Methodological Information -

Impact of COVID-19 on the compilation of the consumer price index

Summary

The extensive restrictions on public life to contain COVID-19 have had an impact on the calculation of the consumer price index since April 2020. Some of the prices could not be collected as usual and were therefore imputed or carried forward. Different methods and approaches were used to compensate for the survey failures and to limit their impact on the inflation rate.

This document provides detailed information about the principles, approaches and methods used to compensate for missing prices and the extent of the imputations required. It allows users of consumer price statistics to better assess the quality of the index and interpret the development of the individual sub-indices and assess their influence on the overall index.
1 COVID-19 challenges and approaches to creating the consumer price index

The monthly price collection for the consumer price index is carried out in more than 3,500 shops and businesses in 19 index cities and regions and is supplemented by a central survey for a total of 768 different goods and services (positions of the basket of goods and services). To calculate the national consumer price index (CPI) and harmonized index of consumer prices (HICP) from the collected price data, a basket with a fixed weighting scheme, which is adjusted annually at the turn of the year in accordance with national and international requirements, is used.

The challenges for calculating the consumer price index in the course of the COVID-19 crisis were manifold. On the one hand, a large part of the shops that are normally visited by the price collectors were closed. On the other hand, for security reasons, local price collectors were sometimes unable to personally collect prices in shops for health safety reasons. Furthermore, a number of services was not offered (such as personal services or cultural events) or were completely discontinued (such as air travel, hospitality and accommodation services).

The consumer price index is designed as a Laspeyres-type price index with a one-year fixed weighting scheme. It is therefore not possible to reduce the number of items in the basket of goods or to change the weighting of individual items and groups from one month to the other within a year. A number of methodological measures were therefore carried out to impute sub-indices for those goods and services that were not available or were only available to a limited extent.

European agreement on fundamental principles for the compilation of harmonised consumer price indices in the context of COVID-19

Eurostat provided RECOMMENDATIONS for the compilation of harmonized indices of consumer prices (HICP) in the COVID-19 crisis, which were discussed and coordinated at a virtual meeting of European price statisticians in the HICP working group on March 25th. The guiding principles for the creation of the HICP, possible imputation procedures and changes to the transmission and publication process were agreed upon.

Principles/Guidelines

Three principles set the methodological framework for the measures regarding possible problems that may arise from COVID-19 restrictions in individual countries for the calculation of HICP:

i. „Stability of HICP weights“: Weights of consumer price indices always refer to the private consumption of a whole year (for HICP approximately the previous year). The temporary elimination of entire consumer segments has no influence on the fundamental weighting scheme.

ii. „Stability of HVPI indices“: The continuity of all index series on which the consumer price index is based should be guaranteed. No index is abandoned. Appropriate imputation procedures and transparent labelling are carried out for indices regarding partially or completely eliminated consumption segments.

iii. „Minimization of the amount of price and sub-index imputations“: Missing price observations from manual price collection should, if possible, be replaced by price information from alternative sources. This is a clear principle that tries to ensure a consumer price index based on transaction prices as much as possible.

Fundamental measures for handling price collection problems

Different methods and approaches were used to compensate for the price collection failures due to COVID-19 restrictions and to limit their impact on the inflation rate. Wherever possible, collection
failures were compensated for using alternative collection methods and data sources. Missing price reports that still existed as well as sub-indices partially or completely affected by market failures had to be imputed using suitable procedures.

These measures, which are described in more detail below, meet the principles agreed across Europe for the creation of consumer price indices in the course of the COVID-19 crisis. Nevertheless, the consumer price indices published between April and July 2020 do not fully meet the usual standards. The consumer price indices, which are mainly or completely updated and whose quality does not meet the usual standards, are therefore referred to separately in all publications. Information is provided transparently about the proportion of the update procedures in the creation of consumer price indices.

2 Compensation of data collection failures through alternative price collection methods

Switch to price collection via telephone or online research

The regional price survey in April and May 2020 in shops and businesses was largely switched to online / telephone surveys or scanner data due to the branch closings, but also for security reasons.

The central price collection, which is carried out by Statistics Austria each month for goods and services with uniform national prices (e.g. insurance) or with complex product characteristics (e.g. nursing homes, holiday package), is already based on surveys by telephone, email, fax and internet. As long as the shops and businesses were accessible and offered their services and goods to consumers, the price collection could continue to be carried out as usual.

The compensation of survey failures through alternative price surveys was carried out in particular in the period April to June 2020 and is described in detail in the respective methodological information for April, May and June.

3 Imputation methods for unusual price reports and market failures

Imputation procedures were used for CPI basket of goods codes/commodity groups for which no regular or compensatory prices could be collected. Imputation procedures are used in price statistics to prevent a distorting influence of missing prices on the price indices. The imputation methods for the calculation of the consumer price index described below are in line with international standards¹ and Eurostat RECOMMENDATIONS². Decisions about the application of imputation methods were based on predefined rules (see also diagram 1).

The following imputation methods were applied:

METHOD A: Imputation with price change rate within a code/CPI market basket position

(Estimation based on available prices for the same product)

This method was used when there were less than 50% of prices missing within one code/CPI basket commodity group. Missing prices were imputed by the applying the average rate of change of all non-missing prices within one code position.

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¹ https://statswiki.unece.org/display/CCD2/Compilation+of+CPI+in+times+of+COVID-19
² All Eurostat Guidelines: https://ec.europa.eu/eurostat/data/metadata/covid-19-support-for-statisticians
METHOD B: Carry forward of previous month’s value

For goods and services, which, based on an analysis of prices from previous years, show stable price patterns from one month to the next, prices from one month were carried forward to the following month (in cases of more than 50% of prices were missing within the product group).

METHOD C: Imputation with nearest higher aggregate

For product groups where only few (<50%) or no prices were collected, the change rate of the nearest higher aggregate is used for data imputation. This way individual product groups are imputed based on price changes of similar goods (nearest higher aggregate: e.g. the price development of bananas is imputed using the rate of change of fruits).

METHOD D: Imputation with overall index

(Estimation based on all reliable sub-indices – all item imputation)

Instead of using the rate of change based on the nearest higher aggregate, the rate of change of the overall index is taken (compiled by using all reliable sub-indices that are not mainly relying on imputations). This method is used in cases where Method C is not appropriate, especially if:

- goods or services from the nearest higher aggregate differ too much from the goods or services within the product group to be imputed (e.g. imputing services with the price development of goods),
- the nearest higher aggregate consists of just one product code,
- all or most of the codes, forming the nearest higher aggregate, have been imputed already

METHOD E: Imputation for seasonal patterns with a seasonal adjustment factor

This method is used for goods and services that have a strong seasonal pattern. There are product codes and COICOP groups, such as package holidays and accommodation that show strong seasonal fluctuations in spring and autumn. Imputation methods A, B, C and D would disrupt the seasonal pattern in these cases, so that no seasonal price change would be visible in the current year in those months in which prices usually go up or down sharply. Expecting usual seasonal prices in April, this would underestimate the inflation rate in the current year and lead to an overestimation in the following year when the pattern reoccurs. To avoid this, the regularly measured rate of change from March 2019 to April 2019 is applied to the prices collected in March 2020, hereby maintaining the seasonal pattern for April 2020.

Diagram 1 displays the decision path and the rules applied for using the described imputation methods.

4. Abolition of the COVID-19 related collection and imputation methods

Since the repeal of most of the lock-down measures, more and more prices can be regularly monitored again. It is important here that the change between the last regular price in March 2020 and the first price that is regularly collected again in the following months is correctly recorded and mapped in the consumer price index, regardless of the prices assumed during the lock down. The
recommendations published by Eurostat on this subject were and will be taken into account when the regular price collection for the consumer price index is resumed for all goods and services.

Diagram 1: Decision path for the treatment of CPI codes since April 2020 in the context of COVID-19
Table 1 lists the share of the update procedures used and the use of scanner data as an alternative data source for the VPI. This table is updated monthly on the day of publication with the latest values.

Table 1: share of weight of scanner data and imputation methods (all-item index)

<table>
<thead>
<tr>
<th>Month</th>
<th>CPI Weight</th>
<th>Scanner-data Share of index in %</th>
<th>Share of weight of imputation methods in %</th>
<th>share in % on weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>April</td>
<td>100,00</td>
<td>15,0</td>
<td>3,1</td>
<td>2,7</td>
</tr>
<tr>
<td>May</td>
<td>100,00</td>
<td>15,0</td>
<td>0,4</td>
<td>0,7</td>
</tr>
<tr>
<td>June</td>
<td>100,00</td>
<td>0,0</td>
<td>0,3</td>
<td>0,0</td>
</tr>
<tr>
<td>July</td>
<td>100,00</td>
<td>0,0</td>
<td>0,3</td>
<td>0,0</td>
</tr>
</tbody>
</table>

A more detailed version of Table 1 with shares of the various methods for all available CPI sub-indices (ECOICOP) during the course of the COVID-19 crisis is available as an Excel table: Table 2 - share of weight of scanner data and imputation methods.