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The full report in Icelandic is available on the website of Alþingi (The Parliament of Iceland): https://www.althingi.is/altext/pdf/149/s/1083.pdf

3 HOW IS INFLATION MEASURED?

3.1 Measurements of price levels in Iceland

Access to broad scope price level indicators is good in Iceland. On its website, Statistics Iceland publishes the Consumer Price Index (CPI), a CPI excluding housing, and Harmonized Indices of Consumer Prices (HICPs), which measure consumer prices. The agency also publishes other types of price indicators, such as the Building Cost Index and Wage Index. There is a long tradition of measuring and publishing most of these indices. Although they share many common features, there are also various aspects which distinguish them from one another. The discussion in this chapter concerns the previously mentioned consumer price level indicators. The CPI is currently the indicator which is stipulated as the basis for indexation of financial obligations. It is also the most comprehensive indicator of consumer prices in Iceland. The housing component of the index will be discussed specifically, as well as the HICP, which is used to measure inflation in EU Member States, primarily for the European Central Bank (ECB).

3.2 Household final consumption expenditure

A consumption good or service is defined as one that members of households use, directly or indirectly, to satisfy their own personal needs and wants. By definition, consumption goods or services provide utility. (International Labour Organization, 2004, ch. 3)

Household final consumption expenditure (HFCE) or **private consumption** is defined in the international national accounting standard "System of National Accounts" of 2008 and it its European edition, ESA 2010. The standard is available from the United Nations (UN), which has led its development. Private consumption in Iceland, as in other UN member states, is presented in a consumption classification system called the "Classification of Individual Consumption According to Purpose", abbreviated as COICOP. The system divides private consumption into twelve main categories, shown in Table 1.

Table 1 Individual consumption expenditure of households (COICOP 01-12)

01	Food and non-alcoholic beverages
02	Alcoholic beverages, tobacco, narcotics
03	Clothing and footwear
04	Housing, water, gas, electricity and other fuels
05	Furnishings, household equipment and routine maintenance of the house
06	Health
07	Transport
08	Communications
09	Recreation and culture
10	Education
11	Restaurants and hotels
12	Miscellaneous goods and services, not in 01-11

3.3 Consumer Price Index

The CPI is calculated as provided for in Act No. 12/1995, on the Consumer Price Index. Its role is to serve as a price level indicator in Iceland. Art. 1 of the Act states:

> "Statistics Iceland shall calculate and publish an index showing changes to the price level of **private consumption** ..."

The main source for measurement of private consumption is the Household Expenditure Survey. Its results are used as the basis for the annual index rebasing of the CPI, aimed at having the index reflect optimally the actual composition of current household consumption in Iceland.

The methods used by Statistics Iceland for measuring prices and calculating the CPI are developed through international co-operation and in close collaboration with other nations. The International Labour Organisation (ILO) publishes a *Consumer Price Index Manual* for measuring consumer price indices. Updating of the manual is directed by the International Monetary Fund (IMF).

Measurements are made monthly in all consumption categories. Prices are measured in stores and enterprises that sell consumer goods and services directly to individuals and households. The results of the measurements are then published in a breakdown according to COICOP on the Statistics Iceland web. Publication is on a monthly basis according to a publication schedule issued in November each year for the coming year. The publications are immediately accessible to all on the Statistics Iceland web free of charge.

Table 2 shows the categories of private consumption used in the consumer price indices. Private consumption covers all goods and services, including use of own housing. To measure consumption of goods and services the price of a basket of goods is used, reflecting the general demand of an average household. To assess the service obtained through owner-occupied housing, an estimate is made of the value of the good or service in question.

Table 2 Household final consumption expenditure (HFCE)

Private consumption	Monetary expenditure
Monetary expenditure for the purchase of consumer goods and services	X
Notification and default charges	X
Rental equivalence for the use of (OOH)	
Production of agricultural products for own consumption	
Production of other products for own consumption, such as production of food or clothing	

Housing generally weighs heavily in household private consumption. Under COICOP, the housing component is broken down as shown in Table 3.

Table 3 Housing in COICOP classification

	COICOP
04	Housing, water, gas, electricity and other fuels
04.1	Actual rentals for housing
04.2	Imputed rentals for OOH
04.3	Regular maintenance and repair of the dwelling
04.4	Other services relating to the dwelling
04.5	Electricity, gas and other fuels

The scope of the CPI in Iceland is based on household expenditures for purchase of consumer goods and services in the country. Icelanders' consumption abroad is not included in the Icelandic CPI due to difficulties in evaluating this consumption.

3.3.1 Housing in the CPI and methods of calculating own housing

The CPI housing component is number 04 in the COICOP classification system for private consumption.[1] As the ILO manual explains, housing is used to provide housing service. This service is used by the residents and for this reason is part of COICOP. On the other hand, the housing itself is classified as an investment in national accounts and for this reason it is excluded from the definition of private consumption.

The CPI housing component has always weighed heavily in household expenditure in Iceland. This is in fact true in many places, although there can be differences between countries. Since the turn of this century its weighting has generally ranged from 20% to 30%, but had risen to 34.5% in 2018. For most of this period the weighting increased, with the exception of a short period in the wake of the economic collapse of 2008. Apart from index rebasing, two things can change the weighting of index components: firstly, price changes of a specific component and, secondly, price changes of other components. It is therefore the interplay of the price level effects of all the components which determines the final weighting of each.

[1] See Tables 1 and 3.

Table 4 Weight of housing in the CPI

Country	Weight of housing (04) in the CPI in 2018
The United States of America	37.7%
Iceland	**34.5%**
Germany	31.7%
The United Kingdom	30.1%
Denmark	29.8%
Canada	25.0%
Norway	24.0%
Sweden	23.0%

Consumption in components 4.1, 4.3, 4.4 and 4.5 in the CPI is measured directly, as the households pay the party selling the goods or services directly. Measurement of imputed rent (component 4.2), however, is more complicated, as it consists of an assessment of the value of the service of owner-occupied housing and monetary transfers take place. Three methods to estimate imputed rent can be considered. These are 1) rental equivalence, 2) simple/partial user cost and 3) net acquisition. The CPI uses the definition of national accounts for private consumption. In national accounts only two of the methods mentioned are considered when assessing the service of homeowner occupancy because the national accounts define purchase of housing as investment. The net acquisition method, however, assesses the value of housing constructed in excess of depreciation. By doing so all investment expenditure is expensed and is part of calculations.

Rental equivalence

According to the national accounts methods, measuring the rental equivalence aims at finding housing of the same sort and in the same area which is, on the one hand, rented out and, on the other, occupied by the owner. The rent paid for the former is then applied to the housing which is occupied by its owner. Another approach is to regularly ask persons who live in their own homes how much they feel they could expect in rent if they were to rent out their home instead of dwelling in it. This approach is less exact, however. The method depends on an extensive rental market with a wide variety of types of housing where rental prices are not controlled, i.e. the price is not subsidised by public authorities or others. For this reason, it has not been considered desirable to use the rental equivalence method to evaluate imputed rent in Iceland, at least not yet. The US, Denmark, Norway and Germany are examples of states which use rental equivalence, in accordance with the methods of national accounts, to assess the cost of owner-occupied housing in connection with measuring the CPI.

Simple user cost

The method of calculating residential expenditure by simple user cost was adopted in Iceland in November 1992. A report on the change stated that use of own housing would be calculated as rental equivalence "according to methods of national accounts" (Statistical Series, 1992). One of the main reasons for using this method was that market rent tracked the market price for housing and the imputed rent reflected this development. During the quarter century that the method has been used there has been a good correspondence between imputed and actual rent. Although there is often some time lag between the price changes, the difference is small when viewed over the entire period. One of the main advantages of assessing imputed rent through simple user cost in this manner is that the method does not require information on the rental market, as does the method of rental equivalence, but still reflects changes in market rents.

Imputed rent for housing in the CPI in Iceland is assessed using simple user cost, taking into consideration interest and depreciation. The real estate value, which is the net present value of the property, is updated using the real estate index each month, which is based on a three-month running average of residential housing price changes. The outcome is used to calculate an annual payment according to the following formula,

$$A_{HV} = P_H \frac{r(1+r)^N}{(1+r)^N - 1}$$

where P_H is the NPV of the property, r is the real interest rate, N is the lifetime of the property and A_{HV} is the annual payment on the market value of the property. The real interest rate has a direct impact on the calculation. In the model it changes only slowly. Return on equity is based on a fixed real interest rate while other interest rates are 12-month running averages of market interest rates for indexed housing mortgages.

Canada and Sweden are examples of other states which use user cost to estimate the price of the service of owner-occupied housing and take interest and depreciation into consideration in the estimate. These states' estimates are based on older data over a long period. The methods of Sweden and Canada, on the one hand, and Iceland, on the other, serve different aims in calculating the CPI. One cannot be replaced by the other without altering the objectives of the calculation. Sweden's objective is to measure the price paid in housing transactions by homeowners. Canada's objective is to measure what housing owners have to pay in relation to the housing they own. As previously stated, Iceland's objective is to assess imputed rent in connection with price levels of private consumption and international standards for national accounts, whereas the methods used by Sweden and Canada do not measure imputed rent.

The treatment of interest rates is by nature different in the Icelandic method, since the methods of Canada and Sweden are payment methods and based on nominal interest rates. The difficulty with such methods is that interest payments on housing mortgages are not private consumption but rather investment expenditure and therefore do not belong to indices which are intended to measure price levels of private consumption in accordance with national account standards. The payment method is also based on price levels in older periods and not current price levels, as previously mentioned.

All the states use current market interest rates; in Iceland this is the real interest rate while in the other states it is the nominal interest rate. The treatment of depreciation, however, is similar in Canada, Sweden and Iceland. It uses a property stock which is updated to current prices.

Interest is applied to different capital stocks in the states. In Canada, nominal interest is calculated on the estimated outstanding balance of loans and in Sweden using the estimated original cost price of the assets.

- In Canada the capital stock is estimated to be on average 12-15 years old and there the capital stock is updated using a running 25-year average of the real estate index.

- In Sweden the current real estate value of properties (single-family dwellings) is calculated backwards to the year when the properties were purchased to estimate the purchase price. On average the base is the estimated original purchase price of the property 12-15 years ago. This purchase price of the properties in the base is updated

each month to the present day using a real estate index for all properties from the time the purchase of the property was registered. Since the length of time since the properties in the stock were purchased varies, the weighting of properties of different age differs and therefore the updating is considered to be similar to updating the average stock using a 25-30-year running average of the real estate index for all single-family homes sold.

- In Sweden the usual arrangement in multi-unit dwellings is that owners have a "dwelling right". The real estate stock of the dwelling right is treated in a manner like that of single-family homes, but the average time from the purchase of a dwelling right is shorter and as a result the period for which the updating is similar is also shorter. The price changes of these properties are greater and as a rule more dwelling rights than single-family homes are bought and sold.

The methods of Sweden and Canada for measuring expenditures for owner-occupied housing are not limited to consumption expenditure. The Swedes also measure, for instance, property tax as part of their housing component, despite the fact that this is not considered private consumption. In Canada the method applies only to persons who owe part of their own housing. In Sweden the method covers everyone who lives in their own home as in the Icelandic version.

If a payment method were chosen to calculate the value of owner-occupied housing in the CPI in Iceland, the index would no longer measure the price level of private consumption, in accordance with the international standard for national accounts, but would rather reflect investment in housing.

Net acquisition method

The net acquisition method is based on estimating the investment value of new construction net of depreciation of older housing and then all newly built housing is expensed. For the method to function, the number of new housing units needs to be fairly stable from one year to the next. This situation is difficult to find in Iceland, as the annual number of new housing units has been closely linked to the current economic cycle. Applying the net acquisition method to estimate imputed housing cost in Iceland is therefore subject to major difficulties. The method is applied in Australia and New Zealand. The intention was until recently to use it in the HICP for owner-occupied housing.

Table 5. Methods of calculating imputed rent (04.2) in consumer price indices

Rental equivalence	User cost	Net acquisition
Assesses the value of the service of owner-occupied housing, in connection with private consumption in national accounts.	Assesses the value of the service of owner-occupied housing, in connection with private consumption in national accounts.	Assesses the value of housing construction net of that depreciated or newly added to the market. All new housing in this sense is expensed at once.
Weights from national accounts or surveys	Weights based on annual payment on the stock of the properties	Weights based on all newly constructed housing and housing purchased by individuals from the private sector or public bodies.
Price changes to rents for similar housing on the private market but not for social housing because there market rents are not paid.	Changes to an annual payment based on the market value of both new and older housing, taking into account the size, type and location, with certain assumptions concerning the real interest rate and depreciation.	Change in the market value of new housing; however, the market value of older housing can be used as an estimate if new construction is low and older housing is considered to follow the same price fluctuations.
Depends upon a private rental market of sufficient size and scope and which reflects the composition of owner-occupied housing.	Depends upon a reliable real estate index.	Depends on a stable construction input in economic cycles, which is a premise that has not existed in Iceland.

3.4 Harmonised Indices of Consumer Prices

The HICPs were established in Europe due to the planned introduction of the euro following the Maastricht agreement of 1992. The indices were then initiated in 1995.[2] The role of the HICPs is to measure inflation in a harmonised manner in EU Member States. The principal user of HICPs is the ECB, but the European Commission also uses the indices in its assessment of price stability in EU and EFTA Member States (Regulation EU 2016/792). The methods for measurement and calculation of HICPs are determined by the EU.

All EU and EFTA states measure an HICP in their home state and submit the results to the EU statistical office (Eurostat). Thereafter Eurostat issues HICPs for the EU, the Eurozone and the

[2] The entry into effect of HICPs was provided for in EU Regulation 2492/95. The current Regulation is EU 2016/792, which repealed EU 2492/95.

European Economic Area (EEA), and publishes at the same time harmonised indices for each state which is party to the agreement. Countries applying for EU membership also take part in preparing HICPs.

European states, led by Eurostat, have done very significant work in developing and standardizing methods for measuring and calculating consumer price indices. HICPs in Europe are a product of this work. There is a strong correspondence between the HICPs in Europe and the CPIs in each individual country of the continent. The difference appears in particular in the scope of the indices, but also to some extent in the methodology. In Iceland, the scope of the HICP includes consumption by foreign travellers in the country, unlike the CPI. This also means that Icelanders' consumption while travelling in Europe is included in the scope of the respective country's HICP. Owner-occupied housing is by definition included in both the CPI and HICPs, but in fact it is excluded in the measurement of the HICP due to measurement difficulties.

The HICPs are based on the European classification of individual consumption according to purpose (ECOICOP). ECOICOP fully accords with the international consumer classification standard COICOP discussed above. The consumption categories are used in all public statistics in Europe related to private consumption. The purpose of HICPs is to measure only price levels in monetary transactions. This distinguishes the HICPs from CPIs, where the purpose is to measure changes in price levels of private consumption. Imputed items, such as production for own use and owner-occupied housing, arrived at using the method of rental equivalence or simple user cost, are part of private consumption as defined in national accounts, but this is not the case for HICPs. Therefore, development work in recent years has been aimed at introducing the use of the net acquisition method for owner-occupied housing in the HICPs.

When the HICPs were taken into use in 1995, many European states were in a position where they were unable to gather the data necessary for calculation using the net acquisition method. For this reason, the OOH part was temporarily not included in the price measurement, whereas other housing components, such as actual rent and charges for sewage, water and waste disposal were included. In 2014, Eurostat began publishing a harmonised index for the cost of owner-occupied housing for many European states in tandem with the HICPs. Despite this, Eurostat has recently proposed that the net acquisition method should not be taken up in the HICP in the near future (EU Commission, 2018). It is not established that the introduction of the net acquisition method will become a reality.

It therefore appears that actual rent for housing will continue to be the only measure for housing residence in the HICP's price measurement. Thus, the size of the rental market has a decisive effect on how large the portion of housing included in the HICP is in each country and this limits the usefulness and harmony of the HICPs.