28 February 2018

Consumer prices: provisional data

February 2018

In February 2018, according to preliminary estimates, the Italian consumer price index for the whole nation (NIC) increased by 0.1% on monthly basis and by 0.6% compared with February 2017 (it was +0.9% in January 2018).

In February, the slowdown of the growth on annual basis of All items index was almost exclusively due to the deceleration of prices of Unprocessed food (-3.2%, that reverse the trend from +0.4% in the previous month), strengthened by that one of Energy, in particular of Regulated energy products (+5.2% down from +6.4% in January).

As a consequence, Excluding energy and unprocessed food, core inflation was +0.7% (0.1 percentage points higher than in January) and inflation excluding energy was +0.3% (+0.6% in the previous month).

The slight increase on monthly basis of All items index was mainly due to the prices of Services related to transport (+1.5%) which were also affected by seasonal factors. This growth was partially offset by the decrease of prices of unprocessed food (-0.7%) and Durable goods (-0.5%).

The annual rate of change of prices of Goods was +0.5% (down from +1.3% in January) and that one of prices of Services was +0.8% (up from +0.6% in the previous month). As a consequence, the inflationary gap between Services and Goods was positive again after five months and equal to +0.3 percentage points (it was -0.7 percentage points in January).

Prices of Grocery and unprocessed food decreased by 0.2% on monthly basis and by 0.1% on annual basis (down from +1.2% in the previous month).

In February 2018, according to preliminary estimates, the Italian harmonised index of consumer prices (HICP) decreased by 0.3% compared with the previous month and increased by 0.7% with respect to February 2017 (it was +1.2% in January). The decrease on monthly basis was mainly due to the further reductions of prices within the winter sales of Clothing and footwear (-4.0% compared with January 2016), which are not taken into account in the national index NIC.

In February both core inflation, measured by Italian HICP (+0.8%) and inflation excluding energy, food, alcohol and tobacco (+0.7%) were the same as in January while inflation excluding energy was +0.5% (0.3 percentage points lower than in January).

ITALIAN CONSUMER PRICE INDICES. February 2018 (base 2015=100)

	INDICES February 2018	Feb-18 / Jan-18	Feb-18 / Feb-17
Italian consumer price index for the whole nation (NIC)	101.6	0.1	0.6
Italian harmonized index of consumer prices (HICP)	100.3	-0.3	0.7

TABLE 1. ITALIAN CONSUMER PRICE INDEX FOR THE WHOLE NATION (NIC), BY ECOICOP DIVISION. February 2018, weights, indices and percentage changes (base 2015=100)

EXPENDITURE DIVISIONS	Weights	Indices	Feb-18 / Jan-18	Feb-18 / Feb-17	Jan-18 / Jan-17	Feb-17 / Jan-17
Food and non-alcoholic beverages	165,103	103.4	-0.3	-0.4	1.3	1.4
Alcoholic beverages, tobacco	30,965	103.3	0.0	1.3	1.3	0.0
Clothing and footwear	72,048	100.7	-0.2	0.1	0.2	-0.1
Housing, water, electricity, gas and other fuels	107,989	102.4	0.0	2.6	3.1	0.5
Furnishings, household equipment and routine household maintenance	71,390	100.6	0.2	0.3	0.1	0.0
Health	84,906	100.4	0.1	-0.3	-0.3	0.1
Transport	146,713	102.5	0.8	1.7	1.6	0.7
Communication	25,318	96.1	-1.3	-2.2	-0.8	0.1
Recreation and culture	77,042	102.1	0.3	1.2	1.2	0.3
Education	9,793	83.8	0.0	-16.2	-16.2	0.0
Restaurants and hotels	117,391	101.4	0.3	1.2	1.0	0.1
Miscellaneous goods and services	91,342	102.6	0.2	1.6	1.6	0.2
ALL ITEMS	**1,000,000**	**101.6**	**0.1**	**0.6**	**0.9**	**0.4**

TABLE 2. ITALIAN CONSUMER PRICE INDEX FOR THE WHOLE NATION (NIC), BY TYPES OF PRODUCT. February 2018, weights, indices and percentage changes (base 2015=100)

SPECIAL AGGREGATES	Weights	Indices	Feb-18 / Jan-18	Feb-18 / Feb-17	Jan-18 / Jan-17	Feb-17 / Jan-17
Food including alcohol:	175,233	103.3	-0.3	-0.3	1.4	1.4
Processed food including alcohol	105,414	102.2	0.0	2.0	2.1	0.1
Unprocessed food	69,819	105.0	-0.7	-3.2	0.4	3.0
Energy:	88,748	102.6	0.0	3.6	4.5	0.8
Regulated energy products	43,394	102.5	0.0	5.2	6.4	1.1
Non-regulated energy products	45,354	103.1	0.1	2.1	2.5	0.5
Tobacco	20,835	103.3	-0.1	0.3	0.5	0.1
Non energy industrial goods:	255,011	100.4	-0.2	-0.1	0.1	0.0
Durable goods	88,207	100.3	-0.5	-0.4	0.2	0.1
Non-durable goods	64,568	100.3	0.3	-0.3	-0.4	0.2
Semi-durable goods	102,236	100.6	-0.1	0.2	0.3	0.0
Goods	**539,827**	**101.8**	**-0.2**	**0.5**	**1.3**	**0.6**
Services related to housing	74,769	101.7	0.0	0.5	0.5	0.0
Services related to communication	19,222	98.9	0.1	0.4	0.3	0.0
Services related to recreation, including repair and personal care	178,091	101.8	0.3	1.2	1.1	0.2
Services related to transport	77,036	102.6	1.5	1.8	1.3	1.0
Services - miscellaneous	111,055	100.6	0.2	-0.4	-0.4	0.2
Services	**460,173**	**101.5**	**0.4**	**0.8**	**0.6**	**0.2**
ALL ITEMS	**1,000,000**	**101.6**	**0.1**	**0.6**	**0.9**	**0.4**
All items excluding energy and unprocessed food (Core inflation)	841,433	101.3	0.2	0.7	0.6	0.1
All items excluding energy, food, alcohol and tobacco	715,184	101.1	0.2	0.5	0.4	0.1
All items excluding energy	911,252	101.5	0.1	0.3	0.6	0.4
Grocery and unprocessed food	197,832	102.9	-0.2	-0.1	1.2	1.1

TABLE 3. ITALIAN HARMONIZED CONSUMER PRICE INDEX (HICP), BY ECOICOP DIVISION. February 2018, weights, indices and percentage changes (base 2015=100)

EXPENDITURE DIVISIONS	Weights	Indices	Feb-18 / Jan-18	Feb-18 / Feb-17	Jan-18 / Jan-17	Feb-17 / Jan-17
Food and non-alcoholic beverages	175,418	103.2	-0.7	-0.7	1.3	1.3
Alcoholic beverages, tobacco	32,861	103.0	-0.2	0.9	1.1	0.0
Clothing and footwear	83,493	83.6	-4.0	1.5	1.0	-4.4
Housing, water, electricity, gas and other fuels	114,604	102.5	0.1	2.6	3.0	0.5
Furnishings, household equipment and routine household maintenance	75,998	99.9	-0.1	0.3	0.3	-0.1
Health	42,429	102.1	0.2	0.5	0.4	0.1
Transport	155,569	102.5	0.8	1.7	1.6	0.7
Communication	26,871	96.2	-1.3	-2.2	-0.8	0.1
Recreation and culture	60,523	102.7	0.3	1.6	1.8	0.5
Education	10,397	83.8	0.0	-16.1	-16.0	0.1
Restaurants and hotels	124,574	101.5	0.3	1.2	1.1	0.2
Miscellaneous goods and services	97,263	102.1	0.0	1.6	1.7	0.1
ALL ITEMS	**1,000,000**	**100.3**	**-0.3**	**0.7**	**1.2**	**0.2**

TABLE 4. ITALIAN HARMONIZED CONSUMER PRICE INDEX (HICP), BY SPECIAL AGGREGATES. February 2018, weights, indices and percentage changes (base 2015=100)

SPECIAL AGGREGATES	Weights	Indices	Feb-18 / Jan-18	Feb-18 / Feb-17	Jan-18 / Jan-17	Feb-17 / Jan-17
Food, alcohol and tobacco:	208,279	103.1	-0.7	-0.5	1.3	1.1
Processed food including alcohol	116,022	102.0	-0.5	1.3	1.7	-0.1
Unprocessed food	92,257	104.6	-0.9	-2.4	0.8	2.4
Energy	94,199	102.7	0.0	3.6	4.5	0.8
Non-energy industrial goods	264,658	95.7	-1.1	1.1	0.9	-1.3
Services	432,864	101.3	0.4	0.6	0.5	0.3
ALL ITEMS	**1,000,000**	**100.3**	**-0.3**	**0.7**	**1.2**	**0.2**
All items excluding energy and unprocessed food (*Core inflation*)	813,544	99.6	-0.2	0.8	0.8	-0.2
All items excluding energy, food, alcohol and tobacco	697,522	99.2	-0.2	0.7	0.7	-0.2
All items excluding energy	905,801	100.1	-0.3	0.5	0.8	0.0

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[1].

Reference base year for NIC and HICP

The NIC indices are expressed with 2015=100 as a reference base year[2].

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.

The 2018 basket for the Italian consumer price index for the whole nation (NIC) and for blue and white-collar households (FOI) is made up of 1,489 elementary products, which are grouped into 920 products and into 404 product aggregates (they were 1,481 in 2017, grouped into 920 products and 405 product aggregates).

TABLE 1. CLASSIFICATION NIC AND FOI INDICES. Year 2018

Year 2018
12 expenditure divisions
43 product groups
102 product classes
230 product sub-classes
303 consumption segments
404 product aggregates
920 products
1,489 elementary products

[1] 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.
[2] The FOI indices are expressed with 2015=100 as a reference base year, too.

The 2018 basket for the Italian harmonized index of consumer prices (HICP) is made up of 1,506 elementary products, which are grouped into 923 products and then into 408 product aggregates (they were 1,498 in 2017, grouped into 923 products and 409 product aggregates)[3].

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 (the dissemination of HICP subclass indices is expected to start in 2018). 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 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[4].

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 22nd April 2009, which sets out minimum standards for dealing with seasonal products in the HICP[5]. This method, also used for the NIC[6], 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 defines a monthly calendar for the whole year, 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.

[3] 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.

[4] 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=.
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".

[5] It has been adopted starting from data referred to January 2011.

[6] It is used for FOI indices, too.

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

Data contributing to the calculation of monthly consumer price indices are traditionally collected using different sources: the *local survey*, carried out by municipal statistics offices, under Istat supervision and coordination; the *central survey* carried out directly by Istat or through different data providers; the *scanner data*; the *administrative sources*.

In 2018 the weight of the products exclusively collected by the local survey is equal to 60.7% despite of those products which are collected by central survey, whose weight is 23.9%. In addition to these two ways the acquisition of scanner data with regard to the distribution channel of hypermarkets and supermarkets (for 55.4%), and local survey with regard to other types of points of sale (for the remaining 44.6% of grocery) is used for grocery products.

Finally, an administrative source is used: the database of fuel prices of Ministry of Economic Development whose weight is equal to 3.9%.

Local survey

In 2018 the geographical basis of the survey is made up of 79 municipalities which contribute to the indices calculation of all the product aggregates included in the basket - and of other 17 municipalities[7] 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 (sport events, cinemas, theatre shows, secondary school education, canteens in universities, etc.).

For the whole basket, the coverage of the index in terms of resident population in the provinces whose chief towns take part in the survey is 83.2%. The participation of provincial chief towns is total for six regions (Valle D'Aosta, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, Emilia-Romagna and Umbria) but it is still incomplete for the others, in particular in Puglia (40.8%), Abruzzo (47.7%) and Sardegna (56.0%). Starting from December 2017, Campobasso, regional chief town of Molise has extended the survey to the whole basket improving the coverage of the survey, which in 2018 goes back to including all Italian regions.

At the macro-area level, coverage is total in the North-East; it is equal to 89.4% in the North-West, 83.3% in the Centre, 65.7% in the South and 75.3% in the Islands.

Concerning the basket subset including local tariffs and some local services - whose weight on the NIC basket is equal to 6.1% - with the participation of the other 17 municipalities the coverage of the survey. measured in terms of provincial resident population rises to 92.5%. The participation becomes total for 13 regions and it is stable in the remaining regions.

Central survey

In 2018 prices/quotes collected each month directly by Istat are more than 153,000, of which:

✓ 152,700 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;
- GfK Italia S.r.l., for information on a large sub-set of technical consumer goods;

[7] They are Asti, Chieti, Fermo, Foggia, Frosinone, Isernia, L'Aquila, Matera, Monza, Prato, Ragusa, Salerno, Savona, Termoli, Vasto, Verbania and Vibo Valentia.

✓ about 400 quotes directly provided by insurance companies which refer to protection against most risks connected to property, such as fire, theft and other damages and are used for the Housing insurance services price index compilation.

The percentage of products observed directly by Istat calculated according to the weight assigned to each product within the NIC is 23.9% in 2018 (23.6% in the previous year).

Concerning the central price collection the main changes in 2018 refer to the survey design for national rail transport and passenger transport by air price collection and the use of a new data source for the index compilation of a large sub-set of technical consumer goods (the new data base, supplied by GfK Italia S.r.l., with price data which refer to more than a million of purchases made on both e-commerce sites and physical stores, per month).

Scanner data

Starting from January 2018 Istat introduces scanner data of grocery products (excluding fresh food) in the production process of estimation of inflation.

This innovation concerns 79 indices of aggregate of products belonging to 5 ECOICOP Divisions (01, 02, 05, 09, 12).

In agreement with retail trade chains (RTCs) and with the collaboration of the Association of modern distribution and Nielsen, scanner data for 1,781 outlets (510 hypermarkets and 1,271 supermarkets) of the main 16 RTCs covering the entire national territory are monthly collected by Istat on a weekly basis at item code level.

For the selection of the sample of outlets a probabilistic design was implemented. Outlets were stratified according to provinces (107), chains (16) and outlet-types (hypermarket, supermarket) in 888 strata. Probabilities of selection were assigned to each outlet based on the corresponding turnover value.

Concerning the selection of the sample of items, a static approach that mimics traditional price collection method has been adopted. Specifically, a cut off sample of barcodes (GTINs) has been selected within each outlet/aggregate of products (covering 40% of turnover but selecting no more than the first 30 GTINs in terms of turnover). The products selected in December are kept fixed during the following year. A “tank” of potentially replacing outlets (258) and GTINs (until a coverage of 60% of turnover within each outlet/aggregate) has been detected in order to better manage the possible replacements during 2018.

About 1,370,000 price quotes are collected each week to estimate inflation. For each GTIN, prices are calculated taking into account turnover and quantities (weekly price=weekly turnover/weekly quantities). Monthly prices are calculated with arithmetic mean of weekly prices weighted with quantities.

Scanner data (SD) indices of aggregate of products are calculated at outlet level as unweighted Jevons index (geometric mean) of GTINs elementary indices. Provincial SD indices of aggregate of products are calculated with weighted arithmetic mean of outlet indices using sampling weights. Finally, for each aggregate of products, SD indices and indices referred to other channels of retail trade distribution are aggregated with weighted arithmetic mean using expenditure weights.

Administrative sources

In 2018 automotive fuels price indices (the weight on the basket is 3.9%) are calculated using the data base supplied by the Ministry of Economic Development that collects prices for these products. More than 63,000 price quotes are monthly used to estimate inflation and they come from about 13,240 fuel stations on the territory, that is 65.9% of the ones active and present in Ministry database.

The 13,240 fuel stations cover the entire national territory and they are located in the different geographical areas as it follows: 3,500 in the North-West; 3,100 in the North-East; 2,900 in the Centre; almost 2,400 in the South and about 1,300 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);
- one 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.
- collecting three prices for month for the hotel bedroom referring to the first three Saturday of the month;

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:

- twice a 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 9th to the 15th 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.);
- twice a month, for technical consumer goods by GfK Italia S.r.l.;
- 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.
- about the grocery products for hypermarkets and supermarkets the average weekly prices are collected, through *scanner data*, in the first three full weeks of referring month.

Weighting structure

In Table 1 the weighting structure for the year 2018 of NIC and HICP is reported.

TABLE 1. WEIGHTS USED FOR CALCULATING CONSUMER PRICE INDICES. BY EXPENDITURE DIVISION. Year 2018, percentage values

EXPENDITURE DIVISIONS	*WEIGHTS*	
	NIC	HICP
Food and non-alcoholic beverages	16.5103	17.5418
Alcoholic beverages. tobacco	3.0965	3.2861
Clothing and footwear	7.2048	8.3493
Housing. water. electricity. gas and other fuels	10.7989	11.4604
Furnishings. household equipment and routine household maintenance	7.139	7.5998
Health	8.4906	4.2429
Transport	14.6713	15.5569
Communication	2.5318	2.6871
Recreation and culture	7.7042	6.0523
Education	0.9793	1.0397
Restaurants and hotels	11.7391	12.4574
Miscellaneous goods and services	9.1342	9.7263
All items	**100.0000**	**100.0000**

Harmonized index of consumer prices at constant tax rates

The Harmonized Index of Consumer Prices at constant tax rates (**HICP-CT**)[8] is calculated as established by the Regulation (EC) no 119/2013 of the 11th 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[9]. 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:

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

- 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:

[8] 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.
[9] The expressions and the rounding rules described for NIC are also carried out for FOI.

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

- 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:

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

- 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:

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

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**

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

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 $i=2\ldots..t$ 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

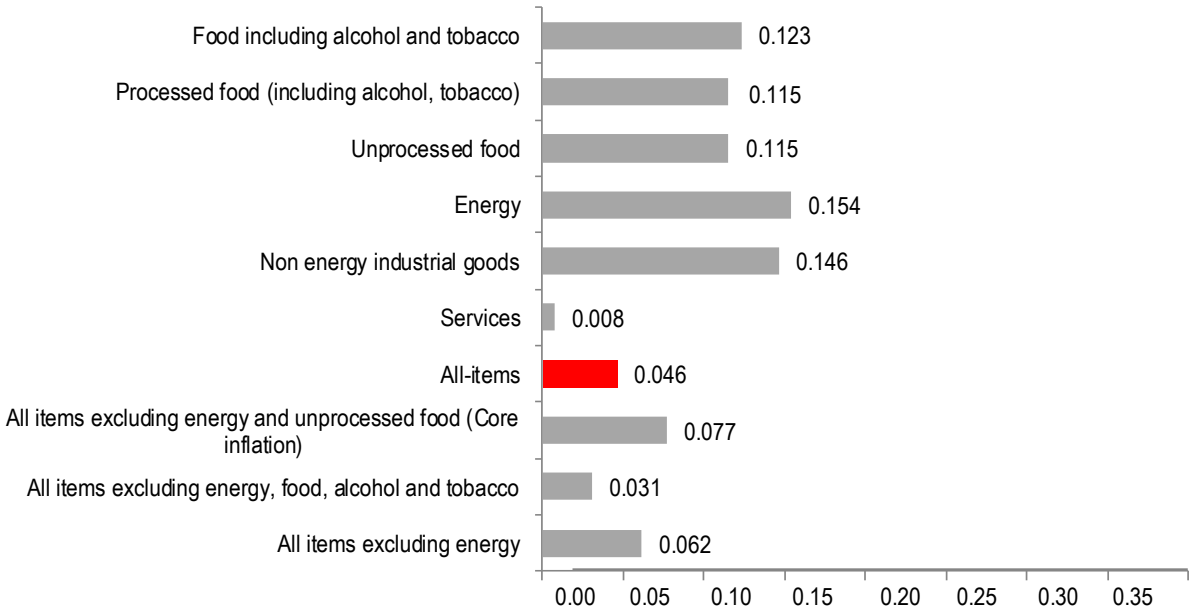
Table 2 compares the flash estimates and the final HICP annual rates of change for the same reference month. Over the last thirteen months, the maximum difference between the flash estimate – all items and the HICP – all items annual rates of change was +0.3 in January 2017. Over the same period, with 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 in January 2017), Processed food (including alcohol, tobacco) (+1.2 in January 2017), Unprocessed food (+0.9 in January 2017), Energy (+0.7 in January 2018) and Non energy industrial goods (+0.5 in January 2017). The highest frequency of revisions for Non energy industrial goods (ten 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
January 2017-January 2018, percentage values (base 2015=100)

Special aggregates		Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18
Food including alcohol and tobacco:	Flash	1.2	3.5	2.7	1.9	1.8	0.8	0.8	0.8	1.3	1.9	1.6	1.7	1.3
	HICP	2.3	3.6	2.7	1.9	1.7	0.8	0.8	0.7	1.3	1.9	1.7	1.6	1.3
Processed food (including alcohol, tobacco)	Flash	-0.7	0.6	0.7	0.5	0.5	0.4	0.5	0.6	0.6	0.7	0.8	1.1	1.8
	HICP	0.5	0.6	0.7	0.5	0.4	0.4	0.5	0.6	0.6	0.7	0.9	1.1	1.7
Unprocessed food	Flash	3.6	7.4	5.2	3.8	3.4	1.2	1.3	0.9	2.1	3.3	2.8	2.4	0.6
	HICP	4.5	7.4	5.4	3.8	3.4	1.3	1.3	0.9	2.1	3.3	2.8	2.3	0.8
Energy	Flash	2.6	4.2	4.5	7.5	6.4	4.6	3.5	4.5	3.4	3.7	4.4	4.2	3.8
	HICP	2.7	4.8	4.6	7.4	6.4	4.6	3.4	4.5	3.4	4.0	4.4	4.2	4.5
Non energy industrial goods	Flash	0.0	0.4	-0.4	0.3	0.2	0.3	0.3	0.7	0.7	0.3	0.3	0.3	1.0
	HICP	0.5	0.1	0,0	0.2	0.3	0.3	0.3	0.7	0.8	0.2	0.4	0.4	0.9
Services	Flash	0.6	1.0	1.1	1.8	1.3	1.4	1.3	1.6	1.3	0.7	0.5	0.5	0.5
	HICP	0.6	1.0	1.1	1.8	1.3	1.4	1.3	1.6	1.3	0.6	0.5	0.5	0.5
All-items	Flash	**0.7**	**1.6**	**1.3**	**2.0**	**1.5**	**1.2**	**1.2**	**1.4**	**1.3**	**1.1**	**1.1**	**1,0**	1.1
	HICP	**1.0**	**1.6**	**1.4**	**2.0**	**1.6**	**1.2**	**1.2**	**1.4**	**1.3**	**1.1**	**1.1**	**1,0**	1.2
All items excluding energy and unprocessed food (Core inflation)	Flash	0.1	0.7	0.6	1.2	0.8	0.9	0.8	1.1	0.9	0.6	0.4	0.5	0.8
	HICP	0.5	0.6	0.7	1.2	0.8	1.0	0.8	1.1	1.0	0.5	0.5	0.5	0.8
All items excluding energy, food, alcohol and tobacco	Flash	0.3	0.7	0.5	1.3	0.9	1.0	0.9	1.2	1.1	0.5	0.4	0.4	0.7
	HICP	0.5	0.7	0.6	1.3	0.9	1.0	0.9	1.2	1.1	0.5	0.4	0.5	0.7
All items excluding energy	Flash	0.5	1.4	1,0	1.4	1.1	0.9	0.9	1.1	1.1	0.8	0.7	0.6	0.8
	HICP	0.9	1.3	1.1	1.4	1.1	1.0	0.9	1.1	1.1	0.8	0.7	0.7	0.8

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 Energy (0.154 percentage points), Non energy industrial goods (0.146 percentage points) and Food including alcohol and tobacco (0.123 percentage points) have recorded the highest MADs.

FIGURE 1. MEAN ABSOLUTE DEVIATION BETWEEN FLASH ESTIMATES AND HICP ANNUAL RATES
January 2017-January 2018, 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 116 out of 130 estimates.

TABLE 3. FLASH ESTIMATE PREDICTION CAPACITY OF THE DIRECTION OF INFLATION MEASURED BY HICP
January 2017-January 2018

Aggregati speciali	gen-17	feb-17	mar-17	apr-17	mag-17	giu-17	lug-17	ago-17	set-17	ott-17	nov-17	dic-17	gen-18
Beni alimentari (incluse bevande alcoliche) e tabacchi, di cui:	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟡	🟢	🟢	🟢	🟡	🟢
Alimentari lavorati (inclusi i tabacchi)	🟡	🟢	🟢	🟢	🟡	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Alimentari non lavorati	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Energia	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🔴
Beni industriali non energetici	🔴	🟢	🟢	🟢	🟡	🟢	🟢	🟢	🟡	🟢	🟢	🟡	🟢
Servizi	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Indice generale	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢
Indice generale al netto dell'energia e degli alimentari freschi (Componente di fondo)	🟢	🟢	🟡	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟡	🟢	🟢
Indice generale al netto dell'energia, degli alimentari (incluse bevande alcoliche) e tabacchi	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟡	🟢
Indice generale esclusi energetici	🟡	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟢	🟡	🟢

Computation methodology of flash estimates

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

- prices collected at local level by 60 municipalities (out of 79) are used. Out of these municipalities, there are the 37 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 17 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[10] 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).

[10] 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.