

Euro area HICP flash estimate breakdown

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Abstract

The early estimate of inflation in the euro area – HICP (Harmonised Index of Consumer Prices) flash estimate – is one of the most followed indicators published by Eurostat. This estimate is based on early HICP estimates relating to the reference month from euro area Member States, energy prices and historical HICP data. It gives an indication of what the euro area inflation is likely to be when the full data set is available. The estimation procedure combines historical information with partial information on price developments in the most recent months to give a total index for the euro area.

The flash estimate is normally released one week before the monthly monetary policy meeting of the board of the ECB and two weeks before the full HICP data set for the month in question is published, and plays therefore a key role for monetary policy purposes (notably the interest rate decisions) of the ECB. Thus it is apparent that the flash measure is of great importance for the financial market. However, the relevance of the estimate could be further improved by adding to the release information on its underlining components, as requested by users.

To respond to this demand Eurostat launched a project that aims at breaking down the current HICP all-item-one-figure flash estimate into four sub-aggregates: energy, food, non-energy industrial goods and services. The project is now in its final stretches. The current plan is to start publishing the Flash Estimate breakdown as from the September 2012 release.

This paper describes how the flash estimate is currently produced and outlines the procedures for the estimation of the breakdown of the HICP flash estimate.

Key words: euro area inflation, HICP flash estimate, sub-aggregates

¹ The opinions expressed in this paper are the author's opinion and need not represent Eurostat's view on the subject. The paper does not prejudge decisions to be made.

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1. Introduction

This document provides an overview of the compilation of the euro area inflation flash estimate³ (FE) published monthly by Eurostat, the statistical office of the European Union. The document, after a brief history of the FE, describes the methodology and the statistical procedures of the planned extension of the release by provision of a breakdown of the inflation to four sub-aggregates.

There has always been a vast interest to the HICP flash figure, both among professional users, media and general public. The HICP FE is one of the European key economic indicators and included to the list of Principal European Economic Indicators (PEEIs). Moreover, it is used as an important input for the European Central Bank's (ECB) monetary purposes, notably the interest rate setting, due to its timeliness. It is the freshest available inflation figure at the time of the monthly meeting of the ECB's Governors where the interest rate decisions are taken. The FE is also of interest for other central banks and financial analysts and for the financial markets generally.

The FE gives an early estimate of the development of annual inflation in the euro area. Eurostat compiles the figure using an econometric model that uses preliminary inflation estimates provided by the euro area National Statistical Institutes (NSI), data of energy prices collected by the European Commission's Energy department (DG ENER) and historical Harmonised Indices of Consumer Prices (HICP) data. Usually Eurostat receives early monthly data from 13 over 17 euro area countries, which represent 98 % of the euro-area total expenditure weight.

Historically, the FE has been a good predictor of the euro area's inflation rate, as released on the basis of the full availability of countries data. The analysis of the performances of the FE over the last years shows that the FE has been reasonably accurate giving on average ten times per year exactly the inflation rate and missing by 0.1 percentage points the regular released figures only twice over the last three years. Over the whole FE time series the nowcast rightly predicted the regular release figures 67% of the times (see Annex 1)

Regardless of its good accuracy and importance, the FE has always had somewhat limited relevance to the users as no sub-components of the inflation has been made available. To mitigate the problem and thus to respond to the demand for more detail, Eurostat has committed itself to extend the FE by breaking the all-items figure down to four sub-components: *food, non-energy industrial goods, energy and services*.

The new estimation procedure follows the headline FE methodology using early information from the euro area countries supplemented with an econometric one-step ahead nowcasting model for missing data, and timely price data on energy. However, on the same occasion the nowcasting procedures have been enhanced to further improve the accuracy. The coverage of the sub-aggregates will however be lower than the headline indicator, at least at the beginning. The FE breakdown is ready for regular production and is planned to be released in September 2012.

³ Flash estimate is an early estimate for an economic variable of interest over the most recent reference period and is normally calculated on the basis of a statistical/econometric model.

2. History of Eurostat's Flash Estimate

Eurostat published the first FE for the HICP for October 2001. This single figure giving an early indicator of the expected annual rate of headline inflation for the euro area has since then been released on the last working day of the reference month, or shortly after, approximately two weeks before the full HICP data set.

The FE has throughout its history been one of the most consulted indicators at Eurostat web site; its success is due to its general importance to the users but it can be attributed to its excellent timeliness and sufficiently good accuracy.

The FE was established to respond to the demand from the users. The full set of HICPs, including the euro area inflation indicator, was (and still is) published around the mid-month following the reference month. Although the timeliness of standard HICP release was considered generally acceptable, the earlier release was nevertheless felt necessary as the main users, such as the ECB and the Commission's Economic and Financial Affairs department, needed the information more quickly. In particular, at the time of creation of the monetary union the European Central Bank was seeking for reliable early inflation information for the conducting of its monetary policy. Therefore, Eurostat, in collaboration with the National Statistical Institutes (NSIs) from the euro area Member States (MSs), developed the new statistical product: the flash estimate

In the beginning only some euro area MSs were able to provide the data for the flash release, and consequently the figure was largely an estimate based on the econometric model developed for the purpose at Eurostat.

Over the time, more countries started the transmission of preliminary data that reduced the need of estimation moving the procedure towards a more standard aggregation data. In 2001, only Germany, Italy and Belgium were sending the data, which accounted for around 40% of the euro area total expenditure weight at that time (when euro area consisted of 12 countries). From December 2005 France started to send data, followed by the Netherlands and Austria (from March 2006), and Luxembourg (in April 2006); these new data more than doubled the coverage to approximately 95% of the euro area weight. Currently, the euro area counts 17 members and in addition to abovementioned countries also Greece, Spain, Portugal, Slovenia and Slovakia are sending preliminary data. These thirteen countries account for 98% of euro area total.

Although the FE coverage of the euro area is high, it should be noted that the supply of preliminary data is voluntary for the NSIs and depends largely on their internal production processes; whether or not they are able to extract reliable preliminary data from the databases. Consequently, not all euro area countries are participating in the FE exercise, and moreover not all countries are necessarily sending the data to Eurostat every month.

Only four countries (Germany, Italy, Spain and Slovenia) publish their preliminary inflation estimates. Given that most countries do not publish their inflation estimates, no information on which countries have contributed to the estimate is given and no estimates by euro area country are published by Eurostat.

3. Euro area HICP Flash Estimate: the current situation

Currently, the computation of the FE is based on preliminary inflation data transmitted to Eurostat by some euro area Member States and the early information about price changes of some energy items across the euro area.

The methodology used to produce the FE consists in directly estimating headline HICP inflation rates country by country. In the current setting, 29 countries are covered by the forecasting exercise: i) the 17 euro area MSs, ii) the 12 EU MSs which are not in the euro area, and iii) Iceland and Norway. The estimates are computed through a fixed set of autoregressive (regression) models. An estimate is sequentially computed for each country's HICP, based on a model combining back data of the country in question, energy data and other countries data.

The estimates produced for each of the euro area MSs are then aggregated (as a weighted average) in order to produce an estimate for the euro area. In this setting, when a preliminary HICP estimate is available for a country it is assumed that it represents the best prediction and it takes precedence over the model based estimate, when computing the FE. At the moment Belgium, Germany, France, Greece, Italy, Cyprus, Luxembourg, the Netherlands, Austria, Portugal, Slovenia, Spain and Finland are sending early inflation data to Eurostat. Early price data is actual or preliminary HICP data which is available for the month t , where $t-1$ is the date in which the HICP full data set is usually available for all countries

The model is re-estimated monthly using a fixed-length rolling window, of 60 observations (maximum). The choice of using the most recent five years of data only reflects a compromise between having enough observations and not having to model too many structural breaks.

Briefly, the current FE is produced as follows. Firstly, received early inflation information is stored in a database after which an estimate is computed for countries for which there is no early HICP. The nowcast estimate uses early information on energy prices (petrol, diesel and heating oil prices) available for all EU countries in the oil bulletin released weekly by DG ENER. The fuels and heating oil COICOP indices ($I_{0722,t}$, $I_{0453,t}$) are estimated using the models

$$\log[I_{0722,t}] = \alpha_0 + \alpha_1 \log[I_{0722,t-1}] + \alpha_2 \log[p_{petrol,t}] + \alpha_3 \log[p_{petrol,t-1}] + \alpha_4 \log[p_{diesel,t}] + \alpha_5 \log[p_{diesel,t-1}] + u_t \quad (1)$$

$$\log[I_{0453,t}] = \beta_0 + \beta_1 \log[I_{0453,t-1}] + \beta_2 \log[p_{heatoil,t}] + \beta_3 \log[p_{heatoil,t-1}] + v_t \quad (2)$$

where $p_{petrol,t}$, $p_{diesel,t}$, $p_{heatoil,t}$ are the petrol, diesel and heating oil prices (including duties and taxes) for each country. These energy prices are the ones that are recorded in the second week of each month.

The country HICPs are then estimated through the model (3). The model estimates the HICP for the countries for which no early HICP data is available, using the available early data for other countries and energy prices, through the following regression:

$$\log[I_t] = \alpha_0 + \alpha_1 \log[I_{ex.fuels,t-1}] + \alpha_2 \hat{\log}[I_{0722,t}] + \alpha_3 \hat{\log}[I_{0453,t}] + \sum_c \beta_c \log[I_{prelim.c,t}^{adj}] + \sum_{i=1..11} \delta_i s_{i,t} + \sum_c \delta_c b_{c,t} + \varepsilon_t \quad (3)$$

in which the all-items index excluding fuels (0722+0453) is added with one lag as an explanatory variable and where $\hat{\log}[I_{0722,t}]$ and $\hat{\log}[I_{0453,t}]$ are obtained from the regressions (1) and (2) above. $I_{prelim.c,t}^{adj}$ denotes the preliminary (or early available final) HICP data.

Finally, the euro area HICP is obtained through the standard aggregation procedure as a country weighted average, which combines the nowcast estimates and the received preliminary data.

3. Flash estimate breakdown and first test results

Following the demand by the main users to have the FE figure broken down to its components Eurostat started a project aiming at producing a breakdown of the nowcast to four sub-aggregates. This work is currently in its final phases.

In the project, the current FE procedure producing a single figure needed to be refined in order to take into account the new input and output data for the breakdown. The new process is designed to compose five steps: Step 1 identifies the parameters for best statistical model to be used in each production round, Steps 2 and 3 gather and process all data available and Steps 4 and 5 are the actual FE computation procedures (forecast and calibration). Figure 1 show graphically the main steps of the FE procedure.

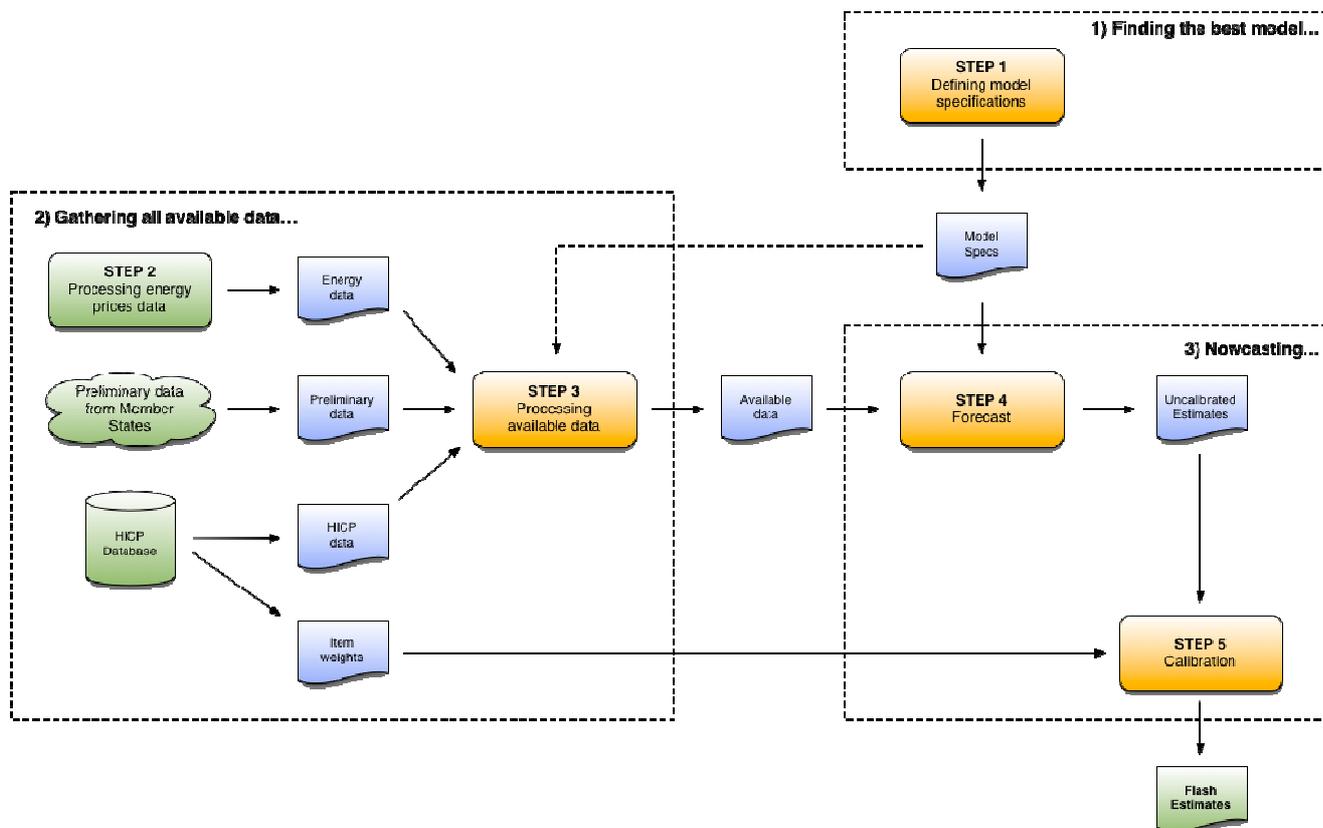
More in details, the different steps perform the following actions:

Step 1: is run before each production round of the FE. In this step an automatic procedure tests which combination of parameters performs the best in terms of the mean square error of the 1-step ahead forecasts; the models used are SARIMAX-type. In this step a test is also performed on whether or not to use energy prices for the aggregate of countries that had provided preliminary data in the previous round. The combination of the parameters and auxiliary energy data, which had produced the smallest 1-step ahead prediction error, defines the model specification to be used in the coming FE calculation.

Step 2: forecasts for the last week of the month are produced for petrol, diesel and heat energy prices. These data are taken from the Weekly Oil Bulletin and usually the last week of the reference month is not yet available at the time of the FE production, hence it needs to be estimated. The monthly averages are then computed.

Step 3: gathers all the data necessary for the computation. Countries are separated into two sets: group 'A' for those who have provided preliminary data for the current month, and group 'N' who did not provide any preliminary data. Country aggregates are then computed for the two groups and for both HICP data and energy prices data. For each sub-aggregate, the 'N' time series (till the previous month) and the 'A' time series (till the current month – i.e. with an additional observation with respect to the 'N' time series, corresponding to the aggregation of the preliminary figures provided by the countries) are then produced.

Figure 1: The flash estimate process



Step 4: produces the 1-step ahead forecast using the data processed in Step 3 and using the model specifications found in Step 1. The missing most recent observation for the time series 'N' is forecasted and afterwards aggregated with the preliminary data provided (series 'A'), producing the (non-calibrated) flash estimate for the specific sub-aggregate.

Step 5: ensures the balancing of the estimated flash estimates of the four sub-aggregates 'food', 'non-energy industrial goods', 'energy' and 'services', i.e. it ensures the coherence between the 'all items' flash estimate and its sub-aggregates in order to produce a consistent set of flash estimates.

In principle the breakdown FE procedure is in line with the current headline FE procedure. Indeed the approach is based on a statistical estimation model with available preliminary national HICP data and energy price information. The model produces one-month ahead estimates of national HICPs and sub-aggregates that are then aggregated to euro area estimates for the reference month.

The procedure for the FE breakdown is also based on the assumption that preliminary data sent by Member States are a better estimate than a model-based estimate. Tests on the historical data confirm this assumption. One implication of this assumption is that, in the best (and desirable) case, the FE is the standard aggregation of preliminary data sent by the NSIs. Another implication is that the FE procedure is closer to a missing data estimation technique than to a forecasting technique.

However, Table 1 shows clearly that the desirable data availability for the FE breakdown is not yet reached. Consequently, there is still need to rely on model based estimates for the sub-aggregates.

For this reason, the nowcasting model that has been traditionally used for the all-items flash estimate had to be updated to a SARIMAX type.

Table 1: Preliminary data availability for the flash estimate in March 2012. Coverage 98% of the all items and 59% of the four sub-aggregates.

	Number of countries	Weight (%)
Full 4-digit COICOP indices	6	14%
All-items and sub-aggregates	4	45%
All-items	3	39%
No data	4	2%

Eurostat has already put in place the 5-step procedure as described in the previous paragraphs and the necessary econometric models for the estimation of the FE breakdown. The procedure is currently in a test phase. The results show an acceptable accuracy (see Table 2 and 3).

Table 2: First results of the test compilation of the FE breakdown November 2011-March 2012.

	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12
All items						
Flash Estimate	3.05	2.77	2.68	2.74	2.63	2.56
HICP	3.04	2.75	2.65	2.73	2.68	2.58
Difference	0.01	0.02	0.03	0.01	-0.05	-0.02
Food						
Flash Estimate	3.60	3.27	3.04	3.33	3.32	2.92
HICP	3.37	3.13	3.12	3.34	3.25	3.10
Difference	0.23	0.14	-0.08	-0.01	0.07	-0.18
Non-energy Industrial Goods						
Flash Estimate	1.55	1.24	1.03	1.09	1.24	1.35
HICP	1.26	1.18	0.95	1.04	1.38	1.32
Difference	0.29	0.06	0.08	0.05	-0.14	0.03
Energy						
Flash Estimate	12.12	9.4	9.38	9.46	8.3	7.54
HICP	12.28	9.68	9.23	9.54	8.54	8.14
Difference	-0.16	-0.28	0.15	-0.08	-0.24	-0.60
Services						
Flash Estimate	1.74	1.77	1.78	1.77	1.91	1.48
HICP	1.85	1.94	1.89	1.82	1.76	1.74
Difference	-0.11	-0.17	-0.11	-0.05	0.15	-0.26

Table 3: Statistics of the reliability of the FE breakdown November 2011-March 2012..

	All-items	Food	Non-energy industrial goods	Energy	Services
RMSE	0.03	0.13	0.15	0.20	0.12
MAD	0.00	0.02	0.02	0.04	0.02
min (1 decimal)	-0.1	-0.1	-0.2	-0.3	-0.2
max (1 decimal)	0.1	0.2	0.3	0.2	0.1

Notes: RMSE: Root Mean Square Error
MAD: Mean Absolute Deviation
Min: Minimum difference in percentage points on the annual rates
Max: Maximum difference in percentage points on the annual rates.

The regular production of the FE breakdown is scheduled by September 2012.

The breakdown of the flash estimate may involve revisiting the general flash estimate communication strategy in particular as the preliminary estimates of the special aggregated are not necessarily as accurate as the all-items estimate.

4. Concluding remarks

This paper describes the methodology used by Eurostat in producing the flash estimates of the HICP all-items for the euro area on the basis of the available preliminary estimates of national HICPs, available energy data and historical HICP data. It also illustrates how Eurostat intend to estimate the breakdown of the HICP all-items flash estimates in four sub-components: food, non-energy industrial goods, energy and services. The regular production of this breakdown of the HICP flash estimates is expected by main users and will complete the insights of the flash estimates at the end of the reference month.

The approach followed for developing the estimation techniques for the FE breakdown is fully in line with the approach used to produce the headline FE. As such, it ensures a coherent view of inflation dynamics with a very good timeliness (end of the reference month).

First test results confirm the good performances of the approach and highlight at the same time the importance of using as much as possible preliminary estimates provided by countries.

Annex 1: FE historical series

Flash Estimate and News Release: euro area annual inflation as published at the time of publication; Final Results⁴: euro area annual inflation currently in Eurostat's databases (18 May 2012), %, and absolute difference between flash estimate and what was published in the news release. The root mean square error of the released flash estimate of euro area inflation rounded to 1 decimal from Jan-2001 to Apr-2012 is 0.045.

TIME	Flash Estimate	News Release	Final Result	FE-NR
	(1)	(2)	(3)	(1)-(2)
2001M10	2.4	2.3	2.2	0.1
2001M11	2.1	2.1	2.0	0.0
2001M12	2.0	2.0	2.0	0.0
2002M01	2.5	2.7	2.6	-0.2
2002M02	2.5	2.5	2.5	0.0
2002M03	2.5	2.5	2.5	0.0
2002M04	2.2	2.4	2.3	-0.2
2002M05	2.0	2.0	2.0	0.0
2002M06	1.7	1.8	1.9	-0.1
2002M07	1.9	1.9	2.0	0.0
2002M08	2.1	2.1	2.1	0.0
2002M09	2.2	2.1	2.1	0.1
2002M10	2.2	2.3	2.3	-0.1
2002M11	2.2	2.2	2.3	0.0
2002M12	2.2	2.3	2.3	-0.1
2003M01	2.1	2.1	2.1	0.0
2003M02	2.3	2.4	2.4	-0.1
2003M03	2.4	2.4	2.5	0.0
2003M04	2.1	2.1	2.1	0.0
2003M05	1.9	1.9	1.8	0.0
2003M06	2.0	2.0	1.9	0.0
2003M07	1.9	1.9	1.9	0.0
2003M08	2.1	2.1	2.1	0.0
2003M09	2.1	2.2	2.2	-0.1
2003M10	2.1	2.0	2.0	0.1
2003M11	2.2	2.2	2.2	0.0
2003M12	2.1	2.0	2.0	0.1
2004M01	2.0	1.9	1.9	0.1
2004M02	1.6	1.6	1.6	0.0
2004M03	1.6	1.7	1.7	-0.1
2004M04	2.0	2.0	2.0	0.0
2004M05	2.5	2.5	2.5	0.0
2004M06	2.4	2.4	2.4	0.0
2004M07	2.4	2.3	2.3	0.1
2004M08	2.3	2.3	2.3	0.0
2004M09	2.2	2.1	2.1	0.1
2004M10	2.5	2.4	2.4	0.1
2004M11	2.2	2.2	2.2	0.0
2004M12	2.3	2.4	2.4	-0.1
2005M01	2.1	1.9	1.9	0.2
2005M02	2.0	2.1	2.1	-0.1
2005M03	2.1	2.1	2.1	0.0
2005M04	2.1	2.1	2.1	0.0
2005M05	2.0	1.9	2.0	0.1
2005M06	2.1	2.1	2.1	0.0
2005M07	2.2	2.2	2.2	0.0
2005M08	2.1	2.2	2.2	-0.1
2005M09	2.5	2.6	2.6	-0.1
2005M10	2.5	2.5	2.5	0.0
2005M11	2.4	2.3	2.3	0.1
2005M12	2.2	2.2	2.2	0.0
2006M01	2.4	2.4	2.4	0.0
2006M02	2.3	2.3	2.3	0.0
2006M03	2.2	2.2	2.2	0.0
2006M04	2.4	2.4	2.5	0.0
2006M05	2.5	2.5	2.5	0.0
2006M06	2.5	2.5	2.5	0.0
2006M07	2.5	2.4	2.4	0.1
2006M08	2.3	2.3	2.3	0.0
2006M09	1.8	1.7	1.7	0.1
2006M10	1.6	1.6	1.6	0.0
2006M11	1.8	1.9	1.9	-0.1
2006M12	1.9	1.9	1.9	0.0
2007M01	1.9	1.8	1.8	0.1
2007M02	1.8	1.8	1.8	0.0
2007M03	1.9	1.9	1.9	0.0
2007M04	1.8	1.9	1.9	-0.1
2007M05	1.9	1.9	1.9	0.0
2007M06	1.9	1.9	1.9	0.0
2007M07	1.8	1.8	1.8	0.0
2007M08	1.8	1.7	1.7	0.1
2007M09	2.1	2.1	2.1	0.0
2007M10	2.6	2.6	2.6	0.0
2007M11	3.0	3.1	3.1	-0.1
2007M12	3.1	3.1	3.1	0.0
2008M02	3.2	3.3	3.3	-0.1
2008M03	3.5	3.6	3.6	-0.1
2008M04	3.3	3.3	3.3	0.0

⁴ The HICP is a revisable index.

Annex 1: continued.

TIME	Flash Estimate	News Release	Final Result	FE-NR
	(1)	(2)	(3)	(1)-(2)
2008M05	3.6	3.7	3.7	-0.1
2008M06	4.0	4.0	4.0	0.0
2008M07	4.1	4.0	4.0	0.1
2008M08	3.8	3.8	3.8	0.0
2008M09	3.6	3.6	3.6	0.0
2008M10	3.2	3.2	3.2	0.0
2008M11	2.1	2.1	2.1	0.0
2008M12	1.6	1.6	1.6	0.0
2009M01	1.1	1.1	1.1	0.0
2009M02	1.2	1.2	1.2	0.0
2009M03	0.6	0.6	0.6	0.0
2009M04	0.6	0.6	0.6	0.0
2009M05	0.0	0.0	0.0	0.0
2009M06	-0.1	-0.1	-0.1	0.0
2009M07	-0.6	-0.7	-0.6	0.1
2009M08	-0.2	-0.2	-0.2	0.0
2009M09	-0.3	-0.3	-0.3	0.0
2009M10	-0.1	-0.1	-0.1	0.0
2009M11	0.6	0.5	0.5	0.1
2009M12	0.9	0.9	0.9	0.0
2010M01	1.0	1.0	0.9	0.0
2010M02	0.9	0.9	0.8	0.0
2010M03	1.5	1.4	1.6	0.1
2010M04	1.5	1.5	1.6	0.0

TIME	Flash Estimate	News Release	Final Result	FE-NR
	(1)	(2)	(3)	(1)-(2)
2010M05	1.6	1.6	1.7	0.0
2010M06	1.4	1.4	1.5	0.0
2010M07	1.7	1.7	1.7	0.0
2010M08	1.6	1.6	1.6	0.0
2010M09	1.8	1.8	1.9	0.0
2010M10	1.9	1.9	1.9	0.0
2010M11	1.9	1.9	1.9	0.0
2010M12	2.2	2.2	2.2	0.0
2011M01	2.4	2.3	2.3	0.1
2011M02	2.4	2.4	2.4	0.0
2011M03	2.6	2.7	2.7	-0.1
2011M04	2.8	2.8	2.8	0.0
2011M05	2.7	2.7	2.7	0.0
2011M06	2.7	2.7	2.7	0.0
2011M07	2.5	2.5	2.6	0.0
2011M08	2.5	2.5	2.5	0.0
2011M09	3.0	3.0	3.0	0.0
2011M10	3.0	3.0	3.0	0.0
2011M11	3.0	3.0	3.0	0.0
2011M12	2.8	2.7	2.7	0.1
2012M01	2.7	2.6	2.7	0.1
2012M02	2.7	2.7	2.7	0.0
2012M03	2.6	2.7	2.7	-0.1
2012M04	2.6	2.6	2.6	0.0

Annex 2: Further information

Eurostat

- [HICP website](#)
- HICP release calendar: [Euro-indicators release calendar](#)
- Principal European Economic Indicators: [PEEIs](#)
- Published data: [Main tables](#) and [Harmonised Indices of Consumer Prices Database](#)
- [News release 113/2001](#) – Launch of the Flash estimate
- [News release 53/2006](#) – Extended coverage
- [News releases on HICP website](#)
- [News releases – HICP Circa site](#)

Directorate-General Economic and Financial Affairs (DG ECFIN)

- [Economic forecasts](#)

Directorate-General Energy (DG ENER)

- Market Observatory: [Energy prices](#)

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- [ECB Survey of Professional Forecasters](#)
- [Forecasting euro area inflation: Does aggregating forecasts by HICP component improve forecast accuracy](#) – K. Hubrich, ECB – Working Paper Series, August 2003