

## Consumer prices: final data

### August 2017

In August 2017, the Italian consumer price index for the whole nation (NIC) increased by 0.3% on monthly basis and by 1.2% compared with August 2016, up from +1.1% in July 2017. The flash estimate was confirmed.

In August, the slight recovery of inflation was mainly due to prices of Non-regulated energy products (+4.3%, up from +2.1% in July) and of Services related to transport (+4.4% from +3.2% in the previous month).

Excluding energy and unprocessed food, core inflation was +1.0% (0.2 percentage points higher than in July) and inflation excluding energy was +0.9% (as in the previous month).

The increase on monthly basis of All items index was especially due to prices of Services related to transport (+3.4%), which were affected by seasonal factors.

The annual rate of change of prices of Goods was +1.0% (up from +0.8% in July) and that one of prices of Services was +1.6% (up from +1.3%). As a consequence, the inflationary gap between Services and Goods was positive and equal to +0.6 percentage points.

Prices of Grocery and unprocessed food increased by 0.1% on monthly basis and by 0.6% on annual basis (from +0.8% in the previous month).

In August 2017, the rate of change of Italian harmonized index of consumer prices (HICP) was +0.1% compared with the previous month and +1.4% with respect to August 2016 (it was +1.2% in the previous month). The flash estimate was confirmed.

In August core inflation, measured by Italian HICP, was +1.1% (up from 0.8% in July) and also inflation excluding energy, food, alcohol and tobacco and inflation excluding Energy accelerated (respectively +1.2% and +1.1%, up from +0.9% in the previous month).

In August 2017, the Italian harmonized index of consumer prices at constant tax rates (HICP-CT) increased by 0.1% compared with the previous month and by 1.3% with respect to August 2016 (0.1 percentage points lower than HICP). Therefore, the difference between HICP and HICP-CT growth rates<sup>1</sup> – which incorporates the effects of changes in indirect taxes occurred in the last twelve months – was positive and equal to 0.1 percentage points.

#### ITALIAN CONSUMER PRICE INDICES. August 2017, (base 2015=100)

	INDICES August 2017	<u>Aug-17</u> Jul-17	<u>Aug-17</u> Aug-16
Italian consumer price index for the whole nation (NIC)	101.5	0.3	1.2
Italian harmonized index of consumer prices (HICP)	100.2	0.1	1.4

<sup>1</sup> The difference between the rates of change of HICP and HICP-CT represents the upper limit of the impact of changes in indirect taxes occurred in the last twelve months on HICP, assuming their full and instantaneous pass-through on prices paid by consumers.

**TABLE 1. ITALIAN CONSUMER PRICE INDEX FOR THE WHOLE NATION (NIC), BY ECOICOP DIVISION.** August 2017, weights, indices and percentage changes (base 2015=100)

DIVISIONS	Weights	Indices	Aug-17 Jul-17	Aug-17 Aug-16	Jul-17 Jul-16	Aug-16 Jul-16
Food and non-alcoholic beverages	164,968	100.9	0.2	0.8	0.9	0.3
Alcoholic beverages, tobacco	32,019	102.3	0.3	0.1	-0.2	0.0
Clothing and footwear	73,620	100.7	-0.1	0.4	0.5	0.0
Housing, water, electricity, gas and other fuels	107,280	99.9	-0.1	2.5	2.6	0.0
Furnishings, household equipment and routine household maintenance	72,371	100.2	-0.1	-0.1	0.0	0.0
Health	86,870	100.4	-0.3	0.0	0.3	0.0
Transport	139,331	104.5	2.2	3.7	2.3	0.8
Communication	26,125	96.4	0.3	-2.6	-2.9	0.0
Recreation and culture	78,409	102.6	0.8	0.5	0.4	0.7
Education	12,119	100.0	0.0	-0.9	-0.9	0.0
Restaurants and hotels	114,864	103.8	-0.1	2.2	2.2	-0.1
Miscellaneous goods and services	92,024	101.1	0.0	0.8	0.8	0.0
<b>ALL ITEMS</b>	<b>1,000,000</b>	<b>101.5</b>	<b>0.3</b>	<b>1.2</b>	<b>1.1</b>	<b>0.2</b>

**TABLE 2. ITALIAN CONSUMER PRICE INDEX FOR THE WHOLE NATION (NIC), BY TYPES OF PRODUCT.** August 2017, weights, indices and percentage changes (base 2015=100)

SPECIAL AGGREGATES	Weights	Indices	Aug-17 Jul-17	Aug-17 Aug-16	Jul-17 Jul-16	Aug-16 Jul-16
Food including alcohol:	175,273	100.8	0.1	0.7	0.9	0.3
Processed food including alcohol	105,071	100.6	0.0	0.6	0.6	0.0
Unprocessed food	70,202	101.0	0.3	0.7	1.3	0.9
Energy:	84,456	97.4	0.2	4.5	3.5	-0.7
Regulated energy products	41,439	97.4	0.0	5.0	5.0	0.0
Non-regulated energy products	43,017	97.8	0.6	4.3	2.1	-1.5
Tobacco	21,714	103.4	0.5	0.2	-0.3	0.0
Non energy industrial goods:	254,637	100.3	-0.1	0.1	0.0	-0.2
Durable goods	84,846	100.3	0.1	-0.6	-0.7	0.0
Non-durable goods	66,173	100.0	-0.3	0.0	0.3	0.0
Semi-durable goods	103,618	100.4	-0.2	0.6	0.4	-0.4
<b>Goods</b>	<b>536,080</b>	<b>100.1</b>	<b>0.1</b>	<b>1.0</b>	<b>0.8</b>	<b>-0.1</b>
Services related to housing	77,003	101.4	0.0	0.6	0.6	0.0
Services related to communication	19,445	97.5	0.2	-1.2	-1.4	0.0
Services related to recreation, including repair and personal care	176,824	103.8	0.4	1.6	1.6	0.4
Services related to transport	76,089	109.4	3.4	4.4	3.2	2.2
Services - miscellaneous	114,559	101.1	0.0	0.6	0.6	0.0
<b>Services</b>	<b>463,920</b>	<b>103.4</b>	<b>0.8</b>	<b>1.6</b>	<b>1.3</b>	<b>0.5</b>
<b>ALL ITEMS</b>	<b>1,000,000</b>	<b>101.5</b>	<b>0.3</b>	<b>1.2</b>	<b>1.1</b>	<b>0.2</b>
All items excluding energy and unprocessed food (Core inflation)	845,342	102.1	0.4	1.0	0.8	0.2
All items excluding energy, food, alcohol and tobacco	718,557	102.2	0.4	0.9	0.8	0.3
All items excluding energy	915,544	101.9	0.3	0.9	0.9	0.3
Grocery and unprocessed food	198,287	100.6	0.1	0.6	0.8	0.3

**TABLE 3. ITALIAN HARMONIZED CONSUMER PRICE INDEX (HICP), BY ECOICOP DIVISION.** August 2017, weights, indices and percentage changes (base 2015=100)

DIVISIONS	Weights	Indices	Aug-17 Jul-17	Aug-17 Aug-16	Jul-17 Jul-16	Aug-16 Jul-16
Food and non-alcoholic beverages	175,240	101.0	0.2	0.8	1.0	0.4
Alcoholic beverages, tobacco	34,015	102.3	0.4	0.2	-0.3	-0.1
Clothing and footwear	85,400	81.8	-5.0	1.5	0.8	-5.6
Housing, water, electricity, gas and other fuels	114,100	100.0	0.0	2.5	2.5	0.0
Furnishings, household equipment and routine household maintenance	77,035	99.9	0.0	0.0	0.0	0.0
Health	43,047	101.9	0.0	0.8	0.8	0.0
Transport	147,915	104.4	2.1	3.6	2.3	0.8
Communication	27,786	96.4	0.3	-2.7	-3.0	0.0
Recreation and culture	62,346	103.5	1.2	0.8	0.4	0.8
Education	12,885	100.0	0.1	-0.8	-0.8	0.1
Restaurants and hotels	122,115	103.8	-0.2	2.1	2.3	0.0
Miscellaneous goods and services	98,116	100.7	0.0	0.8	0.9	0.1
<b>ALL ITEMS</b>	<b>1,000,000</b>	<b>100.2</b>	<b>0.1</b>	<b>1.4</b>	<b>1.2</b>	<b>-0.1</b>
All items at constant tax rates	1,000,000	100.1	0.1	1.3	1.1	-0.1

**TABLE 4. ITALIAN HARMONIZED CONSUMER PRICE INDEX (HICP), BY SPECIAL AGGREGATES.** August 2017, weights, indices and percentage changes (base 2015=100)

SPECIAL AGGREGATES	Weights	Indices	Aug-17 Jul-17	Aug-17 Aug-16	Jul-17 Jul-16	Aug-16 Jul-16
Food, alcohol and tobacco:	209,255	101.2	0.2	0.7	0.8	0.3
Processed food (including alcohol and tobacco)	117,212	101.2	0.2	0.6	0.5	0.1
Unprocessed food	92,043	101.3	0.3	0.9	1.3	0.7
Energy:	89,782	97.5	0.3	4.5	3.4	-0.7
Electricity, gas, solid fuels and heat energy	48,159	97.4	-0.1	4.4	4.5	0.0
Liquid fuels and fuels and lubricants for personal transport equipment	41,623	97.8	0.7	4.7	2.2	-1.7
Non-energy industrial goods:	263,440	94.7	-1.4	0.7	0.3	-1.8
Durable goods	80,863	100.6	0.1	-0.2	-0.3	0.0
Non-durable goods	64,613	101.5	0.0	0.8	0.9	0.1
Semi-durable goods	117,964	86.4	-3.6	1.3	0.6	-4.3
<b>Goods</b>	<b>562,477</b>	<b>97.5</b>	<b>-0.5</b>	<b>1.2</b>	<b>0.9</b>	<b>-0.8</b>
Services related to housing	81,849	101.4	0.0	0.7	0.7	0.0
Services related to communication	27,786	96.4	0.3	-2.7	-3.0	0.0
Services related to recreation, including repairs and personal care	166,219	104.3	0.4	1.7	1.9	0.6
Services related to transport	80,722	109.4	3.4	4.4	3.2	2.2
Services - miscellaneous	80,947	101	0.0	0.5	0.6	0.1
<b>Services</b>	<b>437,523</b>	<b>103.6</b>	<b>0.9</b>	<b>1.6</b>	<b>1.3</b>	<b>0.6</b>
<b>ALL ITEMS</b>	<b>1,000,000</b>	<b>100.2</b>	<b>0.1</b>	<b>1.4</b>	<b>1.2</b>	<b>-0.1</b>
All items excluding energy and unprocessed food (Core inflation)	818,175	100.4	0.1	1.1	0.8	-0.2
All items excluding energy, food, alcohol and tobacco	700,963	100.3	0.1	1.2	0.9	-0.2
All items excluding energy	910,218	100.5	0.1	1.1	0.9	-0.1

**TABLE 5. REVISIONS OF CONSUMER PRICE INDICES.** August 2017, indices and percentage changes (base 2015=100)

	Flash estimates			Final data		
	INDICES	RATES OF CHANGE%		INDICES	RATES OF CHANGE %	
	August 2017	<u>Aug-17</u> Jul-17	<u>Aug-17</u> Aug-16	August 2017	<u>Aug-17</u> Jul-17	<u>Aug-17</u> Aug-16
Italian consumer price index for the whole nation (NIC)	101.5	0.3	1.2	101.5	0.3	1.2
Italian harmonized index of consumer prices (HICP)	100.2	0.1	1.4	100.2	0.1	1.4

**For more details please refer to the Italian version**

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## Consumer Price Indices

### Methodological note

The **Consumer Price Index for the whole nation (NIC)** is based on the consumption of the entire present population.

The **Harmonised index of Consumer Prices (HICP)**, calculated according to the EU regulations in force, is used for the comparison of inflation between Member States and as a key indicator for the monetary policy of the European Central Bank.

Consumer price indices are calculated using a chained Laspeyres formula, in which the basket of products and the weighting system are updated annually. Monthly indices for the current year are calculated with reference to December of the previous year (calculation base) and subsequently chained over the period chosen as a reference base in order to be able to measure price trends over a period of time longer than a year<sup>2</sup>.

### Reference base year for NIC and HICP

The NIC indices are expressed with 2015=100 as a reference base year<sup>3</sup>.

The HICP are calculated and published with 2015=100 as a reference base, as established by the EU Regulation 2015/2010 of the European Commission of 11 November 2015.

### Classification for consumer expenditure, basket of goods

Classification of consumption so far used for HICP, NIC and FOI is the international classification ECOICOP (European Classification of Individual Consumption by Purpose), whose hierarchical structure has 4 levels of disaggregation: Divisions, Groups, Classes of product and Subclasses of product.

Since the final data of January 2016, Istat has been adopted the classification ECOICOP, annexed to the new European framework regulation on harmonised indices of consumer prices and the house price index, (2016/792), that introduced an additional level of detail, the subclasses of product. Anyway, in 2011 Istat introduced two disaggregation levels: product sub-classes and consumption segments.

The 2017 basket for the Italian consumer price index for the whole nation (NIC) and for blue and white-collar households (FOI) is made up of 1,481 elementary products, which are grouped into 920 products and into 405 product aggregates. (1,476 in 2016 grouped into 901 products and 400 product aggregates).

TABLE 1. CLASSIFICATION NIC AND FOI INDICES. Year 2017

Year 2017
12 expenditure divisions
43 product groups
102 product classes
229 product sub-classes
302 consumption segments
405 product aggregates
920 products
1,481 elementary products

<sup>2</sup> ISTAT calculates another index named Consumer Price Index for blue - and white-collar worker households (FOI) based on consumption of households whose reference person is an employee.

<sup>3</sup> The FOI indices are expressed with 2015=100 as a reference base year, too.

The 2017 basket for the Italian harmonized index of consumer prices (HICP) is made up of 1,498 elementary products, which are grouped into 923 products and then into 409 product aggregates (1,484 in 2016 grouped into 906 products and 404 product aggregates)<sup>4</sup>.

Segments of consumption are the most disaggregated level for which NIC indices referring to the entire national territory are disseminated. For HICP indices, the level of detail of the dissemination is that of the product classes, but during 2017, it is expected that of the product subclasses. FOI national indices are disseminated at level of expenditure divisions. At local level (geographical area, region, province), NIC indices are published up to the product groups and FOI indices, just at provincial level, up to the divisions.

Furthermore, HICP indices by special aggregates (**HICP-SA**) are released. HICP-SA indices are calculated using the same classification scheme and the same method adopted by Eurostat (therefore different from the method used for the calculation of NIC indices by types of product), in order to guarantee comparability among the Italian HICPs and the HICP of the other EU countries and the HICPs for the EU and the euro area produced by Eurostat<sup>5</sup>.

All indices and data are available and published on Istat data warehouse, I.Stat, inside the theme "Prices" and subtheme "Consumer prices". In addition to indices at national level, NIC indices at provincial, regional and macro area level and FOI indices at provincial level are published too.

### Price collection and calculation method for seasonal product price indices

The method for collecting and calculating prices of seasonal products is in accordance with Regulation (EC) no 330/2009 of 22<sup>nd</sup> April 2009, which sets out minimum standards for dealing with seasonal products in the HICP<sup>6</sup>. This method, also used for the NIC<sup>7</sup>, is applied to the product groups and classes *Fruit*, *Vegetables*, *Clothing* and *Footwear*.

The European Regulation defines as *seasonal product* that one consumers may not purchase in certain periods of the year (at least one month), or they may purchase in modest or insignificant volumes. It also establishes that in a given month seasonal products are considered *in season* or *out of season*.

On the basis of this standard, Istat defined a monthly calendar for the whole 2017, which establishes, in a given month, when each specific product belonging to the above mentioned product groups or classes must be considered *in season* or *out of season*. The adoption of a seasonality calendar entails that the local consumer price survey is carried out only in months when the product in question is defined as *in season*, while prices of *out of season* products will be estimated on the basis of a method that is consistent with standards contained in the aforementioned European Regulation.

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<sup>4</sup> The difference between the two baskets is due to two elements: on one hand in the HICP basket (but not in the NIC/FOI one), contribution to the NHS for pharmaceutical products, specialist practices and services of medical analysis (six items) are included; on the other hand in the NIC/FOI basket (but not in the HICP one), Games of chance are included.

<sup>5</sup> HICP-SA indices have been released starting from data referred to February 2013.

The description of product classes which are included in the special aggregates is available on Eurostat web site at the following link: [http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST\\_NOM\\_DTL&StrNom=HICP\\_2000&StrLanguageCode=EN&IntPcKey=&StrLayoutCode=](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=HICP_2000&StrLanguageCode=EN&IntPcKey=&StrLayoutCode=)

The HICP-SA calculation method is described in the HICP Compendium which is downloadable at the following link: <http://ec.europa.eu/eurostat/documents/3859598/5926625/KS-RA-13-017-EN.PDF/59eb2c1c-da1f-472c-b191-3d0c76521f9b?version=1.0>.

Back series starting from January 2001 are published on I.Stat, the warehouse of Istat statistics, inside the theme "Prices".

<sup>6</sup> It has been adopted starting from data referred to January 2011.

<sup>7</sup> It is used for FOI indices, too.

## Survey geographical basis, rate of coverage and frequency of data collection

Data contributing to the compilation of monthly consumer price indices are traditionally collected in two distinct surveys: the local survey, carried out by Municipal Offices of Statistics, under Istat supervision and coordination, and the central survey, carried out directly by Istat. In addition to these two ways, an administrative source is used too, that is the database of fuel prices of Ministry of Economic Development.

### *Local survey*

In 2017 the geographical basis of the survey is made up of 80 municipalities (18 regional capitals and 61 provincial capitals) – which participate in the indices calculation for all the product aggregates of the basket – and of other 16 municipalities participating in the survey for a subset of products, which includes local tariffs (water supply, solid waste, sewerage collection, gas for domestic use, urban transport, taxi, car transfer ownership, canteens in schools, public day nursery, etc.) and some local services (building worker, football matches, cinema, theatre shows, secondary school education, canteens in universities, etc.).

Overall, the coverage of the index, measured in terms of resident population in the provinces with capitals participating in the survey for all items in the basket, is 83.7%.

Concerning the basket subset including local tariffs and some local services – whose weight on the NIC basket is equal to 6.0% – with the participation of the other 16 municipalities, the coverage of the survey, measured in terms of provincial resident population, is 92.4%.

### *Central survey*

In 2017 price quotes collected each month directly by Istat are 137,500, of which:

✓ 137,000 via web, also using *web scraping techniques*, or collecting data from different providers. The main data providers for the central price data collection are the following:

- Italian Customs Agency, for Tobacco products and games of chance;
- Italian Association of Concessionaries Highways and Tunnels (Aiscat), for motorway tolls;
- Farmadati, for pharmaceutical products;
- Italian Association of Publishers (AIE), for prices of school books;
- Specialized magazine “Quattroruote” for prices quotes of cars and second hand cars;
- Sanguinetti Editore, for prices of cars, motorcycles and motorbikes, caravans and motorhomes;

✓ about 500 price quotes directly collected using the data by Insurance Companies.

An important news in *central survey* is that of *Housing insurance services* whose prices, monthly collected by insurance company, refer to protection against most risks connected to property, such as fire, theft and other damages.

The percentage of products observed directly by Istat calculated according to the weight assigned to each product within the NIC is 23.6% in 2017 (as in the previous year).

### *Administrative sources*

In 2017 automotive fuels price indices (the weight on the basket is 3.7%) are calculated using the data base supplied by the Ministry of Economic Development, that collects prices for these products. 76,000 price quotes are monthly used to estimate inflation and they come from about 13,596 fuel stations on the territory, that is 69.3% of the ones active and present in Ministry database.

The 13,596 fuel stations cover the entire national territory and they are located in the different geographical areas as it follows: 3,600 in the North-West; 3,200 in the North-East; 3,000 in the Centre; almost 2,400 in the South and about 1,400 in the Islands.

### *Frequency of data collection*

With regard to the local survey, price collection is carried out in the first fifteen working days:

- bi-monthly for products which show a strong temporal variability of their prices (fresh fruit and vegetables, fresh fish; gas in cylinder and heating oil);
- collecting three prices for month for the hotel bedroom referring to the first three Saturday of the month;

- once a month, for the remaining products. For some goods or services, such as for example, water supply, town gas and natural gas, urban transport by bus and combined urban transport, taxi or tickets (contributions to NHS) for specialist practice, services of medical analysis laboratories and X-ray centres and other paramedical services, it is detected the price applied the 15th day of the month to which the index is referred.

Concerning the centralized survey, price collection is widely carried out once a month in the first fifteen working days. Hereafter the exceptions to the general rule:

- for some goods and services such as for example tobacco, games of chance, medicines, telecommunications services, regional railway transport, wagon lits, out of town bus services, out of town combined passenger transport, postal services, highway tolls car transfer ownership, car overhaul, it is detected the price applied the 15th day of the month to which the index is referred;
- three times per month, according an annual calendar fixed at the beginning of the year, for national railway transport;
- bi-monthly for passenger transport by air, passenger transport by sea and inland waterway and magazines;
- from the 9<sup>th</sup> to the 15<sup>th</sup> day of each month for daily newspapers;
- on each day of the month for touristic, recreational and cultural services (fun parks entrance ticket, bathing establishment, ski lifts, etc.).

Concerning the data base supplied by the Ministry of Economic Development, automotive fuel prices applied on the first and the tenth working day of each month are used to compile consumer price indices.

## Weighting structure

In Table 1 the weighting structure for the year 2017 of NIC and HICP is reported.

**TABLE 1. WEIGHTS USED FOR CALCULATING CONSUMER PRICE INDICES. BY EXPENDITURE DIVISION.** Year 2017, percentage values

EXPENDITURE DIVISIONS	WEIGHTS	
	NIC	HICP
Food and non-alcoholic beverages	16.4968	17.5240
Alcoholic beverages. tobacco	3.2019	3.4015
Clothing and footwear	7.3620	8.5400
Housing. water. electricity. gas and other fuels	10.7280	11.4100
Furnishings. household equipment and routine household maintenance	7.2371	7.7035
Health	8.6870	4.3047
Transport	13.9331	14.7915
Communication	2.6125	2.7786
Recreation and culture	7.8409	6.2346
Education	1.2119	1.2885
Restaurants and hotels	11.4864	12.2115
Miscellaneous goods and services	9.2024	9.8116
<b>All items</b>	<b>100.0000</b>	<b>100.0000</b>



## Harmonized index of consumer prices at constant tax rates

The Harmonized Index of Consumer Prices at constant tax rates (**HICP-CT**)<sup>8</sup> is calculated as established by the Regulation (EC) no 119/2013 of the 11<sup>th</sup> February 2013. It measures the change of prices at constant tax rates. It follows the same computation principles as the HICP, but it is based on prices 'at constant tax rates'.

Prices at constant tax rates are estimated cancelling out the effects due to changes in taxes in the current month compared to the tax rates system in force in December of previous year (calculation period base).

The taxes considered in the HICP-CT are those directly linked to final consumption. They are mainly VAT, excise duties and other taxes on some specific items (such as cars and insurance). Subsidies and taxes paid on intermediate stages (e.g. production, transportation) are not taken into account. In principle, for the compilation of HICP-CT, all taxes should be included and kept constant; however, due to practical consideration, taxes which generate very small tax revenues may not be taken into account. In detail, according to recommendations reported in the Eurostat HICP-CT Manual, taxes which cover less than 2% of the total tax revenue can be excluded. On the whole, included taxes must cover a minimum of 90% total tax revenue. Therefore in the compilation of the Italian HICP-CT, taxes kept constant are the following: VAT, excise duties on tobacco and energy items (fuels, heating oil, gas, electricity, etc.), the main local surcharge on electricity and gas, tax for the public liability insurance and contribution to the National Health Service for transport means insurance. On the basis of National Accounts data taxes which cover less than 1% of the total tax revenue are excluded and, on the whole, taxes included cover almost 98% of total revenues carried out with taxes on final consumption.

The HICP-CT covers the same goods and services as those covered by the HICP. The same weight structure is applied as for the HICP (Table 1). As HICP, it has expressed in 2015=100 as a reference base year.

The HICP-CT provides a measure of the **theoretical impact** of changes of indirect taxes on the overall HICP inflation. It has to be emphasised that it does not provide an exact measure of this impact, rather an indication for its upper limit. In effect, the difference between HICP and HICP-CT growth rates points to the theoretical impact of tax changes on overall HICP inflation, assuming an instantaneous and full pass-through of tax rate changes on the price paid by the consumer.

It has to be pointed out that, during the year, the Italian HICP-CT **may be revised** following introduction of methodological changes required by indirect taxation system changes. Data become final in the next year to the reference one.

## Indices rates of change calculation

Hereafter formulae for the calculation of monthly, annual and annual average rates of change for consumer price indices are described<sup>9</sup>. The HICP formulae apply also to HICP-CT. The first expression concerns calculation of rates of change between indices in the same reference base period:

### ■ Monthly rate of change (**NIC, HICP**)

The monthly rate of change is the current month's index in respect to the previous month's index (with one decimal place), for example:

$$MOR(I_{Jan,2012}; I_{Feb,2012}) = Round\left(\frac{I_{Feb,2012}}{I_{Jan,2012}} \times 100 - 100; .1\right)$$

### ■ Annual rate of change (**NIC, HICP**)

The annual rate of change is the current month's index in respect to the same month's index a year previously (with one decimal place), for example:

<sup>8</sup> The HICP-CT has been released starting from data referred to March 2012. Back series starting from January 2002 are published on I.Stat, inside the theme Prices <http://dati.istat.it>.

<sup>9</sup> The expressions and the rounding rules described for NIC are also carried out for FOI.

$$ANR(I_{Feb,2011}; I_{Feb,2012}) = Round\left(\frac{I_{Feb,2012}}{I_{Feb,2011}} \times 100 - 100; .1\right)$$

■ Annual average rate of change (**NIC**)

The annual average rate of change is the current annual average index in respect to a previous annual average index (with one decimal place), for example:

$$AVR(I_{2011}; I_{2012}) = Round\left(\frac{I_{2012}}{I_{2011}} \times 100 - 100; .1\right)$$

■ Annual average rate of change (**HICP**)

For the HICP, in a different way compared to NIC, the annual average rate of change is obtained directly from the monthly indices and therefore it is based on the unrounded annual average indices. This method, applied in compliance with Eurostat, guarantees international comparability of data. For example:

$$AVR(I_{2011}; I_{2012}) = Round\left(\frac{\sum(I_{Jan,2012} + I_{Feb,2012} + \dots + I_{Dec,2012})}{\sum(I_{Jan,2011} + I_{Feb,2011} + \dots + I_{Dec,2011})} \times 100 - 100; .1\right)$$

The following expression describes the calculation of monthly rate of change between indices expressed in different reference base year; it can be also used for the calculation of the annual rate of change and the annual average rate of change:

■ Monthly rate of change - **Indices expressed in different reference base year**

$$MOR(I_{m,j}^{X_1}; I_{n,h}^{X_t}) = Round\left(\frac{I_{n,h}^{X_t}}{I_{m,j}^{X_1}} \times C(X_t; X_{t-1}) \times C(X_{t-1}; X_{t-2}) \times \dots \times C(X_2; X_1) \times 100 - 100; .1\right)$$

where  $I_{m,j}^{X_1}$  is the index, with one decimal place, of the month  $m$  year  $j$ , expressed in the more remote reference base  $X_1$ ,  $I_{n,h}^{X_t}$  is the index, with one decimal place, of the month  $n$  year  $h$ , expressed in the more recent reference base  $X_t$ , and  $C(X_i; X_{i-1})$  with  $i=2, \dots, t$  are the splicing coefficients between contiguous reference bases. These coefficients are equal to the annual average index of the year corresponding to the new reference base expressed in the previous base, divided by 100. They are as many as base changes have been carried out during the considered period.

### Flash estimates of HICP: accuracy and computation methodology

Flash estimate of Italian HICP (and NIC) are usually published on the last working day of the reference month according to the Eurostat release calendar of HICP flash estimate for euro area. Final data are generally published around 13 days later.

The aim of the inflation flash estimates is to provide a timely information on inflation, predicting as accurately as possible the final HICP (and NIC) annual rate of change released about two weeks later. The analysis of their revisions represents an important tool to evaluate the correct balancing between the two quality dimensions, timeliness and accuracy.

Totally in line with the Eurostat Statistics Explained on Inflation – methodology of the euro area flash estimate, this section analyses the accuracy of the Italian HICP flash estimates and describes the methodology used in their computation.

## Accuracy of flash estimates

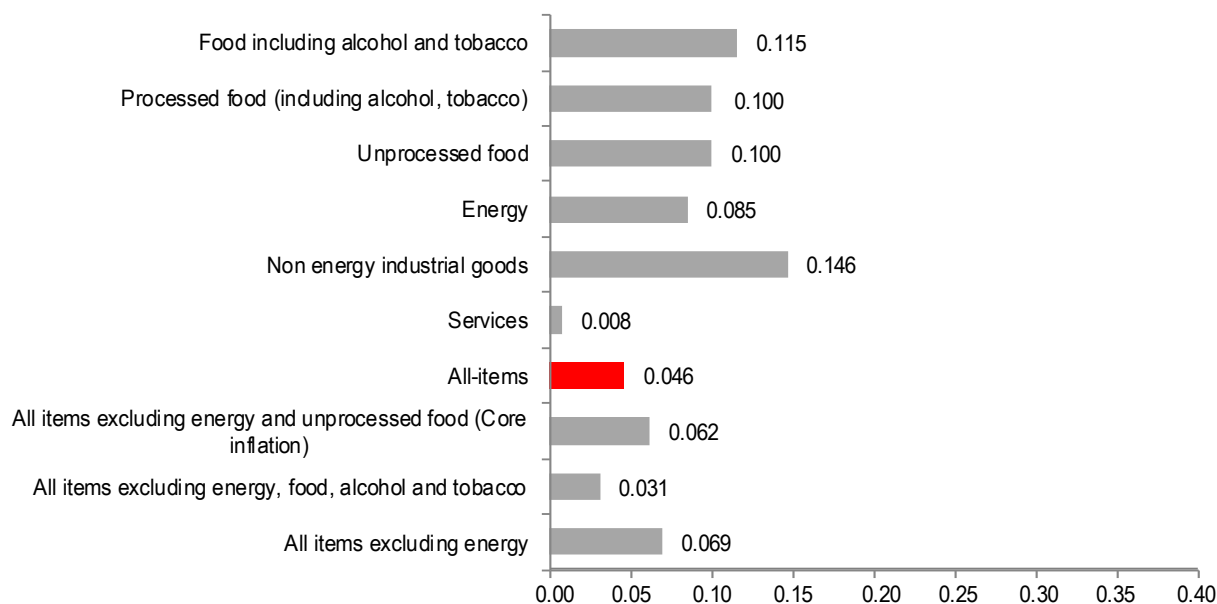
Table 2 compares the flash estimates and the final HICP annual rates of change for the same reference month. Over the last thirteen months, the maximum difference between the flash estimate – all items and the HICP – all items annual rates of change was +0.3 in January 2017. Over the same period, with reference to the main special aggregates, the maximum differences between the flash estimate and the final HICP annual rates of change concerned Food, including alcohol and tobacco (+1.1 recorded in January 2017), Processed food (including alcohol, tobacco) (+1.2 in January 2017), Unprocessed food (+0.9 in January 2017), Energy (+0.6 in February 2017) and Non energy industrial goods (+0.5 in January 2017). The highest frequency of revisions for Non energy industrial goods (9 months out of 13) are mainly due to the seasonal sales dynamics of Clothing and footwear, for which the partial information available has a higher impact on the flash estimate and therefore it turns out to be less accurate.

**TABLE 2. FLASH ESTIMATES AND HICP ANNUAL RATES FOR THE ALL-ITEMS AND MAIN SPECIAL AGGREGATES**  
August 2016-August 2017, percentage values (base 2015=100)

Special aggregates		Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17
Food including alcohol and tobacco:	Flash	1.0	0.4	0.1	0.5	1.1	1.2	3.5	2.7	1.9	1.8	0.8	0.8	0.8
	HICP	1.0	0.4	0.1	0.5	1.0	2.3	3.6	2.7	1.9	1.7	0.8	0.0	0.7
Processed food (including alcohol, tobacco)	Flash	0.4	0.5	0.3	0.5	0.5	-0.7	0.6	0.7	0.5	0.5	0.4	0.5	0.6
	HICP	0.4	0.5	0.3	0.5	0.5	0.5	0.6	0.7	0.5	0.4	0.4	0.0	0.6
Unprocessed food	Flash	1.9	0.3	-0.2	0.5	1.8	3.6	7.4	5.2	3.8	3.4	1.2	1.3	0.9
	HICP	1.9	0.4	-0.2	0.5	1.8	4.5	7.4	5.4	3.8	3.4	1.3	0.0	0.9
Energy	Flash	-6.4	-3.4	-3.5	-2.9	-2.0	2.6	4.2	4.5	7.5	6.4	4.6	3.5	4.5
	HICP	-6.4	-3.3	-3.5	-2.9	-2.0	2.7	4.8	4.6	7.4	6.4	4.6	0.0	4.5
Non energy industrial goods	Flash	0.4	0.4	0.3	0.2	0.3	0.0	0.4	-0.4	0.3	0.2	0.3	0.3	0.7
	HICP	0.2	0.3	0.3	0.3	0.4	0.5	0.1	0.0	0.2	0.3	0.3	0.0	0.7
Services	Flash	0.6	0.6	0.2	0.6	0.9	0.6	1.0	1.1	1.8	1.3	1.4	1.3	1.6
	HICP	0.6	0.6	0.2	0.5	0.9	0.6	1.0	1.1	1.8	1.3	1.4	0.0	1.6
<b>All-items</b>	Flash	<b>0.0</b>	<b>0.1</b>	<b>-0.1</b>	<b>0.1</b>	<b>0.5</b>	<b>0.7</b>	<b>1.6</b>	<b>1.3</b>	<b>2.0</b>	<b>1.5</b>	<b>1.2</b>	<b>1.2</b>	<b>1.4</b>
	HICP	<b>-0.1</b>	<b>0.1</b>	<b>-0.1</b>	<b>0.1</b>	<b>0.5</b>	<b>1.0</b>	<b>1.6</b>	<b>1.4</b>	<b>2.0</b>	<b>1.6</b>	<b>1.2</b>	<b>0.0</b>	<b>1.4</b>
All items excluding energy and unprocessed food (Core inflation)	Flash	0.5	0.5	0.2	0.5	0.7	0.1	0.7	0.6	1.2	0.8	0.9	0.8	1.1
	HICP	0.4	0.5	0.2	0.5	0.7	0.5	0.6	0.7	1.2	0.9	1.0	0.0	1.1
All items excluding energy, food, alcohol and tobacco	Flash	0.5	0.4	0.2	0.4	0.7	0.3	0.7	0.5	1.3	0.9	1.0	0.9	1.2
	HICP	0.4	0.4	0.2	0.4	0.7	0.5	0.7	0.6	1.3	0.9	1.0	0.0	1.2
All items excluding energy	Flash	0.7	0.4	0.2	0.5	0.8	0.5	1.4	1.0	1.4	1.1	0.9	0.9	1.1
	HICP	0.6	0.4	0.2	0.5	0.9	0.9	1.3	1.1	1.4	1.1	1.0	0.0	1.1

The Mean Absolute Deviation (MAD) provides another way to measure accuracy. It is calculated as the average of the absolute differences between the flash estimate and the final HICP annual rates of change over the last thirteen months. Figure 1 shows the MAD for the all-item index and the main special aggregates. Over the last thirteen months Non energy industrial goods (0.146 percentage points) and Food including alcohol and tobacco (0.115 percentage points) have recorded the highest MADs.

**FIGURE 1. MEAN ABSOLUTE DEVIATION BETWEEN FLASH ESTIMATES AND HICP ANNUAL RATES.** August 2016-August 2017, percentage points



The direction of inflation is correctly predicted if both the flash estimate and the final one show increasing (declining or no changing) annual rates of change with respect to those ones calculated in the previous month. There are three possible outcomes for the comparison of the direction of inflation:

- the flash estimate correctly predicts the direction of inflation, so the predicted rise, decline or no change in inflation is confirmed by final data (denoted by ●);
- the flash estimate wrongly predicts the direction of inflation, namely it predicts an increase when there is a decrease or vice versa (denoted by ●);
- the flash estimate points to an increase or a decrease but the final annual rate of change remains unchanged; or the flash estimate predicts no change in inflation but the final figure points to an increase or a decrease (denoted by ●).

Over the last thirteen months, the flash estimate accurately predicted the inflation direction in 118 out of 130 estimates.

**TABLE 3. FLASH ESTIMATE PREDICTION CAPACITY OF THE DIRECTION OF INFLATION MEASURED BY HICP**  
August 2016-August 2017

Special Aggregates	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17
Food including alcohol and tobacco:	●	●	●	●	●	●	●	●	●	●	●	●	●
Processed food (including alcohol, tobacco)	●	●	●	●	●	●	●	●	●	●	●	●	●
Unprocessed food	●	●	●	●	●	●	●	●	●	●	●	●	●
Energy	●	●	●	●	●	●	●	●	●	●	●	●	●
Non energy industrial goods	●	●	●	●	●	●	●	●	●	●	●	●	●
Services	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>All-items</b>	●	●	●	●	●	●	●	●	●	●	●	●	●
All items excluding energy and unprocessed food (Core inflation)	●	●	●	●	●	●	●	●	●	●	●	●	●
All items excluding energy, food, alcohol and tobacco	●	●	●	●	●	●	●	●	●	●	●	●	●
All items excluding energy	●	●	●	●	●	●	●	●	●	●	●	●	●

## Computation methodology of flash estimates

For the Italian HICP (and NIC) flash estimate compilation, each month.

- prices collected at local level by 61 municipalities (out of 80) are used. Out of these municipalities, there are the 38 municipalities which calculate the preliminary local consumer price indices and publish them independently, at the same time of Istat national CPI and HICP release. Data collected by the other 16 municipalities participating in the survey for a subset of products (local tariffs and some local services) are not used; these data are used for the compilation of final indices;
- all prices collected directly by ISTAT (via internet and other sources) are used. As soon as indices are calculated for aggregate products for which prices are collected directly by ISTAT, product aggregate indices for the municipalities, which participate in the flash estimate of inflation rate, are compiled. For the other municipalities, which do not participate in the flash estimation, product aggregate indices are generally<sup>10</sup> calculated applying to the indices of the previous month, the monthly rate of change of the regional product aggregate indices. The latter are calculated using data of municipalities which participate in the flash estimate, as follows:

$${}_R I_h^{m,a} = \sum_{i \in R} \left( \frac{{}_i \pi}{\sum_{i \in R} {}_i \pi} \right) \cdot {}_i I_h^{m,a}$$

where  ${}_i I_h^{m,a}$  is the elementary index of product aggregate  $h$  at municipality level  $i$  of the reference month  $m$  of year  $a$  and  $\frac{{}_i \pi}{\sum_{i \in R} {}_i \pi}$  is equal to the share of resident population in the municipality  $i$  of region  $R$  on the total resident population of the region.

As soon as product aggregate indices of all municipalities are compiled, regional and, then, national indices are calculated (by product aggregates, by upper aggregates and for all items).

If all municipalities of a certain region are not included in the flash estimate, the product aggregate indices of this region are calculated applying to the indices of the previous month, the monthly rate of change of national product aggregate indices. The latter are calculated using data of regions which participate in the flash estimate, as follows:

$$I_h^{m,a} = \sum_{R=1}^{20} \left( \frac{{}_R \pi_h}{\sum_{R=1}^{20} {}_R \pi_h} \right) \cdot {}_R I_h^{m,a}$$

where  ${}_R I_h^{m,a}$  is elementary index of product aggregate  $h$  at regional level of the reference month ( $m$ ) of year ( $a$ ) and  $\frac{{}_R \pi_h}{\sum_{R=1}^{20} {}_R \pi_h}$  is equal to the share of household consumption expenditure for the product aggregate  $h$  in the region  $R$  on the national household consumption expenditure for the same product aggregate.

Once product aggregate indices of all regions are compiled, national indices are calculated (by product aggregates, by upper aggregates and for all items).

Once product aggregate indices of all regions are compiled, national indices are calculated (by product aggregates, by upper aggregates and for all items).

<sup>10</sup> For some product aggregates – among others, rents and local tariffs such as water supply, solid waste, sewerage collection, urban transport services by road – for the municipalities that do not participate in the flash estimation, indices are estimated by carrying forward the price of the previous month. The adoption of this different estimation technique is due to the fact that the evolution of prices in the other municipalities of the same region is not considered a satisfactory proxy.