



Paper

Contributions to and impacts on inflation

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1. Introduction

In this paper two methods are compared that calculate in different ways how much influence a product group has on the annual rate of inflation. One method has been used for many years at CBS in the CPI-publications. The other one is used by Eurostat in the HICP news releases.

In section 2 the CBS method is explained, in section 3 the Eurostat method. Both methods have been applied to HICP results for COICOP Divisions from the year 2013 until July 2015. Results are compared in section 4. The derivation of the formulas will be explained in the appendix.

CBS intends to publish results using both methods on the website from 2016.

2. The CBS method to calculate contributions

The first method has been used by CBS for many years and calculates the 'contribution' of a product group to the annual rate of inflation. The method is based on the calculation of the change in overall consumption expenditures as a result of the price change of the product group, on the assumption of a fixed basket.

In the time the CPI was a five years fixed based index the contribution was calculated as follows:

$$(1) \quad Contribution_j^{y,m} = w_j * \left(\frac{p_j^{y,m} - p_j^{y-1,m}}{p^{y-1,m}} \right)$$

Where:

$Contribution_j^{y,m}$	is the contribution to the annual rate of inflation in month m of year y of product group j
$\overline{p_j^{y,m}}$	is the price index for the product group j in month m of year y.
$p^{y,m}$	is the overall price index for total basket in month m of year y.
w_j	is the product group j weight for the base year.

The HICP and from 2006 also the CPI are chain linked indices with yearly changing December weights. Now the formula for the calculation of the contribution becomes a bit more complicated:

$$(2) \quad Contribution_j^{y,m} = \frac{p^{y-1,12}}{p^{y-1,m}} * w_j^{y-1} * \left(\frac{p_j^{y,m} - p_j^{y-1,12}}{p_j^{y-1,12}} \right) + \frac{p^{y-2,12}}{p^{y-1,m}} * w_j^{y-2} * \left(\frac{p_j^{y-1,12} - p_j^{y-2,12}}{p_j^{y-2,12}} \right)$$

where:

$Contribution_j^{y,m}$, $P_j^{y,m}$, and $P_j^{y,m}$ are defined as above, and w_j^{y-1} is the product group j weight in December of year y-1, used for the link from December of year y-1 till December of year y.

Some of the statistical properties of this contribution are:

- A product group with an annual price increase usually¹⁾ has a positive contribution to inflation and with an annual price decrease it has a negative contribution,
- The contribution of a product group to inflation is not influenced by price developments of other product groups,
- The larger the weight, and the bigger the price change, the larger is the contribution,
- The sum of the contributions of all product groups together equals overall inflation

3. The Eurostat method to calculate impacts

The second method has been used by Eurostat for many years and calculates the 'impact' of a product group to the annual rate of inflation. The method is based on the calculation of the difference between the headline inflation rate and the calculation of the inflation rate if a product group were to be removed from the basket. Results for the largest positive and negative impacts are published each month in the Eurostat news release.

The impacts can be calculated using the next formula:

$$(3) \quad Impact_j^{y,m} = \frac{P_{i \in S}^{y,m}}{P_{i \in S}^{y-1,m}} - \frac{P_{i \neq j}^{y,m}}{P_{i \neq j}^{y-1,m}}$$

Where

$$(4) \quad \frac{P_{i \neq j}^{y,m}}{P_{i \neq j}^{y-1,m}} = \frac{\left(\frac{P_{i \in S}^{y,m}}{P_{i \in S}^{y-1,12}} - w_j^{y-1} * \frac{P_j^{y,m}}{P_j^{y-1,12}} \right) * \left(\frac{P_{i \in S}^{y-1,12}}{P_{i \in S}^{y-2,12}} - w_j^{y-2} * \frac{P_j^{y-1,12}}{P_j^{y-2,12}} \right)}{\left(1 - w_j^{y-1} \right) * \left(\frac{P_{i \in S}^{y-1,m}}{P_{i \in S}^{y-2,12}} - w_j^{y-2} * \frac{P_j^{y-1,m}}{P_j^{y-2,12}} \right)}$$

The properties of the impacts differ from the properties of the contributions:

- The sum of the impacts of all product groups together is generally close to zero, but the impacts do not add up to any interpretable figure.
- The direction and size of the impacts depend on the rate of price change compared with overall inflation. If prices go up with a higher speed than headline inflation the impact on inflation is positive, if they grow at a lower rate than headline inflation the impact is negative.
- The size of the impact depends also on the weight for the product group.

¹⁾ It may be different only in exceptional cases, e.g. when the price P_j in December of year y-1 is higher than the prices both in month m of year y and in month m in year y-1, and there is also a significant difference in the weight in the two years.

4. Comparison of results of different methods

In this section we present the results for contributions and impacts for the HICP of the Netherlands. Contributions and impacts were calculated for all 12 COICOP Divisions from December 2012 until July 2015.

In table 1 we summarize the main results for two of the most interesting months. December 2012 because it is the month with highest overall inflation in the period concerned and April 2015 because overall inflation is nearest to zero.

4.1 Contribution to and impact on inflation in two selected months

COICOP	Contribution	Impact	Contribution	Impact
	2012M12	2012M12	2015M04	2015M04
0 All-items HICP	3.37	3.37	-0.03	-0.03
1 Food and non-alcoholic beverages	0.51	0.05	0.02	0.02
2 Alcoholic beverages, tobacco and narcotics	0.21	0.08	0.09	0.10
3 Clothing and footwear	-0.03	-0.26	-0.18	-0.19
4 Housing, water, electricity, gas and other fuels	0.55	-0.04	0.21	0.30
5 Furnishings, household equipment and routine household maintenance	0.11	-0.15	-0.07	-0.07
6 Health	0.38	0.29	-0.01	-0.02
7 Transport	0.85	0.40	-0.33	-0.37
8 Communications	-0.01	-0.15	-0.07	-0.07
9 Recreation and culture	0.27	-0.16	-0.07	-0.10
10 Education	0.02	0.00	0.02	0.02
11 Restaurants and hotels	0.17	-0.03	0.18	0.16
12 Miscellaneous goods and services	0.33	-0.01	0.19	0.22

In the month with inflation closest to zero results for impacts are generally slightly larger, but always in the same direction as the results for contributions.

In periods of high inflation results are much more different. For COICOP 7 Transport the contribution was highest and also the impact was high. This is a case of a high annual rate (+5.6%, compared with 3.4% for headline inflation) and rather large weight. Very interesting is the result for COICOP 9 Recreation and culture. Due to the rather large weight and the moderate price increase the contribution to inflation in December 2012 was 0,27%-points. However, because the price increase was below headline inflation the impact was -0.16% points. Also for COICOP 4 Housing we observe a very high contribution (0.55) and yet a negative impact (-0.04).

All results are in tables 2 to 5. Table 2 gives the HICP indices for the COICOP divisions and months concerned. In table 3 annual rates of change are compiled. Table 4 gives the contributions to inflation of COICOP divisions using the CBS method, and table 5 gives the impacts on inflation by COICOP divisions using the Eurostat method. The final table 6 gives all the weights for the relevant years.

4.2 HICP index numbers by COICOP Division; Netherlands

COICOP	0	1	2	3	4	5	6	7	8	9	10	11	12
2012M12	114.20	117.48	133.73	97.77	119.26	110.46	126.03	121.27	91.59	101.62	102.28	123.60	116.27
2013M01	114.17	116.50	135.82	89.68	120.21	110.33	132.18	122.03	93.28	100.12	101.67	121.30	120.72
2013M02	115.34	118.09	137.04	93.98	120.25	110.44	132.13	123.53	93.33	101.58	101.67	123.02	121.52
2013M03	116.88	118.50	142.28	115.26	119.87	110.58	131.73	123.38	92.23	101.34	101.67	122.79	121.40
2013M04	116.97	117.97	143.85	115.32	119.70	110.34	132.49	122.99	92.62	101.92	101.48	124.04	121.61
2013M05	117.02	118.57	143.86	114.25	119.65	110.28	132.30	123.15	90.65	102.43	101.48	125.33	121.57
2013M06	116.44	118.61	143.41	105.15	119.68	110.28	132.23	123.40	90.02	103.09	101.48	125.32	121.44
2013M07	116.86	118.55	143.85	94.86	121.69	110.09	132.03	125.27	89.61	106.53	101.87	127.01	121.58
2013M08	116.60	117.77	144.04	95.71	121.63	109.43	131.82	125.17	90.55	105.08	101.87	127.42	121.49
2013M09	116.70	116.89	143.98	105.68	121.61	109.68	132.19	124.25	89.26	103.35	104.85	125.03	121.68
2013M10	116.40	116.65	144.11	106.33	121.53	109.56	132.21	122.91	89.01	102.09	104.85	126.09	121.85
2013M11	115.71	116.22	144.31	104.59	121.61	109.93	132.53	121.56	89.42	100.40	104.85	123.47	121.70
2013M12	115.81	117.57	144.00	97.62	121.51	109.73	132.46	122.25	89.16	102.31	104.85	125.34	121.75
2014M01	115.08	117.23	145.28	89.73	122.19	109.15	133.92	122.68	88.91	101.43	104.91	122.22	121.49
2014M02	115.77	117.97	145.49	93.25	122.26	109.30	133.69	123.23	87.93	102.37	104.91	124.24	122.00
2014M03	117.04	118.12	145.52	113.52	122.22	109.96	134.07	123.16	87.18	101.46	104.91	123.43	121.76
2014M04	117.72	118.22	145.46	113.29	122.09	109.97	133.75	125.53	86.84	102.51	105.10	127.76	121.92
2014M05	117.18	117.76	145.37	111.83	122.04	109.86	133.67	124.37	86.24	101.90	105.10	126.95	121.65
2014M06	116.76	117.61	144.92	104.97	121.80	109.41	133.58	125.29	84.98	102.47	105.10	127.86	121.53
2014M07	117.16	118.01	145.59	91.84	123.86	109.37	133.65	126.62	84.67	106.63	105.39	130.87	121.56
2014M08	117.02	117.45	145.54	94.34	123.69	108.52	133.84	126.35	84.99	105.49	105.39	130.98	121.71
2014M09	116.99	117.05	145.75	105.11	123.79	108.34	133.17	124.74	83.70	103.38	108.56	127.44	121.88
2014M10	116.86	117.14	145.75	106.01	123.85	108.60	133.69	123.50	84.66	101.97	108.56	128.02	122.15
2014M11	116.00	117.20	145.89	104.73	123.91	108.26	133.68	121.32	84.72	100.28	108.56	125.50	121.13
2014M12	115.74	117.61	145.60	97.75	123.82	108.20	133.63	120.02	84.82	101.93	108.56	127.22	121.71
2015M01	114.31	116.54	147.48	86.81	123.69	107.56	133.39	118.20	84.40	100.89	108.62	123.71	123.82
2015M02	115.24	117.96	147.68	90.44	123.62	108.17	133.41	119.87	81.95	102.09	108.62	125.70	123.95
2015M03	116.72	117.87	148.97	110.08	123.36	108.39	133.59	121.19	82.33	101.23	108.62	125.51	124.08
2015M04	117.69	118.35	149.15	110.18	123.48	108.85	133.17	122.85	85.33	101.90	107.94	130.40	124.27
2015M05	117.98	118.43	148.03	108.91	123.43	108.66	133.19	124.05	85.60	103.16	107.94	131.70	124.01
2015M06	117.33	118.34	148.25	103.69	123.49	109.09	133.42	123.89	82.45	103.01	107.94	130.09	124.05
2015M07	118.10	118.82	149.15	91.98	124.32	109.10	131.57	125.96	82.73	107.56	107.93	136.11	124.27

4.3 HICP annual rates of change by COICOP Division; Netherlands

COICOP	0	1	2	3	4	5	6	7	8	9	10	11	12
2012M12	3.37	3.64	5.31	-0.46	3.19	1.54	13.32	5.62	-0.26	2.20	3.13	2.91	3.28
2013M01	3.22	3.78	6.17	0.04	3.44	1.88	6.17	4.43	0.24	1.41	2.08	1.72	5.30
2013M02	3.24	2.88	7.58	-0.32	3.39	1.53	6.15	4.71	-0.06	2.43	2.08	1.85	5.35
2013M03	3.20	3.39	11.42	1.19	3.03	1.33	5.60	3.24	-0.93	2.75	2.08	2.16	5.13
2013M04	2.78	2.83	11.82	0.71	2.77	1.37	5.58	1.73	-0.16	2.50	2.31	1.27	5.14
2013M05	3.06	3.47	11.21	1.42	2.62	0.89	5.54	2.68	-2.31	3.24	2.31	1.95	5.47
2013M06	3.16	2.94	10.16	1.85	2.64	0.82	5.54	4.06	-3.02	3.58	2.31	1.86	5.13
2013M07	3.10	3.20	10.20	3.08	2.66	0.76	5.17	3.25	-1.30	3.13	1.81	1.08	4.97
2013M08	2.79	2.93	10.36	1.40	2.68	0.41	4.89	2.11	-1.94	2.89	1.81	1.86	5.50
2013M09	2.39	2.24	10.01	-0.88	2.54	0.23	5.24	1.71	-2.35	2.89	2.55	1.51	5.30
2013M10	1.31	0.90	9.42	-1.50	1.73	-0.89	4.94	-0.32	-3.96	1.52	2.55	1.64	4.56
2013M11	1.19	0.49	7.95	-1.91	1.94	-0.70	5.03	0.15	-3.06	0.68	2.51	1.06	4.45
2013M12	1.41	0.08	7.68	-0.15	1.89	-0.66	5.10	0.81	-2.65	0.68	2.51	1.41	4.71
2014M01	0.80	0.63	6.97	0.06	1.65	-1.07	1.32	0.53	-4.68	1.31	3.19	0.76	0.64
2014M02	0.37	-0.10	6.17	-0.78	1.67	-1.03	1.18	-0.24	-5.79	0.78	3.19	0.99	0.39
2014M03	0.14	-0.32	2.28	-1.51	1.96	-0.56	1.78	-0.18	-5.48	0.12	3.19	0.52	0.30
2014M04	0.64	0.21	1.12	-1.76	2.00	-0.34	0.95	2.07	-6.24	0.58	3.57	3.00	0.25
2014M05	0.14	-0.68	1.05	-2.12	2.00	-0.38	1.04	0.99	-4.86	-0.52	3.57	1.29	0.07
2014M06	0.27	-0.84	1.05	-0.17	1.77	-0.79	1.02	1.53	-5.60	-0.60	3.57	2.03	0.07
2014M07	0.26	-0.46	1.21	-3.18	1.78	-0.65	1.23	1.08	-5.51	0.09	3.46	3.04	-0.02
2014M08	0.36	-0.27	1.04	-1.43	1.69	-0.83	1.53	0.94	-6.14	0.39	3.46	2.79	0.18
2014M09	0.25	0.14	1.23	-0.54	1.79	-1.22	0.74	0.39	-6.23	0.03	3.54	1.93	0.16
2014M10	0.40	0.42	1.14	-0.30	1.91	-0.88	1.12	0.48	-4.89	-0.12	3.54	1.53	0.25
2014M11	0.25	0.84	1.09	0.13	1.89	-1.52	0.87	-0.20	-5.26	-0.12	3.54	1.64	-0.47
2014M12	-0.06	0.03	1.11	0.13	1.90	-1.39	0.88	-1.82	-4.87	-0.37	3.54	1.50	-0.03
2015M01	-0.67	-0.59	1.51	-3.25	1.23	-1.46	-0.40	-3.65	-5.07	-0.53	3.54	1.22	1.92
2015M02	-0.46	-0.01	1.51	-3.01	1.11	-1.03	-0.21	-2.73	-6.80	-0.27	3.54	1.18	1.60
2015M03	-0.27	-0.21	2.37	-3.03	0.93	-1.43	-0.36	-1.60	-5.56	-0.23	3.54	1.69	1.91
2015M04	-0.03	0.11	2.54	-2.75	1.14	-1.02	-0.43	-2.13	-1.74	-0.60	2.70	2.07	1.93
2015M05	0.68	0.57	1.83	-2.61	1.14	-1.09	-0.36	-0.26	-0.74	1.24	2.70	3.74	1.94
2015M06	0.49	0.62	2.30	-1.22	1.39	-0.29	-0.12	-1.12	-2.98	0.53	2.70	1.74	2.07
2015M07	0.80	0.69	2.45	0.15	0.37	-0.25	-1.56	-0.52	-2.29	0.87	2.41	4.00	2.23

4.4 HICP overall annual rate of change and contribution to inflation by COICOP Division; Netherlands

COICOP	0	1	2	3	4	5	6	7	8	9	10	11	12
2012M12	3.37	0.51	0.21	-0.03	0.55	0.11	0.38	0.85	-0.01	0.27	0.02	0.17	0.33
2013M01	3.21	0.52	0.24	0.00	0.60	0.14	0.18	0.68	0.01	0.17	0.02	0.10	0.55
2013M02	3.24	0.41	0.29	-0.02	0.58	0.11	0.18	0.72	0.00	0.29	0.02	0.11	0.55
2013M03	3.19	0.47	0.42	0.08	0.52	0.10	0.16	0.49	-0.04	0.32	0.02	0.13	0.52
2013M04	2.77	0.39	0.44	0.05	0.47	0.10	0.16	0.26	0.00	0.30	0.02	0.08	0.53
2013M05	3.05	0.48	0.42	0.10	0.44	0.06	0.16	0.41	-0.09	0.38	0.02	0.12	0.56
2013M06	3.16	0.41	0.38	0.12	0.45	0.06	0.16	0.62	-0.12	0.43	0.02	0.11	0.53
2013M07	3.09	0.45	0.38	0.18	0.47	0.06	0.15	0.49	-0.05	0.38	0.01	0.07	0.51
2013M08	2.80	0.40	0.39	0.08	0.47	0.03	0.14	0.32	-0.08	0.35	0.01	0.12	0.56
2013M09	2.39	0.31	0.37	-0.06	0.44	0.02	0.15	0.26	-0.09	0.34	0.02	0.09	0.54
2013M10	1.30	0.12	0.35	-0.10	0.30	-0.06	0.14	-0.06	-0.16	0.18	0.02	0.10	0.47
2013M11	1.19	0.07	0.30	-0.13	0.34	-0.05	0.14	0.02	-0.12	0.08	0.02	0.06	0.46
2013M12	1.40	0.01	0.29	-0.01	0.33	-0.05	0.14	0.12	-0.11	0.08	0.02	0.09	0.48
2014M01	0.80	0.09	0.26	0.01	0.29	-0.08	0.04	0.08	-0.19	0.16	0.02	0.05	0.07
2014M02	0.38	-0.01	0.23	-0.04	0.30	-0.07	0.04	-0.04	-0.24	0.09	0.02	0.06	0.04
2014M03	0.14	-0.04	0.09	-0.11	0.34	-0.04	0.05	-0.03	-0.22	0.01	0.02	0.03	0.03
2014M04	0.64	0.03	0.04	-0.13	0.35	-0.02	0.03	0.30	-0.25	0.07	0.03	0.18	0.03
2014M05	0.14	-0.10	0.04	-0.15	0.35	-0.03	0.03	0.14	-0.19	-0.06	0.03	0.08	0.01
2014M06	0.27	-0.12	0.04	-0.01	0.31	-0.06	0.03	0.22	-0.22	-0.07	0.03	0.12	0.01
2014M07	0.26	-0.06	0.05	-0.18	0.32	-0.05	0.04	0.15	-0.22	0.01	0.03	0.19	0.00
2014M08	0.36	-0.04	0.04	-0.08	0.30	-0.06	0.05	0.13	-0.24	0.05	0.03	0.17	0.02
2014M09	0.26	0.02	0.05	-0.04	0.32	-0.08	0.02	0.05	-0.24	0.00	0.03	0.12	0.02
2014M10	0.40	0.06	0.04	-0.02	0.34	-0.06	0.03	0.07	-0.19	-0.01	0.03	0.09	0.03
2014M11	0.25	0.12	0.04	0.00	0.34	-0.11	0.03	-0.03	-0.21	-0.01	0.03	0.10	-0.05
2014M12	-0.06	0.00	0.04	0.01	0.34	-0.10	0.03	-0.27	-0.19	-0.04	0.03	0.09	0.00
2015M01	-0.67	-0.09	0.06	-0.19	0.22	-0.10	-0.01	-0.53	-0.20	-0.08	0.03	0.01	0.19
2015M02	-0.46	0.00	0.06	-0.18	0.20	-0.07	-0.01	-0.40	-0.27	-0.03	0.03	0.05	0.16
2015M03	-0.28	-0.03	0.09	-0.20	0.17	-0.10	-0.01	-0.24	-0.21	-0.03	0.03	0.07	0.18
2015M04	-0.03	0.02	0.09	-0.18	0.21	-0.07	-0.01	-0.33	-0.07	-0.07	0.02	0.18	0.19
2015M05	0.69	0.08	0.07	-0.17	0.21	-0.08	-0.01	-0.06	-0.03	0.16	0.02	0.30	0.19
2015M06	0.48	0.09	0.09	-0.07	0.25	-0.02	0.00	-0.19	-0.11	0.08	0.02	0.15	0.20
2015M07	0.80	0.10	0.09	0.00	0.06	-0.02	-0.05	-0.11	-0.09	0.17	0.02	0.40	0.22

4.5 HICP overall annual rate of change and impact on overall annual rate by COICOP Division; Netherlands

COICOP	0	1	2	3	4	5	6	7	8	9	10	11	12
2012M12	3.37	0.05	0.08	-0.26	-0.04	-0.15	0.29	0.40	-0.15	-0.16	0.00	-0.03	-0.01
2013M01	3.22	0.09	0.12	-0.19	0.05	-0.11	0.08	0.22	-0.12	-0.25	-0.01	-0.10	0.25
2013M02	3.24	-0.06	0.17	-0.23	0.03	-0.14	0.08	0.26	-0.14	-0.11	-0.01	-0.09	0.25
2013M03	3.20	0.03	0.32	-0.16	-0.04	-0.15	0.07	0.01	-0.17	-0.06	-0.01	-0.07	0.22
2013M04	2.78	0.00	0.35	-0.16	-0.01	-0.11	0.08	-0.19	-0.12	-0.04	0.00	-0.10	0.27
2013M05	3.06	0.06	0.32	-0.13	-0.10	-0.17	0.07	-0.06	-0.22	0.02	-0.01	-0.07	0.27
2013M06	3.16	-0.04	0.27	-0.09	-0.12	-0.18	0.07	0.16	-0.26	0.06	-0.01	-0.08	0.23
2013M07	3.10	0.01	0.28	0.00	-0.09	-0.18	0.06	0.02	-0.18	0.00	-0.01	-0.13	0.22
2013M08	2.79	0.02	0.29	-0.09	-0.02	-0.18	0.06	-0.13	-0.20	0.01	-0.01	-0.06	0.31
2013M09	2.39	-0.03	0.30	-0.23	0.03	-0.17	0.08	-0.13	-0.20	0.07	0.00	-0.06	0.33
2013M10	1.31	-0.07	0.31	-0.20	0.09	-0.17	0.11	-0.30	-0.22	0.03	0.01	0.02	0.37
2013M11	1.19	-0.12	0.26	-0.22	0.16	-0.15	0.11	-0.18	-0.18	-0.07	0.01	-0.01	0.37
2013M12	1.41	-0.22	0.25	-0.10	0.10	-0.16	0.11	-0.11	-0.17	-0.10	0.01	0.00	0.38
2014M01	0.80	-0.03	0.24	-0.04	0.19	-0.15	0.02	-0.05	-0.23	0.07	0.02	0.00	-0.02
2014M02	0.37	-0.08	0.23	-0.07	0.28	-0.11	0.03	-0.11	-0.26	0.05	0.02	0.04	0.00
2014M03	0.14	-0.08	0.09	-0.13	0.38	-0.05	0.05	-0.05	-0.23	0.00	0.02	0.03	0.02
2014M04	0.64	-0.07	0.02	-0.19	0.28	-0.07	0.01	0.24	-0.29	-0.01	0.02	0.15	-0.05
2014M05	0.14	-0.14	0.04	-0.18	0.38	-0.04	0.03	0.15	-0.21	-0.09	0.03	0.07	-0.01
2014M06	0.27	-0.19	0.03	-0.03	0.31	-0.08	0.02	0.21	-0.24	-0.12	0.02	0.11	-0.02
2014M07	0.26	-0.12	0.04	-0.21	0.33	-0.07	0.03	0.13	-0.24	-0.03	0.02	0.18	-0.03
2014M08	0.36	-0.11	0.03	-0.11	0.29	-0.09	0.03	0.09	-0.27	0.00	0.02	0.16	-0.02
2014M09	0.25	-0.02	0.04	-0.06	0.33	-0.11	0.01	0.02	-0.27	-0.03	0.03	0.11	-0.01
2014M10	0.40	0.00	0.03	-0.05	0.33	-0.09	0.02	0.01	-0.22	-0.07	0.03	0.07	-0.02
2014M11	0.25	0.09	0.03	-0.01	0.36	-0.13	0.02	-0.07	-0.23	-0.05	0.03	0.09	-0.09
2014M12	-0.06	0.02	0.05	0.01	0.43	-0.10	0.03	-0.30	-0.20	-0.04	0.03	0.10	0.00
2015M01	-0.67	0.01	0.09	-0.16	0.39	-0.06	0.01	-0.51	-0.18	0.02	0.04	0.08	0.28
2015M02	-0.46	0.08	0.08	-0.16	0.34	-0.04	0.01	-0.39	-0.26	0.03	0.03	0.09	0.22
2015M03	-0.27	0.01	0.10	-0.19	0.29	-0.08	0.00	-0.23	-0.21	-0.02	0.03	0.07	0.25
2015M04	-0.03	0.02	0.10	-0.19	0.30	-0.07	-0.02	-0.37	-0.07	-0.10	0.02	0.16	0.22
2015M05	0.68	-0.02	0.05	-0.23	0.16	-0.12	-0.04	-0.17	-0.06	0.06	0.01	0.24	0.15
2015M06	0.49	0.02	0.07	-0.11	0.24	-0.06	-0.02	-0.30	-0.14	0.00	0.02	0.10	0.18
2015M07	0.80	-0.02	0.07	-0.04	-0.05	-0.07	-0.08	-0.26	-0.12	0.07	0.01	0.33	0.17

4.6 HICP weights by COICOP Division, 2012-2015; Netherlands

COICOP	0	1	2	3	4	5	6	7	8	9	10	11	12
2012	1,000.00	140.38	38.85	63.41	172.54	74.34	28.64	151.76	39.89	121.71	7.49	59.82	101.18
2013	1,000.00	142.62	37.61	60.95	175.96	72.59	28.19	150.55	40.00	119.95	7.77	61.39	102.42
2014	1,000.00	144.14	38.57	59.51	179.15	69.27	30.25	145.58	39.49	118.33	8.07	60.99	106.64
2015	1,000.00	144.36	37.64	60.40	164.73	65.05	32.16	136.48	37.76	130.41	9.77	82.99	98.26

5. Appendix: Derivation of the formulas

5.1 Contribution for fixed basket method

Formula (1) in section 2 follows directly from the annual rate of inflation, which can be written as

$$(1) \frac{p^{y,m} - p^{y-1,m}}{p^{y-1,m}} = \frac{\sum_j w_j * (p_j^{y,m} - p_j^{y-1,m})}{p^{y-1,m}} = \sum_j w_j * \frac{p_j^{y,m} - p_j^{y-1,m}}{p^{y-1,m}}$$

It is immediately seen that the contributions

$$(2) \text{Contribution}_j^{y,m} = w_j * \frac{p_j^{y,m} - p_j^{y-1,m}}{p^{y-1,m}}$$

add up to total inflation.

5.2 Contribution in a chain-linked index

In a chain-linked series the monthly index can be written as:

$$(1) p^{y,m} = p^{y-1,12} * \sum_i w_i^{y-1} * \frac{p_i^{y,m}}{p_i^{y-1,12}}$$

Therefore the formula for the annual rate of inflation can be written as:

$$(2) \frac{p^{y,m} - p^{y-1,m}}{p^{y-1,m}} = \frac{p^{y-1,12}}{p^{y-1,m}} * \left[\sum_i w_i^{y-1} * \frac{p_i^{y,m}}{p_i^{y-1,12}} \right] - \frac{p^{y-2,12}}{p^{y-1,m}} * \left[\sum_i w_i^{y-2} * \frac{p_i^{y-1,m}}{p_i^{y-2,12}} \right]$$

$$(3) \frac{p^{y,m} - p^{y-1,m}}{p^{y-1,m}} = \frac{p^{y-1,12}}{p^{y-1,m}} * \left[\sum_i w_i^{y-1} * \left(\frac{p_i^{y,m}}{p_i^{y-1,12}} - 1 \right) \right] + \frac{p^{y-1,12}}{p^{y-1,m}} - \frac{p^{y-2,12}}{p^{y-1,m}} * \sum_i w_i^{y-2} * \frac{p_i^{y-1,m}}{p_i^{y-2,12}}$$

The index $p^{y-1,12}$ was compiled in the previous link from December y-2 till December y-1

$$(4) \frac{p^{y,m} - p^{y-1,m}}{p^{y-1,m}} = \frac{p^{y-1,12}}{p^{y-1,m}} * \left[\sum_i w_i^{y-1} * \left(\frac{p_i^{y,m}}{p_i^{y-1,12}} - 1 \right) \right] + \frac{p^{y-2,12}}{p^{y-1,m}} * \sum_i w_i^{y-2} * \frac{p_i^{y-1,12}}{p_i^{y-2,12}} - \frac{p^{y-2,12}}{p^{y-1,m}} * \sum_i w_i^{y-2} * \frac{p_i^{y-1,m}}{p_i^{y-2,12}}$$

The two final terms can be combined to get:

$$(5) \frac{p^{y,m} - p^{y-1,m}}{p^{y-1,m}} = \frac{p^{y-1,12}}{p^{y-1,m}} * \sum_i w_i^{y-1} * \left(\frac{p_i^{y,m} - p_i^{y-1,12}}{p_i^{y-1,12}} \right) + \frac{p^{y-2,12}}{p^{y-1,m}} * \sum_i w_i^{y-2} * \left(\frac{p_i^{y-1,12} - p_i^{y-1,m}}{p_i^{y-2,12}} \right)$$

This annual rate in formula (5) can be split up in the contributions of each individual product group, which is the formula (2) in section (2):

$$(6) \text{ Contribution}_j^{y,m} = \frac{p_j^{y-1,12}}{p_j^{y-1,m}} * w_j^{y-1} * \left(\frac{p_j^{y,m} - p_j^{y-1,12}}{p_j^{y-1,12}} \right) + \frac{p_j^{y-2,12}}{p_j^{y-1,m}} * w_j^{y-2} * \left(\frac{p_j^{y-1,12} - p_j^{y-1,m}}{p_j^{y-2,12}} \right)$$

5.3 Impact in a chain linked series

The impact of a product group in the chain-linked series is defined as the difference between the headline annual rate and the annual rate if the product group is removed from the calculation.

$$(1) \text{ Impact}_j^{y,m} = \frac{p_{i \in S}^{y,m}}{p_{i \in S}^{y-1,m}} - \frac{p_{i \neq j}^{y,m}}{p_{i \neq j}^{y-1,m}}$$

Where S is the universe of all product groups in the basket.

The calculation of the annual rate in 11 out of 12 months involves the use of two links with two sets of weights. The first step is to split up the calculation of the annual rate into three terms, each within one link:

$$(2) \frac{p_{i \in S}^{y,m}}{p_{i \in S}^{y-1,m}} = \frac{\frac{p_{i \in S}^{y,m}}{p_{i \in S}^{y-1,12}} * \frac{p_{i \in S}^{y-1,12}}{p_{i \in S}^{y-2,12}}}{\frac{p_{i \in S}^{y-1,m}}{p_{i \in S}^{y-2,12}}}$$

For the full basket all these price indices are published. We will now derive hoe the same formula can be calculated for the basket excluding product group j. The same formula as (2) applies for the basket excluding product group j:

$$(3) \frac{p_{i \neq j}^{y,m}}{p_{i \neq j}^{y-1,m}} = \frac{\frac{p_{i \neq j}^{y,m}}{p_{i \neq j}^{y-1,12}} * \frac{p_{i \neq j}^{y-1,12}}{p_{i \neq j}^{y-2,12}}}{\frac{p_{i \neq j}^{y-1,m}}{p_{i \neq j}^{y-2,12}}}$$

The second step is to write each of the three parts of formula (2) as a weighted average of a part excluding product group j and a part representing product group j:

$$(4) \begin{aligned} \frac{p_{i \in S}^{y-1,12}}{p_{i \in S}^{y-2,12}} &= \sum_i w_i^{y-2} * \frac{p_i^{y-1,12}}{p_i^{y-2,12}} = w_j^{y-2} * \frac{p_j^{y-1,12}}{p_j^{y-2,12}} + \sum_{i \neq j} w_i^{y-2} * \frac{p_i^{y-1,12}}{p_i^{y-2,12}} \\ &= w_j^{y-2} * \frac{p_j^{y-1,12}}{p_j^{y-2,12}} + (1 - w_j^{y-2}) * \frac{p_{i \neq j}^{y-1,12}}{p_{i \neq j}^{y-2,12}} \end{aligned}$$

After some rearranging we get:

$$(5) \frac{p_{i \neq j}^{y-1,12}}{p_{i \neq j}^{y-2,12}} = \frac{\left(\frac{p_{i \in S}^{y-1,12}}{p_{i \in S}^{y-2,12}} - w_j^{y-2} * \frac{p_j^{y-1,12}}{p_j^{y-2,12}} \right)}{(1 - w_j^{y-2})}$$

In the same way we derive:

$$(6) \frac{p_{i \neq j}^{y-1,m}}{p_{i \neq j}^{y-2,12}} = \frac{\left(\frac{p_{i \in S}^{y-1,m}}{p_{i \in S}^{y-2,12}} - w_j^{y-2} * \frac{p_j^{y-1,m}}{p_j^{y-2,12}} \right)}{(1 - w_j^{y-2})}$$

and

$$(7) \quad \frac{p_{i \neq j}^{y;m}}{p_{i \neq j}^{y-1;12}} = \frac{\left(\frac{p_{i \in S}^{y;m}}{p_{i \in S}^{y-1;12}} - w_j^{y-1} * \frac{p_j^{y;m}}{p_j^{y-1;12}} \right)}{(1 - w_j^{y-1})}$$

Combining formulas (5), (6) and (7) with (3) gives:

$$(8) \quad \frac{p_{i \neq j}^{y;m}}{p_{i \neq j}^{y-1;m}} = \frac{\frac{\left(\frac{p_{i \in S}^{y;m}}{p_{i \in S}^{y-1;12}} - w_j^{y-1} * \frac{p_j^{y;m}}{p_j^{y-1;12}} \right)}{(1 - w_j^{y-1})} * \frac{\left(\frac{p_{i \in S}^{y-1;12}}{p_{i \in S}^{y-2;12}} - w_j^{y-2} * \frac{p_j^{y-1;12}}{p_j^{y-2;12}} \right)}{(1 - w_j^{y-2})}}{\frac{\left(\frac{p_{i \in S}^{y-1;m}}{p_{i \in S}^{y-2;12}} - w_j^{y-2} * \frac{p_j^{y-1;m}}{p_j^{y-2;12}} \right)}{(1 - w_j^{y-2})}}$$

which can be rewritten as

$$(9) \quad \frac{p_{i \neq j}^{y;m}}{p_{i \neq j}^{y-1;m}} = \frac{\left(\frac{p_{i \in S}^{y;m}}{p_{i \in S}^{y-1;12}} - w_j^{y-1} * \frac{p_j^{y;m}}{p_j^{y-1;12}} \right) * \left(\frac{p_{i \in S}^{y-1;12}}{p_{i \in S}^{y-2;12}} - w_j^{y-2} * \frac{p_j^{y-1;12}}{p_j^{y-2;12}} \right)}{(1 - w_j^{y-1}) * \left(\frac{p_{i \in S}^{y-1;m}}{p_{i \in S}^{y-2;12}} - w_j^{y-2} * \frac{p_j^{y-1;m}}{p_j^{y-2;12}} \right)}$$

Finally, the result from formula (9) can be used in (1) to calculate the impact.

Explanation of figures

Empty cell	Figure not applicable
.	Figure is unknown, insufficiently reliable or confidential
*	Provisional figure
**	Revised provisional figure
2015–2016	2015 to 2016 inclusive
2015/2016	Average for 2015 to 2016 inclusive
2015/'16	Crop year, financial year, school year, etc., beginning in 2015 and ending in 2016
2013/'14–2015/'16	Crop year, financial year, etc., 2013/'14 to 2015/'16 inclusive

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