

Economic Statistics Department  
Price Statistics

# Special imputations during the coronavirus pandemic

This document describes the imputation method used by Statistics Sweden to address the issue of temporary missing prices during the coronavirus pandemic. The document is updated regularly with each publication as long as there is a need.

## **A special imputation method is used during the coronavirus pandemic**

In the Swedish CPI, missing prices are normally imputed based on the price development of other products within the same product group. During the coronavirus pandemic, however, the share of missing prices within some groups have been so large that reliable direct estimates could not be computed. Hence, a special imputation method have been introduced to deal with product groups where all (or a very large part of) the products are missing. This method relies on the average year-on-year change for non imputed product groups to form the basis of imputation (see appendix for details).

In 2021, Statistics Sweden will continue with the special imputation method when deemed necessary. The need for imputations is, however, naturally smaller in 2021 than it was in 2020 as the product baskets at both elementary and aggregate levels have now been updated to take consumption shifts during 2020 into account.

## **Monthly imputations rates**

Table 1 shows which product groups have been imputed, fully or partially, according to the special imputation method.

**Table 1: Product groups imputed using the special imputation method (rate in per cent).**

<b>Year</b>	<b>Month</b>	<b>Fully imputed product groups</b>	<b>Partially imputed product groups</b>	<b>Rate of special imputations for the CPI basket</b>
<b>2020</b>	<b>April</b>	Package holidays (6309) International air travel (6311) Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804) Admission tickets, entertainment (7805)	Domestic air travel (6305) Cruises, domestic and international (6310) Long distance bus travel (6312) Museums (7814)	3,08
	<b>May</b>	Package holidays (6309) International air travel (6311) Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Domestic air travel (6305) Cruises, domestic and international (6310) Long distance bus travel (6312) Admission tickets, entertainment (7805) Museums (7814)	2,93
	<b>June</b>	Package holidays (6309) Tickets, sporting competitions (7802) Theatre tickets (7804)	Domestic air travel (6305) International air travel (6311) Cruises, domestic and international (6310) Long distance bus travel (6312) Admission tickets, entertainment (7805)	2,69
	<b>July</b>	Tickets, sporting competitions (7802) Theatre tickets (7804)	International air travel (6311) Cruises, domestic and international (6310) Long distance bus travel (6312) Admission tickets, entertainment (7805)	1,28
	<b>August</b>	Tickets, sporting competitions (7802) Theatre tickets (7804)	International air travel (6311) Admission tickets, entertainment (7805)	1,20

Year	Month	Fully imputed product groups	Partially imputed product groups	Rate of special imputations for the CPI basket
2020	September	Tickets, sporting competitions (7802)	International air travel (6311) Admission tickets, entertainment (7805)	0,96
	October	Tickets, sporting competitions (7802)	International air travel (6311) Admission tickets, entertainment (7805)	0,95
	November	Tickets, sporting competitions (7802)	Package holidays (6309) International air travel (6311) Long distance bus travel (6312) Admission tickets, entertainment (7805) Museums (7814)	1,79
	December	Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Package holidays (6309) International air travel (6311) Long distance bus travel (6312) Admission tickets, entertainment (7805) Museums (7814)	2,20
2021	January	Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Admission tickets, entertainment (7805) Museums (7814)	0,83
	February	Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Admission tickets, entertainment (7805) Museums (7814)	0,83
	March	Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Admission tickets, entertainment (7805) Museums (7814)	0,82
	April	Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Admission tickets, entertainment (7805)	0,80

<b>Year</b>	<b>Month</b>	<b>Fully imputed product groups</b>	<b>Partially imputed product groups</b>	<b>Rate of special imputations for the CPI basket</b>
<b>2021</b>	<b>May</b>	Tickets, sporting competitions (7802) Cinema tickets (7803) Theatre tickets (7804)	Admission tickets, entertainment (7805)	0,80
	<b>June</b>	Theatre tickets (7804)	Admission tickets, entertainment (7805)	0,26
	<b>July</b>	Theatre tickets (7804)		0,13
	<b>August</b>	Theatre tickets (7804)		0,13
	<b>September</b>	-	-	0,0

## Appendix: Imputation method, technical details

Imputations based on the year-on-year change in non-imputed product groups are computed according to the formulas described in this appendix.<sup>1</sup>

**Computation of annual rate of change:** The year-on-year change for month  $m$  in year  $y$ , denoted  $\Delta_{y-1,m}^{y,m}$ , is calculated as:

$$\Delta_{y-1,m}^{y,m} = \frac{\sum\{v^y(h) \cdot I_{y-2}^{y,m}(h)\} \times \sum\{w^{y-2}(h) \cdot I_{y-3}^{y-2}(h)\}}{\sum\{v^{y-1}(h) \cdot I_{y-3}^{y-1,m}(h)\}}$$

where summation is taken over all product groups,  $h$ , which do not include any imputations, and further notation is described in Table 1.<sup>2</sup>

**Table 1: Notations.**

Notation	Description
$v^y(h)$	Weight of product group $h$ . Computed based on the composition of consumption in year $(y - 2)$ .
$v^{y-1}(h)$	Weight of product group $h$ . Computed based on the composition of consumption in year $(y - 3)$ .
$w^{y-2}(h)$	Weight of product group $h$ . Computed based on the average composition of consumption in years $(y - 2)$ and $(y - 3)$ .
$I_{y-2}^{y,m}(h)$	An index measuring the estimated price development between year $(y - 2)$ and the current month $(y, m)$ , for product group $h$ .
$I_{y-3}^{y-1,m}(h)$	An index measuring the estimated price development between year $(y - 3)$ and month $(y - 1, m)$ , for product group $h$ .
$I_{y-3}^{y-2}(h)$	An index measuring the estimated price development between year $(y - 3)$ and year $(y - 2)$ , for product group $h$ .

**Computation of an imputed price:** A price in month  $m$  year  $y$ , for a product belonging to product group  $g$ , is imputed in the following way:

$$\widehat{P}_g^{m,y} = P_g^{0,y} \times \frac{I_{y-2,12}^{y-1,m}(g)}{I_{y-2,12}^{y-1,12}(g)} \times \Delta_{y-1,m}^{y,m}$$

where  $P_g^{0,y}$  denotes the “base price” (the price in December the previous year) for the same product,  $I_{y-2,12}^{y-1,m}(g)$  refers to a preliminary elementary index for the product group for the same month of the previous year, and  $I_{y-2,12}^{y-1,12}(g)$  refers to a revised elementary index for December of the previous year. For further information on the computation methods used in the Swedish CPI, see the document “Statistikens Framställning 2020”, available in Swedish on Statistics Sweden’s website [www.scb.se/PR0101](http://www.scb.se/PR0101).

<sup>1</sup> The same imputations are used for the CPIF and the HICP as for the CPI.

<sup>2</sup> The formulas in this appendix have been simplified and do not describe the standardisation of weights; in each weighting, weights are adjusted to add up to one. Product group 7808 (games of chance) is not included in the imputation base.