METHODOLOGICAL NOTE

GUIDANCE ON TREATMENT OF COVID-19-CRISIS EFFECTS ON DATA

Background

The COVID-19 outbreak has a severe impact on several economic activities. This does not only concern most EU countries but also the rest of the world and might lead to a major downturn in the economy. When compared with similar previous economic situations, the main difference is that this time the turning point for the European Union and the Euro zone can be clearly determined.

Data issue

In statistical terms, the current crises can be translated into the treatment of an end point of the time series; in theory this might be seen as a simple question with an answer provided by the "ESS guidelines on seasonal adjustment, (Eurostat, 2015)", where in chapter 2.8 there is guidance about the "Treatment of outliers at the end of the series and at the beginning of a major economic change". **Important to note that atypical values are treated as outliers with an opportune modelling strategy**. The main alternatives are additive outlier (AO), transitory change (TC) and level shift (LS).

Figure 1 Source Deutsche Bundesbank

Major economic changes, firstly appear as an additive outlier at the end of the series. **Additional observations are needed** before changing the outlier type from an additive outlier to a transitory change or a level shift. However, changing the outlier type can have an impact on the series revisions and the choice of the type of outlier can influence turning point identification. The outlier may be reflected in

the trend-cycle component or in the irregular, depending on the final specification. Since **the seasonally/calendar adjusted results** contain both the trend-cycle and the irregular component, the effect of the COVID-19 crisis on the data will remain visible.

In the context of seasonal adjustment, a calendar adjustment corresponds to a predictable and recurrent phenomenon linked to the calendar. In contrast, the COVID-19 crisis is completely different and must be handled by means of outliers. At this stage, the data point in question **shall not be treated as a seasonal outlier**, since it would imply that the current COVID-19 outbreak occurs each year in the same period with similar magnitude. For each following observation, a change may occur in the seasonal pattern and/or a discontinuity in seasonality.

Useful to do (prior to data on the crisis period becoming available)

- SARIMA forecast (without the crisis observation), if the series is long enough. Monitor the gap/distance between real value and forecasted to decide on the type of outliers.
- Consult users to assess the direction of the change in different domains/countries (ref. to guidelines 1.2).
- For 2020, note that figures for February could already be affected due to non-response/late response of respondents or resource restrictions in NSI. Many NSIs compile the figures for February in March and prepare the transmission to Eurostat and the national publication in March/ beginning of April, i.e. during the lockdown period. In Italy, the first lockdowns began 21st February.

Possible alternatives (once data on crisis period become available)

a) Outliers are modelled at the end of a time series based on statistical criteria and economic information **(recommended).**
b) Using automatic outlier detection procedures (based on statistical criteria only) as available in JDemetra+ (**acceptable**).
c) Do not model it as outliers at the end of the series but rather assign it to the calendar/seasonal component. (**not recommended**, but could still make sense in some specific case where there is no impact on data expected).

Specific suggestion for crisis period data points

The crisis period (in most cases March/Q1 2020) shall be **modelled as outliers**, depending on the expected impact on a specific domain, and it should be treated at least as an AO. The type of outlier will then be verified when new information will be available, revising it to TC or to LS or staying with the AO using a comparison among the results of three option starting with the successive period. Please note that using an AO to model the event is an implicit assumption that the trend-cycle is not affected (see below Fig. 2). If you expect an impact on the trend-cycle, you could model it already as LS.

A valid alternative is to also **use the projected seasonal factors** to discount for seasonality for the coming months/quarter (this is the "Controlled current adjustment", ref. to guidelines chapter 4.2).

The size and direction of the shock might differ by type of economic activity. An indirect approach should also be preferred within a domain (and/or an economic region such as the EU or Euro zone), or at least used as a comparator when a direct approach is used.
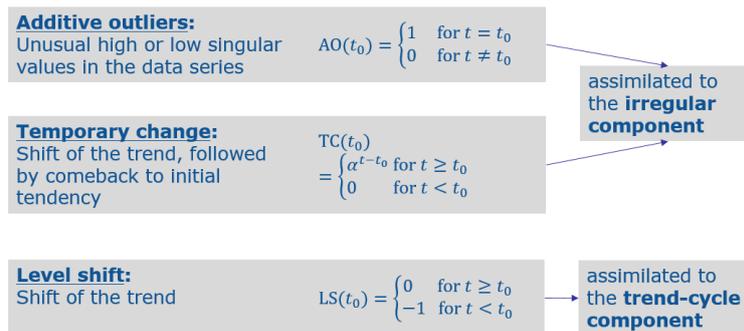
Additive outliers:
Unusual high or low singular values in the data series

$$AO(t_0) = \begin{cases} 1 & \text{for } t = t_0 \\ 0 & \text{for } t \neq t_0 \end{cases}$$

Temporary change:
Shift of the trend, followed by comeback to initial tendency

$$TC(t_0) = \begin{cases} \alpha^{t-t_0} & \text{for } t \geq t_0 \\ 0 & \text{for } t < t_0 \end{cases}$$

assimilated to the **irregular component**

Level shift:
Shift of the trend

$$LS(t_0) = \begin{cases} 0 & \text{for } t \geq t_0 \\ -1 & \text{for } t < t_0 \end{cases}$$

assimilated to the **trend-cycle component**

Figure 2 - Source Deutsche Bundesbank

Other considerations/options

- While the Guidelines in chapter 2.8 are clear on what to do, the actual modelling is more difficult. The use of additional information might help in the process. In case of survey disruption, identifying the real shock might be more challenging.
- Consider the possibility to increase the frequencies of your infra-annual statistics (i.e. switch from quarterly to monthly). This might help an early detection of the turning point.
- Consider the possibility to model the outlier using external regressors with an ad-hoc dummy variable (i.e. for ramp effects, step outlier etc.).
- In line with chapter 2.10 of the Guidelines and in the case of an additive seasonal decomposition, pay attention to the impact of seasonal adjustment on time series with values close to zero due to a COVID-19 crisis effect, as the adjusted figures can become negative, which might be implausible for the series in question (e.g. for indices). If additive adjustment leads to implausible negative adjusted figures, change the decomposition scheme. Depending on the dynamics of the unadjusted figures, shortening the time span for seasonal adjustment at the current end could be another option to rescale the estimates of the seasonal component and, thus, the seasonally adjusted figures appropriately.
- The full shape of the outlier needs to be modelled when future observations become available. This will likely be complex and may need to go beyond TC or LS. It is possible, for instance, that there will be a "stronger" additive effect in the second quarter 2020 before it starts normalizing (the "U-shaped" pattern).
- Communication and guidance for users should be provided. The initial seasonally adjusted results might be revised significantly for many quarters ahead (also due to revisions in the raw data), and the users shall be warned about the increased uncertainty around the seasonally adjusted figures referring to the COVID-19 crisis period.

Further information and support

A remote helpdesk on seasonal adjustment provided by the ESS Centre of Excellence is available at https://ec.europa.eu/eurostat/cros/content/ess-seasonal-adjustment-helpdesk_en

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