6 The role of seasonality and outliers in HICP inflation excluding food and energy

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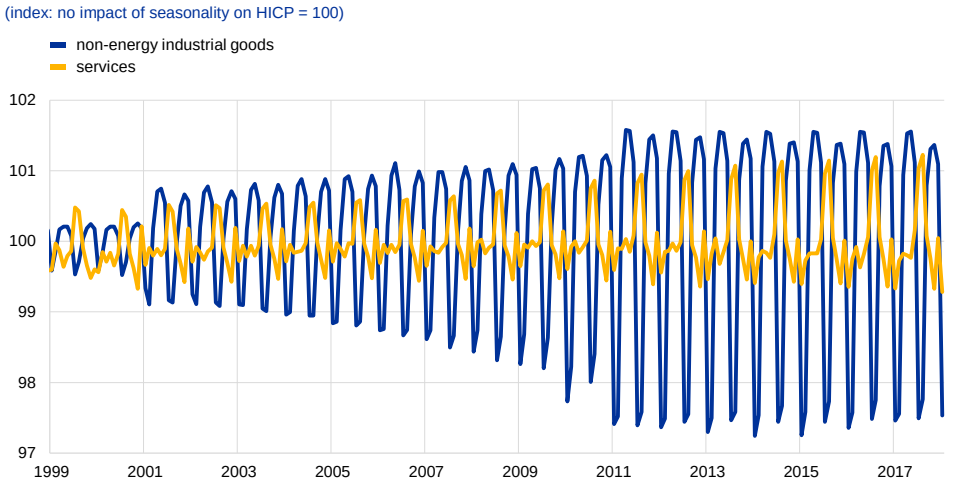
Measures of underlying inflation provide a means of looking beyond short-term volatility in price developments. An example of this is the exclusion of the highly volatile food and energy components from the HICP. However, HICP inflation excluding food and energy can still be subject to short-term volatility. This box reviews two possible sources – changes in seasonality and idiosyncratic price changes (henceforth "outliers") – and assesses to what extent they can explain recent short-term volatility in the profile of euro area HICP inflation excluding food and energy.

Seasonal fluctuations in the euro area HICP excluding food and energy have become more pronounced over time. Seasonal fluctuations per se have no impact on annual inflation rates, but changes in the seasonal factor do. A considerable part of the increased seasonality is due to methodological changes, although some of it also appears to reflect a more general development.[24] The increased seasonality is visible in both the HICP for non-energy industrial goods and the HICP for services (see Chart A).

Chart A

Seasonal factor for the euro area HICP for non-energy industrial goods and services



Sources: Eurostat and ECB calculations.
Notes: The seasonal factor is calculated as the ratio between the non-seasonally adjusted series and the seasonality-adjusted series. A number above (below) 100 means a positive (negative) impact of seasonality on the euro area HICP for non-energy industrial goods and services.

The impact of seasonality on the HICP for non-energy industrial goods and on the HICP for services is related mainly to prices for clothing and travel-related services respectively. Seasonal sales of clothing usually take place in the winter months of January and February and in the summer months of July and August (see

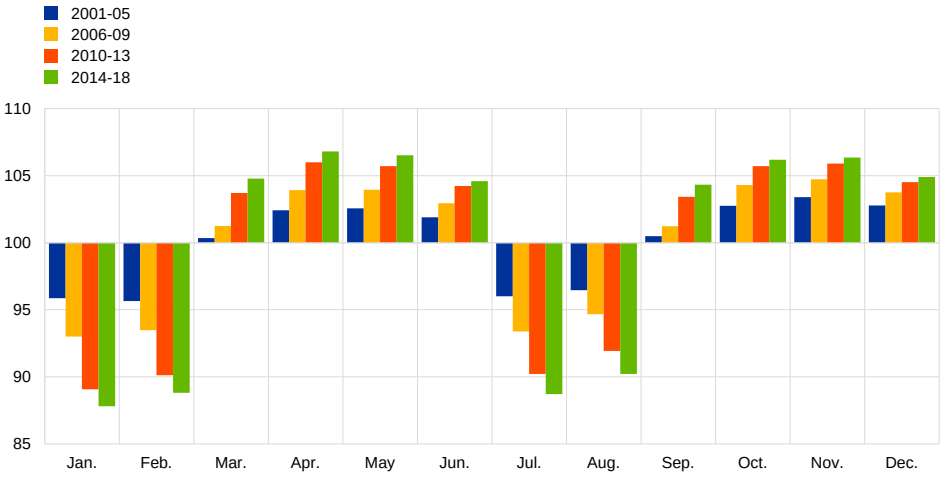
[24] For a definition of "seasonality", see the box entitled "Harmonised Index of Consumer Prices – Easter effects and improved seasonal adjustment", *Economic Bulletin*, Issue 3, ECB, 2016.

Chart B).[25] An earlier (later) start to the sales period can then imply a stronger (weaker) month-on-month price change than in the previous year and hence a strong, temporary decrease (increase) in the annual inflation rate. The seasonality impact on clothing prices has become substantially larger since 2001, not least due to enhanced price collection, improvements in methods for compiling price changes in winter and summer clothing and, since 2010, the introduction of the regulation on the treatment of seasonal products.[26] Seasonality in the prices of travel-related services (e.g. package holidays, accommodation and air transport) implies strong price changes mainly in the summer and winter months (see Chart C).[27] Given the relative high weight of clothing and travel-related services in the HICP excluding food and energy (about 12%), deviations from the usual seasonal pattern can have a strong impact on annual inflation.

Chart B

Seasonal factor for the euro area HICP for clothing

(index: no impact of seasonality on HICP = 100, averages)



Sources: Eurostat and ECB staff calculations.
Notes: For clothing prices, reference is made to the garments price index in the HICP. The period 2014-18 includes data up to and including January 2018. The seasonal factor is calculated as the ratio between the non-seasonally adjusted series and the seasonality-adjusted series. The authors use the X12-regArima procedure to seasonally adjust the series.

25 Italy and Spain drive the strong seasonality in clothing prices, while Germany and France exhibit a less pronounced seasonal pattern.

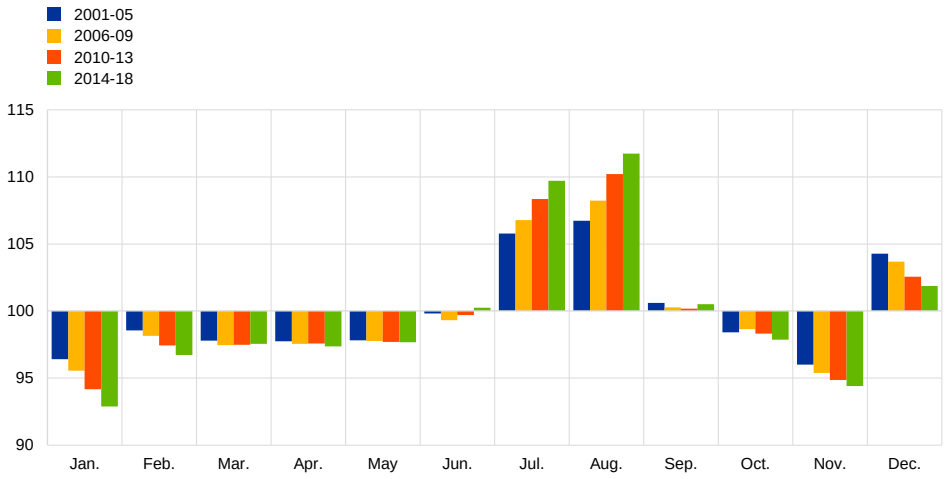
26 See the box entitled “Methodological changes in the compilation of the HICP and their impact on recent data”, *Monthly Bulletin*, ECB, April 2011.

27 With respect to travel-related services, seasonality is dominated by France in the summer months and Germany throughout the year, which in the case of Germany reflects mainly a distinct seasonal pattern for package holidays. The exact timing of summer holiday periods may change from one year to the next. By definition, the impact of this change would not be captured by the seasonal factor.

Chart C

Seasonal factor for the euro area HICP for travel-related items

(index: no impact of seasonality on HICP = 100, averages)



Sources: Eurostat and ECB staff calculations.
Notes: Travel-related items include package holidays, accommodation services and air transport. The period 2014-18 includes data up to and including January 2018. The seasonal factor is calculated as the ratio between the non-seasonally adjusted series and the seasonality-adjusted series. The authors use the X12-regArima procedure to seasonally adjust the series.

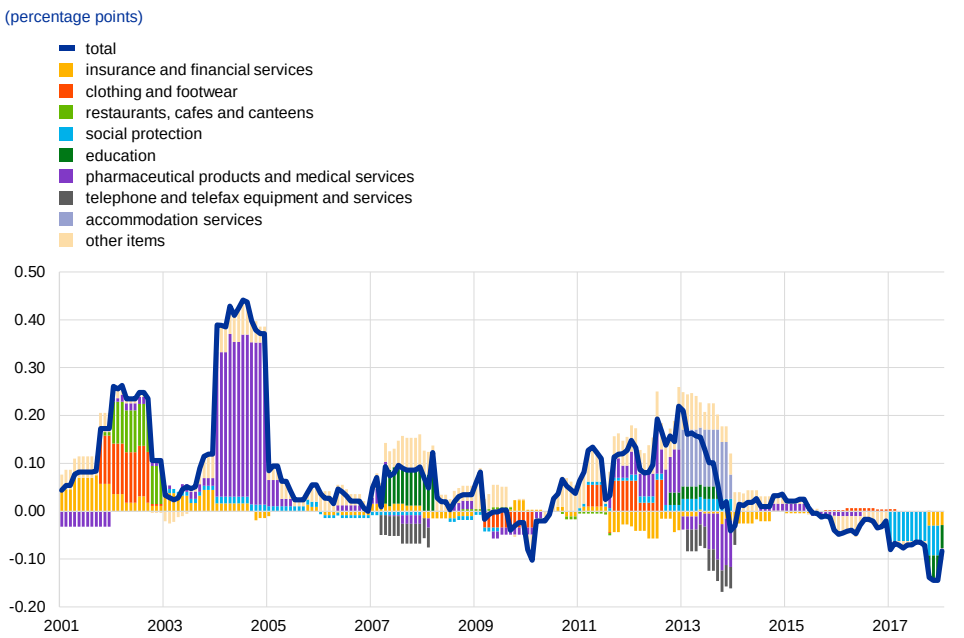
The profile of HICP inflation excluding food and energy is also affected by outliers. Outliers can be defined as unusual price changes that are statistically significantly above or below the average change in a given month (after controlling for seasonal and calendar effects) and that are usually related to specific events.[28] Prominent examples of such events are a change in the VAT rate or an administrative measure, but also organised international events, such as world fairs (Expo) or the Olympic Games. Chart D shows a decomposition of the impact of outliers defined in this way.[29] In 2017 the contribution of outliers to HICP inflation excluding food and energy was around −0.1 percentage point, the strongest net negative contribution in the sample 2001-17. This was a result of a reduction in social security contributions in Germany in January 2017, a broadening of the exemption from payment of university fees in Italy in October 2017 and a reduction in transport insurance premiums in Germany in October 2017.

28 For this box, outliers were identified by means of autoregressive integrated moving average (ARIMA) models (according to X13-regArima). Only the impact of level shift outliers is shown, as there is a certain likelihood that identified additive outliers may not be sufficiently distinguishable from changes in seasonality. For items with no seasonality, outliers have been identified as month-on-month changes that are three standard deviations away from the average, which is close to the critical value applied in the regArima procedure.

29 The outliers are identified individually for the 72 items in the euro area HICP excluding food and energy. The aggregation of these outliers may differ from that implied in the ECB's seasonal and calendar adjustments of the euro area HICP excluding food and energy and of the services and non-energy industrial goods components. This is due to the increased likelihood of having outliers at a more disaggregated level of prices.

Chart D

Contribution of outliers to annual HICP inflation excluding food and energy



Sources: Eurostat and ECB staff calculations.

The impact of outliers on annual inflation rates is usually short-lived. The impact of an unusual price change compared with the previous month will affect inflation rates for a period of one year, unless the impact is relatively quickly reabsorbed in the subsequent month(s), possibly then implying outliers in the other direction. One example is a very mild winter with no snow in the ski resort regions, implying less demand for accommodation services and lower price increases compared with the usual profile. However, the frequency of price-setting for most of the items considered in Chart D is usually low, especially for administered prices, making the outlier price change mostly a true level shift with an impact on inflation that disappears only after one year.

Increasing seasonality and outliers raise the potential for inflation surprises. The detection and assessment of unusual changes in seasonal patterns and outliers is important for short-term forecasting in order to disentangle short-lived shocks from cyclical fluctuations and medium to long-term trends. In practice, owing to their unexpected and one-off nature, outliers are often mechanically incorporated when updating the short-term inflation forecast path – keeping the month-on-month profile for subsequent months unchanged compared with the previous forecast. This bears the risk of overlooking that the outlier might be a first step in a change in trend, or that it might unwind very quickly via a countermovement.