An Phríomh-Oifig Staidrimh
Central Statistics Office

Estimated Inflation by Household Characteristics - Methodology,

March 2022

Appendix – Methodology of Estimating Inflation by Household Characteristics, March 2022

Overview

The Consumer Price Index (CPI) for month t is given by the formula

$$I_{0,t} = \sum_i \frac{p_i^t}{p_i^0} w_i^0$$

where p_i^t and p_i^0 are the prices of item i in month t and month 0 (the base month) respectively, and w_i^0 is the weight or expenditure share of item i for month 0. The weights $w_i^0$for each item in the CPI basket are adjusted every December to reflect changes in expenditure patterns. The most important source for annual updating of these weights is the Household Final Monetary Consumption Expenditure (HFMCE) data from the National Accounts for the preceding year. The CPI is calculated using these weights until the following December, and the annual indices are chained to produce a multi-year CPI.

In this analysis we make the simplifying assumption that all households are subject to the same price changes, so $\frac{p_i^t}{p_i^0}$ for expenditure item i will be the same for all households. By combining these universal price changes with weights $w_{i,h}^0$that differ for each household group h, we produce indices specific to household groups.

$$I_{0,t}^h = \sum_i \frac{p_i^t}{p_i^0} \mathrm{w}_{\mathrm{i,h}}^0$$

These weights are constant from December to December, and the annual indices are chained to produce a multi-year index for household group h.

The data for estimating how the weights $w_{i,h}^0$ differ for household groups come from the 2015/16 Household Budget Survey (HBS).

There were 6,839 households that participated in the 2015/16 HBS. Detailed expenditure was recorded for each household. Many characteristics of the household were also recorded, such as number of adults and children, gross household income, whether the household owned or rented their home, the age of the household reference person, and whether the household is in an urban or rural location. These characteristics allow us to analyse specific household groups within the HBS dataset. Each household in the HBS sample has a grossing factor which ensures that the total expenditure is representative of the population.

The following are the steps in producing indices for different household groups.

Step 1. Summarize all data by COICOP group

The CPI data is broken down into subindices which follow the international COICOP classification (Classification of Individual Consumption by Purpose). As a first step in estimating indices for different household groups the following data are all summarised by COICOP group:

1) The detailed expenditure for each household in the HBS sample
2) The CPI annual item weights
3) CPI indices from December 2016 to March 2022

Step 2. Produce annual updates of HBS file that are CPI consistent

We use the HBS dataset of 6,839 households surveyed in 2015/16 to generate CPI-consistent HBS data for each year from December 2016 to December 2021. Each household $h's$ expenditure on COICOP group i in the year t is calculated as:

$$e_{h,i,t}^{CPI} = e_{h,i}^{HBS} \times \frac{w_{i,t}^{CPI}}{w_i^{HBS}}$$

Where $e_{h,i,t}^{CPI}$ is the adjusted level of expenditure for household h on COICOP group i for year t, consistent with the CPI weights for year t.

$e_{h,i}^{HBS}$ is the expenditure recorded by the HBS for household h, on COICOP group i.

$w_{i,t}^{CPI}$ is the proportion of total CPI expenditure spent on COICOP group i in year t.

w_i^{HBS} is the population proportion of total expenditure spent on COICOP group i according to the HBS.

The result of these adjustments is that there are now annual iterations of the HBS data, where the population proportion of the expenditures for each COICOP group equals the CPI weight for that year.

The adjustment factors $\frac{w_{i,t}^{CPI}}{w_i^{HBS}}$ that make the HBS file CPI-consistent are close to 1 in many cases, meaning that only small adjustments each year are made to each household $h's$ expenditure on a COICOP group i. For some COICOP groups the adjustments can be large. This occurs if:

i) The COICOP group is one where the HBS tends to underestimate true expenditure, possibly due to under-reporting. The COICOP group 02.1 'Alcoholic Beverages' is an example of this, and so the adjustment factor is more than 1.

ii) The HBS records expenditure on mortgage payments, but the CPI weight for COICOP group 04.2 is for mortgage **interest** payments. The HBS estimate is therefore higher than the CPI annual weights so the adjustment factor is less than 1.

iii) CPI weights include expenditure by visitors to Ireland and by institutional households. This expenditure is not captured by the HBS which surveys private households only. For some COICOP groups (e.g. 11.2 Accommodation services) the CPI weight is bigger than the HBS weight for this reason, and so the adjustment factor is more than 1.

Note that the adjustment factor $\frac{w_{i,t}^{CPI}}{w_i^{HBS}}$ is the same for all households. The assumption is that where there are differences between the HBS and CPI-consistent expenditure totals for a given COICOP group, the reasons and proportionate effect of the differences are uniform across households.

Step 3. Calculate annual weights for each household group

We can now take subsets of the CPI-consistent annual HBS data for each household group we are analysing. We calculate annual expenditure weights by COICOP group for each household group subset:

- households grouped by equivalised gross household income (deciles)
- households grouped by type of tenure
- urban and rural households
- households grouped by the age of the household reference person and
- households grouped by composition

Step 4 Calculate estimated price index for each household group

An estimated price index for each household group I_{HG} is calculated by the formula

$$I_{HG}^{t} = \sum_{i} I_{i}^{t} \, w_{i}^{HG}$$

Where I_i^t is the price index for COICOP group i at time t, and w_i^{HG} is the weight for household group HG for COICOP group i. The weights w_i^{HG} change annually (see Step 2 above) so this is an annually chained index.

The total inflation, or annual change in the index, for each household group is a sum of the contributions of each COICOP group. The contributions are the product of the inflation and the weight for that COICOP group. As the weights differ by household group, the contribution of a COICOP group to overall inflation will also differ by household group.

Equivalised income groups

Equivalised gross household income is used to assign households to income deciles. The modified OECD scale is used. This scale assigns a value of 1 to the first household member, 0.5 to each additional adult, and 0.3 to each child (aged under 14 years). In this scale, a household with two adults and two children would have an equivalised household size of 2.1 (1+0.5+0.3+0.3). If this household had an income of €500 per week, its equivalised income is calculated as €500/2.1 = €238. For a household of one adult with an income of €250 per week, the equivalised income is calculated as €250/1 = €250. In this example the first household would be assigned to a lower income decile than the second household.