

## Box 9

### IDENTIFYING CYCLICAL SIGNALS FROM EURO AREA ECONOMIC INDICATORS

For cyclical analysis in general and the assessment of the current economic situation in the euro area in particular, it can be very useful to try to distinguish whether a turnaround in one of the regularly monitored monthly economic indicators represents a genuine cyclical turning point or is simply “noise”. Filter techniques can be used to distinguish between cyclical and irregular movements of time series. The filtered results are, however, generally less reliable at

the end of the sample, i.e. for the part of the time series most relevant for an assessment of the current economic situation. An alternative way to tackle this issue, which avoids the end-point problem, is to base the distinction between a genuine cyclical movement and data volatility on past experience with the series. This can be done by applying the “Months for Cyclical Dominance” measure, which is based on a comparison of the average sizes of changes in the irregular and cyclical components of a series over different time spans in the past.<sup>1</sup> On the basis of this statistic it is possible to derive an indication of the length of time over which a change in a series needs to be observed in order to be relatively confident that it reflects a cyclical development and is not just noise. This box presents the Months for Cyclical Dominance measure and applies it to a range of indicators regularly used in the monitoring of economic activity in the euro area.

### The Months for Cyclical Dominance approach

To derive the Months for Cyclical Dominance for an economic indicator, the seasonally adjusted series first has to be decomposed into estimates of its irregular, cyclical and, where applicable, trend components. This can be done using standard filter techniques. If changes in the trend component are approximately zero over shorter horizons, short-term changes in the time series can be attributed largely to changes in the irregular and cyclical components. In a second step, noise-to-signal ratios are calculated. These compare the average size of the short-term change in each of these two components for different time spans. As the size of the change in the cyclical component tends to increase with the time span, while the change in the irregular component remains about the same regardless of the time span, the noise-to-signal ratio declines when the time span increases. Once the change in the cyclical component exceeds that in the irregular component, the ratio falls below 1. The length of the time span at that point is the number of months required on average for the cyclical component to become dominant over the irregular component for that series, i.e. the Months for Cyclical Dominance. The Months for Cyclical Dominance hence indicates the minimum time span over which a change in a given series needs to be observed to be considered as cyclical. Generally, the noisier a series, the longer that time span.

However, while a value for the ratio below 1 indicates that an observed change in the series over this time span is more likely to reflect a cyclical development than noise, to be relatively confident that this is in fact the case, one might also consider choosing a time span corresponding to a noise-to-signal ratio somewhat further below 1. At a value of 0.95, for instance, changes in the irregular component over that horizon have been on average only 5% smaller than those in the cyclical component. The value for the noise-to-signal ratio should not be too low, however, as this delays the detection of cyclical changes.

### Empirical results for economic indicators for the euro area

The Months for Cyclical Dominance approach was applied to a range of short-term economic activity indicators for the euro area. The indicators considered included “hard” data on production in the industrial and construction sectors and sub-sectors of the former. Survey data from the

<sup>1</sup> The Months for Cyclical Dominance measure goes back to Shiskin, J., “Electronic Computers and Business Indicators”, *Occasional Paper Series*, No 57, National Bureau of Economic Research, 1957. See e.g. also Shiskin, J., “How accurate?”, *The American Statistician*, Vol. 14, No 4, October 1960, pp. 15-17.

European Commission and Purchasing Managers' Index surveys on activity developments in the industrial, construction and services sectors as well as in the economy as a whole were also taken into account. The table shows the noise-to-signal ratios for the indicators for time spans of one to six months.<sup>2</sup> It also gives an indication of the minimum period over which a change must be observed in the different indicators to be relatively confidently classified as cyclical. To allow some safety margin when selecting the horizon empirically and reduce the likelihood of a false signal of a cyclical change being given, the threshold for the noise-to-signal ratio was set at below 0.8.

The table highlights the fact that there are large differences in the noise-to-signal ratios of the indicators considered and, hence, the number of months over which a change needs to be observed to be relatively confidently considered as cyclical. For the vast majority of the hard production data series the irregular component dominates over developments in the cyclical component even when changes over three months or more are taken into account. Even for the headline series on industrial production (excluding construction), developments need to be observed taking the above safety margin for the noise-to-signal ratio over at least five months before they can be relatively confidently assessed to represent cyclical movements. Developments in series such as construction and energy production need to be observed over an even longer time span. The best-performing indicator among the production data appears to be intermediate goods production, but even here a change must be observed over four months for a conclusion to be drawn. Moreover, taking the publication delays for production data into account (about one and a half months after the reference month), even for the series on intermediate

2 The empirical results were derived by applying the Baxter-King band pass filter.

#### Noise-to-signal ratios and selected number of months for economic activity indicators

Monthly indicator	Noise-to-signal ratios (number of months)						Selected number of months
	1	2	3	4	5	6	
Industrial production (excluding construction)	3.0	1.6	1.0	0.9	0.7	0.5	5
Intermediate goods production	2.0	1.2	0.8	0.6	0.5	0.4	4
Capital goods production	2.8	1.5	1.0	0.8	0.7	0.5	5
Durable consumer goods production	3.6	1.8	1.3	1.0	0.8	0.6	6
Non-durable consumer goods production	4.8	2.5	1.8	1.5	1.2	0.9	>6
Consumer goods production	3.0	1.8	1.4	1.1	0.9	0.7	6
Energy production	6.0	3.6	2.4	1.9	1.6	1.3	>6
Manufacturing production	2.2	1.2	0.8	0.7	0.5	0.4	4
Construction production	4.4	2.5	1.7	1.4	1.2	1.0	>6
EC industrial confidence	0.8	0.5	0.4	0.3	0.3	0.2	2
EC services confidence	1.9	1.1	0.8	0.7	0.5	0.4	4
EC construction confidence	2.6	1.6	1.0	0.7	0.6	0.4	4
EC economic sentiment indicator	0.9	0.6	0.4	0.3	0.3	0.2	2
PMI manufacturing total	1.0	0.8	0.6	0.5	0.4	0.3	3
PMI manufacturing output	1.3	0.9	0.7	0.5	0.4	0.4	3
PMI manufacturing new orders	1.3	1.0	0.7	0.6	0.4	0.4	3
PMI services business activity	1.6	1.1	0.9	0.6	0.5	0.4	4
PMI services new business	1.7	1.3	1.0	0.7	0.6	0.5	4
PMI construction output	2.1	1.4	1.1	0.8	0.7	0.5	5
PMI construction new orders	1.9	1.2	1.0	0.7	0.6	0.5	4
PMI composite output	1.3	1.0	0.8	0.6	0.5	0.4	4
PMI composite new business	1.4	1.1	0.8	0.7	0.5	0.4	4

Sources: Eurostat, European Commission, Markit and ECB calculations.

Note: EC stands for European Commission; PMI stands for Purchasing Managers' Index.

goods production a cyclical signal can be relatively confidently identified only almost half a year after the reference month, which is too late to be useful for analysis of the current economic situation.

Survey indicators show a better performance than hard data, but here, too, notable differences are visible between indicators. The best results are obtained for the European Commission's industrial confidence indicator, closely followed by its economic sentiment indicator. For these indicators, even changes observed over two months have a relatively high likelihood of being driven by the cycle. For industrial confidence, the irregular fluctuations over two months are already on average about 50% smaller than cyclical changes. Among the Purchasing Managers' Index surveys, the Purchasing Managers' Indices for manufacturing show the best results, with noise-to-signal ratios of 0.6 to 0.7 for three-month changes. The better performance of the surveys in terms of the Months for Cyclical Dominance together with their better timeliness (as they are released towards the end of the month in question or at the beginning of the following month) make these data the most useful in terms of timely information on cyclical developments (to the extent these are captured by the survey data).

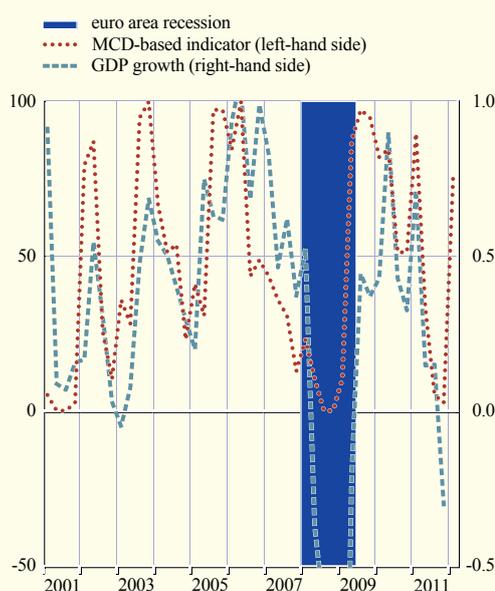
### Signals for the cyclical situation in the euro area

A convenient way to summarise the cyclical signals from short-term indicators on the basis of their Months for Cyclical Dominance is to compute the fraction of those indicators that signal a cyclical improvement, i.e. the fraction of them that have improved over at least the time span considered reliable on the basis of the Months for Cyclical Dominance. This approach is illustrated in the chart using the signals given by the set of surveys discussed above. Hard data are not considered in this summary indicator given their delayed signals for cyclical changes.

The chart shows that the indicator seems to quite reliably detect changes in the underlying strength of GDP growth. It should be stressed, however, that the summary indicator should not be interpreted as providing quantitative estimates of the strength of growth. The changes in the indicator appear on average to slightly lead changes in the underlying strength of GDP growth. In addition, the information underlying the indicator is available earlier than the national accounts data for the same reference period. As regards the current situation, the indicator suggests a cyclical improvement for the first quarter of 2012. About 75% of the underlying series increased in the first quarter over at least the horizon considered as reliable on the basis of the Months for Cyclical Dominance.

Fraction of selected survey indicators pointing to a cyclical improvement

(percentages; quarterly rates of growth)



Sources: Eurostat, European Commission, Markit and ECB calculations.

Note: To improve the readability of the chart, the sharply negative quarterly growth rates of GDP during the recession are cut off. MCD stands for Months for Cyclical Dominance.

Overall, the Months for Cyclical Dominance approach appears to be a useful tool to distinguish cyclical from irregular developments in economic indicators and to help identify indicators that may provide early signals of a change in the cycle. While it puts a focus on indicators that have low noise-to-signal ratios and provide timely information on a turning point, the approach however does not take into account the strength of their relationship with GDP growth. In addition, the set of series included in the summary indicator used to illustrate the results and the applied weighting scheme are not directed towards deriving quantitative indications of the strength of growth. This notwithstanding, the summary indicator seems to track changes in the underlying growth momentum in the euro area quite well and at an early stage. As regards the current cyclical situation in the euro area, the results suggest that the increases in economic indicators in the first quarter are not just due to noise but are likely to reflect a genuine cyclical improvement, while the evidence for the second quarter is still too limited to draw a conclusion.