Box 7

SEASONAL ADJUSTMENT OF SHORT-TERM ECONOMIC INDICATORS FOR THE EURO AREA IN THE CURRENT RECESSION

Many short-term economic indicators are significantly affected by events that recur regularly at the same time each year. Summer holidays, for instance, lead to a sharp decline in industrial production every August, and Christmas shopping boosts retail trade turnover every December. Such seasonal effects make the assessment of short-term economic developments more difficult. Therefore, in order to meaningfully interpret the data in conjunctural analysis, the time series of short-term economic indicators are adjusted for seasonal variations. Certain economic developments like the current sharp recession, however, pose additional challenges for seasonal adjustment procedures as they make it harder to identify the part of the movement of the series that is due to recurring seasonal developments.

This box initially outlines the basic concept of seasonal adjustment. It continues with an explanation of how the seasonal adjustment of short-term economic indicators is conducted in the euro area. Using euro area industrial production as an example, it illustrates how seasonal adjustment works in general and how recent economic developments may have increased the uncertainty surrounding seasonally adjusted data.

Basic concept of seasonal adjustment

Seasonal adjustment procedures are aimed at identifying and extracting the seasonal pattern from e.g. a monthly or quarterly economic indicator, i.e. at eliminating those effects that occur year after year in the same month or quarter and impact on the series by approximately the same amount each time.[1] The most widely used seasonal adjustment methods rely on the decomposition of an economic time series into non-observable components, i.e. a trend-cycle component, a seasonal component and an irregular component. After seasonal adjustment, the series reflects the trend-cycle component, which is typically the focus of conjunctural analysis, but also irregular movements, including outliers.

While stable seasonal patterns can be estimated and extracted in a straightforward manner, modelling seasonality in practice usually requires allowing for gradual changes in the seasonal component over time. Time-varying seasonality may, however, significantly increase the uncertainty in estimating a seasonally adjusted series. Unusual developments in the most recent data of a series may imply additional uncertainty, since it is hard to isolate the movement in the seasonal component from the overall dynamics of the series. Sharp upturns or downturns, for instance, can significantly increase the uncertainties involved in identifying and estimating the seasonal pattern of a time series.

A number of different methods are available for seasonal adjustment; the most frequently used are TRAMO-SEATS, which extracts the seasonal pattern from a time series by finding a suitable

1 A related issue is calendar adjustment, which is conducted in addition to seasonal adjustment. It is aimed at eliminating calendar effects, i.e. effects that are specific to the situation in a given calendar year, e.g. on whether 1 May falls on a weekend or within a week, or on whether Easter is in March or April. However, calendar effects related to the "average" calendar situation in a given month or quarter, e.g. on the fact that 1 May falls on weekdays more often than on weekends and that Easter is more often in April than in March, are eliminated by the seasonal adjustment process.

mathematical decomposition of an ARIMA model into seasonal and non-seasonal components, and X-12-ARIMA, which – in essence – estimates the impact of seasonal movements on the basis of moving averages applied to seasonal periods.

Seasonal adjustment of short-term economic indicators in the euro area

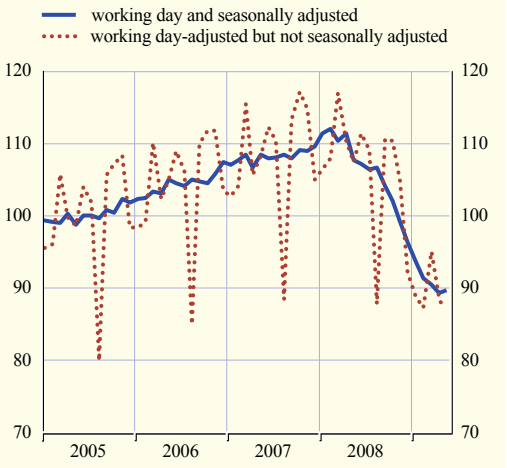
For the euro area as a whole, Eurostat, the Statistical Office of the European Communities, estimates seasonally adjusted short-term economic indicators (e.g. industrial production, new orders and retail sales) by aggregating non-seasonally adjusted country data and then directly adjusting the euro area aggregate (thus using the so-called "direct approach" to seasonal adjustment). Another approach to obtaining seasonally adjusted data for the euro area is the aggregation of the seasonally adjusted national series. This "indirect approach" to seasonal adjustment is often applied by market analysts, who use already released seasonally adjusted national data to compute a first estimate for the euro area as a whole, prior to its official release by Eurostat.[2] Since seasonal adjustment normally implies non-linear transformations, the outcome of the direct adjustment of euro area aggregates usually differs from that of the aggregation of adjusted national results. The production of reliable euro area results through indirect adjustment requires that all countries adjust on the basis of the same program and apply the same adjustment policy with respect to e.g. the criteria used not only for selecting and adapting models and functions, but also for revising back data. This is not yet the case for short-term economic indicators in the euro area as an only limited degree of harmonisation has been reached across national statistical institutes, so that the aggregated nationally adjusted data might reflect spurious effects.[3]

Seasonal adjustment of euro area industrial production data

The effect of seasonal adjustment can be illustrated by comparing the seasonally adjusted and unadjusted time series of euro area industrial production, as compiled by Eurostat. Chart A highlights the extreme volatility of the seasonally unadjusted series of industrial production (excluding construction) with its strong, but very regular seasonal pattern. The most striking effect of seasonal adjustment is recorded in August every year when production regularly falls by about 20%, month on month, in unadjusted terms and rebounds sharply thereafter, which compares with a typical order of magnitude of close to or below 1% in absolute terms for the monthly rates of change in the seasonally adjusted series

Chart A Euro area industrial production (excluding construction)

(index: 2005 = 100)



Source: Eurostat.

2 The release dates of national data on short-term economic indicators are not synchronised.

3 In order to foster the harmonisation of seasonal adjustment procedures, the European Statistical System and central banks have recently developed comprehensive guidelines on seasonal adjustment, in which the use of either TRAMO-SEATS or X-12 is recommended. See http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-09-006/EN/KS-RA-09-006-EN.PDF.

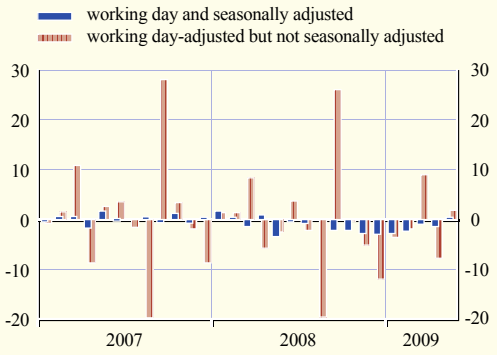
(see Chart B). This illustrates that, in practice, unadjusted production data are not very informative for conjunctural analysis.

Uncertainty in seasonally adjusted industrial production data in the context of the current recession

As mentioned earlier, uncertainty in seasonally adjusted series can be much higher in times of unusual developments such as during the current sharp recession. Chart C illustrates the outcome based on different seasonal adjustment approaches and methods. Chart C, panel (a), shows the differences between the monthly rates of change in Eurostat's official industrial production figures for the euro area, based on TRAMO-SEATS, and the aggregate of seasonally adjusted national data. Chart C, panel (b), depicts the differences between Eurostat's figures and an X-12 test calculation applied directly to the euro area figures.[4] While larger deviations between Eurostat's official euro area figures and the aggregation of national results are occasionally also observed for the period prior to the recession, Chart C, panel (a), highlights that the magnitude of these deviations has increased during the current recession, in particular since its intensification in September 2008. There has also been an accumulation of consecutive deviations in the same direction. Moreover, Chart C,

Chart B Euro area industrial production (excluding construction)

(monthly percentage changes)

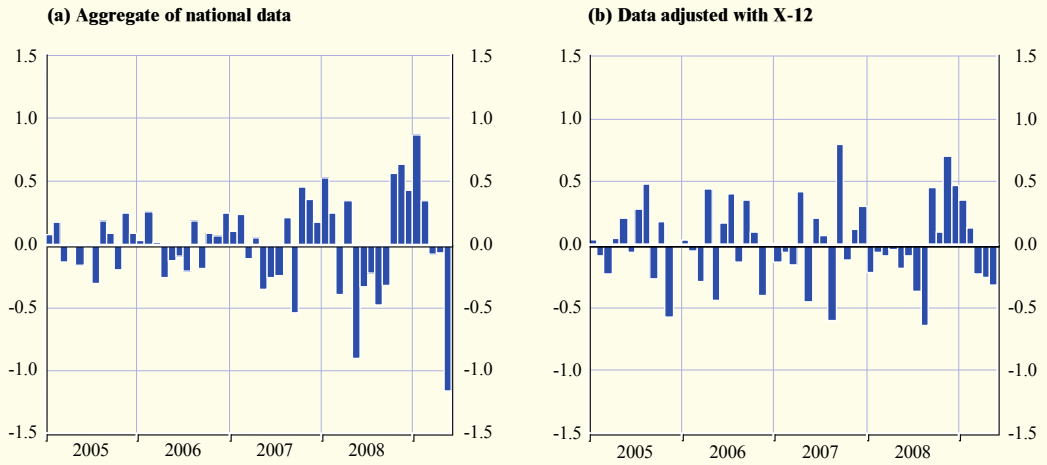


Sources: Eurostat and ECB computations.

4 X-12 was applied by keeping the seasonal pattern reasonably stable and not allowing the detection of outliers at the most recent end of the series.

Chart C Euro area industrial production (excluding construction) – differences between the monthly rates of change in Eurostat's seasonally adjusted data and alternative calculations

(percentage points)

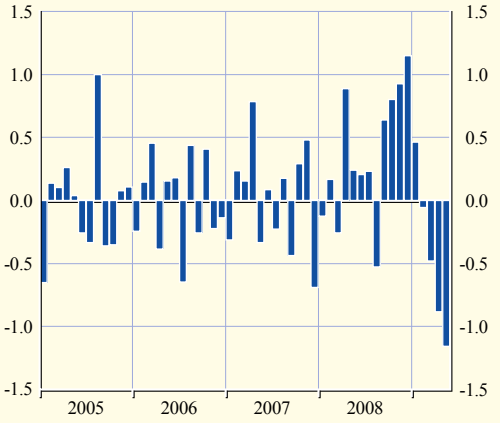


Sources: Eurostat and ECB computations.

panel (b), shows a rather unusual clustering of consecutive differences in the same direction between Eurostat's official euro area data and those of direct adjustment with X-12 during the sharpest part of the recession, but the magnitude of these discrepancies appears to be within the normal margin of statistical uncertainty.

Chart D Difference between Eurostat's figures on seasonally adjusted industrial production (excluding construction) and the aggregate of the corresponding national figures, based on real time data

(percentage points)



Sources: Eurostat and ECB computations.

While the larger or more protracted discrepancies observed between the outcomes of different seasonal adjustment approaches and methods provide indications of larger uncertainties in the seasonally adjusted figures, it is important to note that, as of January 2009, the data have also been significantly affected by the introduction of the new classification of economic activities (NACE Rev2) and by the use of updated weights that refer to the base year 2005. These methodological changes have also led to exceptional revisions to adjusted and unadjusted data during, in particular, the first quarter of 2009.[5] More generally, the most recent data in Chart C, panels (a) and (b), may imply somewhat larger discrepancies, given that Eurostat's first euro area data release includes estimates for some countries.[6] Moreover, due consideration must be given to the fact that any estimation of the movement in the seasonal pattern over time is generally prone to higher statistical uncertainties at the recent end of a time series. These uncertainties are amplified by the sharp drop recorded as a consequence of the current recession.

Chart D shows the differences between the Eurostat figures and the aggregate of seasonally adjusted country data on the basis of real time data (i.e. unrevised data reflecting the respective information at the time of the first release of the Eurostat data), which takes account of the generally higher statistical uncertainties at the recent end of a time series. It shows that deviations in earlier years based on real time data have in fact been somewhat larger, on average, than those reflected in current data (as depicted in Chart C, panel (a)), and occasionally also very large. It also highlights very clearly, however, that the recent deviations, as shown in Chart C, panel (a), were initially even more exceptional in terms of both their magnitude and their persistence, and have led to a more protracted divergence than usual between the estimates obtained on the basis of the different approaches.

The increased discrepancies between Eurostat's production figures and the aggregate of country data also entail increased uncertainties for conjunctural analysis. Although seasonally adjusted country data are compiled in a non-harmonised manner, the aggregate of these national data has often been used to derive early signals concerning Eurostat's seasonally adjusted euro area

5 For further details, see the box entitled "Recent changes in short-term statistics" in the April 2009 issue of the Monthly Bulletin.

6 Certain countries may not provide data for the most recent month at the time of the first release of Eurostat data. In such cases, Eurostat estimates the data for the missing countries and integrates these estimates in the calculation of the euro area aggregates; the individual estimates (at country level) are not published. These country data have likewise not been included in the country aggregations in Chart D.

figures. While it is evident from occasionally larger past deviations that the country aggregation does not necessarily – not even in normal times – provide a good estimate of the Eurostat figure, it is clear from Chart D that such approximations have become even more uncertain in recent times. Overall, given the increased uncertainties in seasonally adjusted figures, users should avoid extracting strong signals from short-term developments, such as monthly rates of change, in the current circumstances even more than in less exceptional times.