

How to compute a Consumer Price Index in the context of the Covid-19 crisis ?

Definitive estimate-May 2020

The health crisis and the lockdown measures in the context of the Covid-19 crisis have important impacts on the measures of short term statistics such as the Consumer Price Index (CPI). These statistics are however very important to understand economic stakes during this period.

On the one hand, **in order to preserve price collectors but also consumers and salesmen, INSEE has adjourned the collection of prices by INSEE collectors in physical outlets since March the 16th**¹. These prices collected on the field are only one data source among others used to compute the CPI; however, they represent more than four tenth of the CPI, in terms of consumption share.

On the other hand, CPI aims to describe an average measure of price changes for all the purchased items. The basket of products is renewed yearly but it remains fixed during a year; the slow changes in the consumption structure ensure that this basket fixity is globally neutral on the inflation measure. **The current health crisis disrupted deeply and suddenly the household consumption structure during the lockdown** either because the consumption was prevented by the impossible moves of households (transport, tourism), or because outlets were closed (the implementing order of 15 March 2020 related to measures for the struggle against the Covid-19 spreading defines the first necessary outlets that were allowed to remain opened during the lockdown), or because confronted to the crisis, the households decided to adapt their consumption habits (food, for instance).

In compliance with [Eurostat guidelines](#), shared with the different European countries, INSEE carried out new collection methods and adapted imputation methods.

The current note details the consequences on the inflation measure of the important shock that impacts the household consumption and then, gives an overview of the quality of data in a context of partial price collection in May.

1 – How to measure inflation when whole parts of the consumption disappear? An alternative consumer price index.

The implementing order of 15 March 2020 related to measures for the struggle against the Covid-19 spreading defined the first necessary outlets that were allowed to remain opened during the lockdown. If a part of the consumption that was purchased in the closed outlets might be purchased online, some other consumption segments simply disappeared (shows, tourism, restaurants, hairdressers, cars, guiding lessons...)

Moreover, even if they did not disappear, the share of numerous consumption segments in the consumption decreased heavily, like fuel or more generally transport services. However, the consumer price index which is

¹ This price collection has been progressively carried out on the field during June.

a fixed-basket index (a Laspeyres-type index) uses a fixed consumption structure, updated each year. The assumption is that this structure slowly evolves and is usually true. But it does not fit the huge shock that occurred on consumption structure during the health crisis.

In compliance with [the methodological guidance note of the compilation of the HICP in the context of the covid-19 crisis](#) by Eurostat,

- The CPI remains a fixed-basket index and the weights for each consumption segments remain unchanged (that is to say the one observed for the year 2019): for instance, whereas the household food expenditures increase with the lockdown, the food weight remains the one observed before the health crisis.
- When a consumption segment is not transacted any more, its price cannot be observed; the sub-index is consequently imputed (i) either with the price changes of a similar product or of the nearest higher aggregate (ii) or with the all-item index, (iii) or scarcely, in duly justified circumstances, by carrying forward the last observed price. Moreover, when the price of a product follows a highly seasonal pattern, the imputation reproduces the past seasonality. The three methods were used.

This consumer price index that is consistent with the past habits of consumption enables to describe the inflationary / deflationary pressure in the economy, in particular the scarce drop in the fuel and transport prices. However, it could be quite far from the consumer feelings who, because of the health crisis, were no more able or no more eager to purchase some products. For that reason and in order to illustrate the consequences of this major shock on household consumption, an alternative price index was built for exploratory motivation. Contrary to the CPI that is a chained Laspeyres-type index (built on the past structure of the consumption, yearly updated), this index is a Paasche-type index (built on the current structure of the consumption). This kind of index is usually not produced monthly because the consumption structure is known with a delay which is not compatible with the CPI production. In order to compute this Paasche-type index for April, the most updated nowcasting exercise carried out by INSEE was used. Although the exercise was performed at a lower detailed level than the one used for CPI weight, it enables to illustrate what inflation should have been with a consumption basket purchased during the lockdown period (from the 17th of March to the 10th of May). Since the end of the lockdown, the consumption structure evolved again but a large part of the price collection for the May index occurred during the lockdown period (see *infra*).

According to this nowcasting exercise, fuel consumption dropped sharply as well as transport services and accommodation and catering services; food consumption is contrariwise one of the few products whose consumption is maintained. Therefore, the consumption structure during the lockdown has a higher weight for food and a smaller weight for fuel, transport and accommodation services whose volatile prices have often a high contribution to the monthly change in prices.

Although the consumption structures are quite different, the gap between the price changes measured with these two different indices is limited in May as in March and April (*figure 1*). Using the past consumption structure or the one observed during the lockdown, prices in metropolitan France increased by 0.2% in May²: the drop in fuel prices weighted more in the index using the past consumption structure but so was the increase in the service prices.

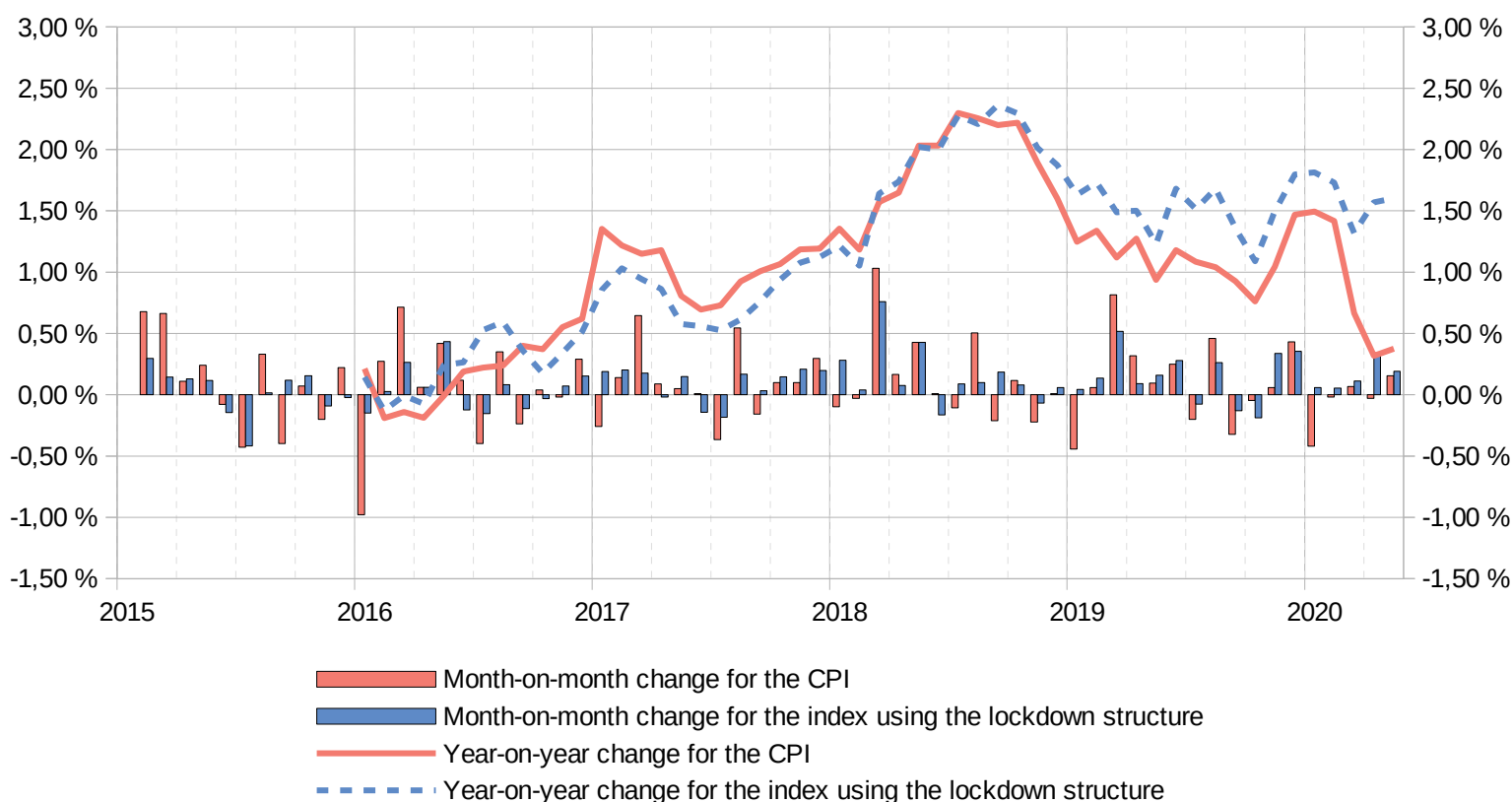
The gap between the two indexes is however also the consequence of seasonality effects: both indices are not seasonally adjusted and their seasonality is different because of the different weight of highly seasonal products as airfares or tourism.

2 Without rounding the figures, the Laspeyres-type index is inferior to the Paasche-type index by 0.04 point.

The year-on-year change in prices enables to take into account seasonality effects: the CPI (the Laspeyres-type index) increased by 0.4% in May year on year, after +0.3% in April whereas the index built from the lockdown consumption structure increased by 1.6% in May, as in April. However this gap was important even before the health crisis when the true consumption structure was nearer from that used for the Laspeyres-type index (*figure 1*).

To conduct a consistent analysis and to take into account seasonality effect, we should compare the change in the yearly price evolution for each index: with a Laspeyres-type index, the year-on-year change in prices decreased by 1 point between February and May 2020 (from +1.4% in February to +0.4% in May 2020) whereas it would have decreased by 0.1 point (from +1.7% in February to +1.6% in May) if the consumption structure had been identical to that observed during the lockdown.

Figure 1: The Consumer Price Index and an alternative index using the consumption structure observed during the lockdown (annual and monthly rate)



Scope : metropolitan France

Lecture: If the consumption structure, from 2015 on, was that observed during the lockdown, the month-on-month change in prices in April 2020 would have been +0.2% as the month on month change of the CPI (i.e. the 2019 consumption structure for 2020 indices, the year Y-1 structure for the year Y index).

2 – How to measure inflation when the price collection in the field is adjourned?

2.1 – To mitigate the adjournment of price collection on the field in May, INSEE carried out new kinds of price collection.

Usually, about 160 000 prices are collected each month by INSEE's price collectors in physical outlets. INSEE uses other data sources but this on-the-field collection represents more than four tenth of the CPI basket. They are particularly important for fresh food produces, food sold in other outlets than super and hypermarkets, clothing and footwear, furniture, sustainable goods, other manufactured products (except cleaning and maintenance products and articles for personal hygiene and beauty products), other services (hotel and restaurant, services provided by craftsmen, cleaning services, hairdressing, mechanic...).

This price collection on the field has been adjourned since the 16th of March and has been progressively carried again only since the month of June. As it was also done in other European countries and in compliance with the European guidelines, INSEE tried to compensate the consequences of the missing manual price collection for the month of May by developing new types of collection.

- When outlets usually visited by price collectors have a website and are still opened or at least offer an online trade, price are collected online. Products concerned are mainly fresh food produces, meat, cheese, bread sold in super and hypermarkets, food products sold in minimarkets, hard-discounters... as well as clothes, sustainable goods and some other manufactured products.
- Some scanner data were usually unused (for clothes or sustainable goods sold in super and hypermarkets or for some small shops); they are used in order to register the prices of products that belong usually to the CPI basket.
- From May 2020 on, a price collection by phone was gradually performed for services and in some small shop (bakery, butchery, cheese shop, fish shop, greengrocer's...).

These alternative price collections do not mitigate completely the adjournment of price collection on the field: the number of prices used in order to compute the CPI is really below the usual standards and consequently, all the estimations are very less precise.

2.2– The CPI is usually built from various data sources, most of which were not impacted by the health crisis.

In order to compute the French CPI, INSEE uses different data sources. Prices collected on the field by price collectors are impacted by the health crisis but it is not the case for the other data sources that remain available.

- The use of scanner data is not impacted by the health crisis. Scanner data are used in order to follow manufactured food, cleaning and maintenance products and articles for personal hygiene and beauty products sold in super and hypermarkets (one tenth of the index in terms of consumption share) as well as medicine sold in pharmacy.
- Prices are also collected online; this online price collection was carried out even during the lockdown. Online price collection is used mainly for transport services, tourism, communication

services, gas, electricity, insurances, financial services, some manufactured goods and cultural services.

For transport and tourism, prices are usually collected in advance and are registered in the index, the month when the service is provided; the prices of these services when they have been cancelled because of the health crisis were withdrawn from the price sample for May.

- Some prices are collected thanks to dedicated surveys like rents (the rents and charges survey, the social housing landlord survey); these surveys were carried out.
- Some prices come from administrative data, mandatory declarations or are official tariffs; in this case, data collection was not impacted by the health crisis; it is the case for fuel prices, health service prices, tobacco prices...

2.3– To what extent does the CPI for May 2020 measure correctly the end of the lockdown?

The Consumer price index tracks averaged changes in the prices over a given month. However, depending on the products, the price collection does not occur usually every day of the month. It is carried out according to different collection calendars defined in order to take into account different constraints. For instance, in order to collect a price in a given outlet, the opening days have to be taken into account; or in order to reflect properly the shift in the calendar of the sales or of the holidays, the collection calendar is adapted.

Because of these issues, prices taken into account for the May index that came from scanner data or from the alternative collections (collection online, by phone) occurred from the 27th of April to the 22nd of May; prices for tourism were collected from the 18th of April to the 15th of May. Contrariwise, price collection for transport, health services or fuel was carried out during the whole month.

Because of these different collection calendars, sometimes shifted with reference to the calendar month, the share of prices collected during the lockdown period is less important than the real one in May (the lockdown was partially removed the 11th of May). Moreover, some outlets that were closed during the lockdown but have been opened since the 11th of May were not visited by price collectors because of the adjournment of price collection on the field and their prices were not collected by phone or online either.

2.4– Finally, less than four tenth of the CPI basket were imputed

Finally, the share of imputation due to the Covid-19 is about 39% in the May all-item index; these imputations include both missing data due to the adjournment of the price collection and the disappearance of some consumption segments during the lockdown or that haven't reopened since the end of the lockdown (restaurants, shows...).

These imputation rates are particularly high for manufactured products and food (*figure 2*) whereas some aggregates remain well-followed: tobacco, energy, rents, communication services, health services. A table in the complementary data attached to the CPI dissemination for May provides information for each index about the imputation rate due to the health crisis.

The more commonly used method to perform these imputations is the imputation by the observed price change for the same products (about 16% of the CPI basket is imputed with this method); the imputation by the nearest aggregate estimation or a close consumption segment represents about 15% of the CPI basket.

When no price was observed for a close product (it is the case for a lot of services), the estimation is based on the all-item index (about 5% of the CPI basket). Last, in few cases (about 3% of the basket), the carry-forward method was used (mainly for products purchased on a yearly basis). (*figure 3*).

Figure 2: imputation rate, in terms of consumption, according to the type of products

	Imputation rate
All-item	39.1
Food	40
Fresh food	58.7
Other food	36.8
Tobacco	1
Manufactured products	47.3
Clothing and footwear	68.6
Health products	25.1
Other manufactured products	48
Energy	5.5
Petroleum products	7.2
Services	41.7
Actual rentals and services for dwellings	0.8
Health services	1.8
Transports	36.4
Communications	0
Other services	63.3

Note: Here are only registered the imputations linked to missing data due to (i) a non-observation of prices because of the adjournment of the price collection in the physical outlets, because of the lockdown, (ii) the lack of transaction for some consumption segments in the context of the Covid-19 crisis (extraordinary closure of some outlets, for instance) .

Figure 3: imputation rate, in terms of consumption, according to the imputation method

Imputation method	Share in terms of consumption
Estimation based on available prices for the same product	15.8%
Nearest aggregate estimation	14.7%
Estimation based on the all-item index	5.3%
Carry-forward	3.3%
Total	39.1%