the lead horizon of the index (until August 2011). A similar business cycle outlook for the near term emerges from the latest Conference Board and OECD composite leading indicators. In this context, it is important to note that the ALI is designed to predict the direction of and, in particular, turning points in the euro area business cycle. The ALI is, hence, a qualitative indicator for the euro area business cycle which is one of the main differences from short-term GDP forecasting tools,<sup>8</sup> which are quantitative in nature.

All in all, the business cycle indicator derived from industrial production excluding construction provides useful information on a monthly basis for identifying cyclical developments in euro area real GDP at an early stage, and the ALI is useful for signalling the future direction of and turning points in the euro area business cycle six months ahead. Such qualitative business cycle indicators are used in the internal analysis of ECB staff with a view to providing information which complements data from other sources, including quantitative short-term GDP forecasting tools. It must also be kept in mind that the focus of the deviation cycle approach is on developments in the cyclical component vis-à-vis those in the trend, both of which are measured with considerable uncertainty. In addition, some of the underlying series used in this approach are subject to revisions over time, and historical relationships and average lead times could change, for instance owing to structural changes in the economy.

<sup>8</sup> See e.g. the article entitled “Short-term forecasts of economic activity in the euro area”, *Monthly Bulletin*, ECB, April 2008.