The Central Bank of Iceland's monetary policy objective is to keep inflation at 2½%, on average. According to the joint declaration issued by the Government and the Bank in 2001, the Bank's inflation target is based on the twelve-month change in the consumer price index (CPI), the most comprehensive measure available of Icelandic households' living expenses.

Measures of underlying inflation
A shared characteristic of all general price indices such as the CPI is that it can be difficult to determine the extent to which they reflect temporary changes in relative prices, which is generally appropriate to ignore in formulating monetary policy, as opposed to a persistent rise or fall in the general price level to which monetary policy should respond, other things being equal. For this reason, the Bank also considers a number of measures of so-called underlying inflation, or core inflation (see the discussion of how underlying inflation has developed in Chapter VI). With such measures, an attempt is made to exclude temporary price changes in individual subcomponents or price changes that can be attributed to supply-side effects or official price decisions that change the price level permanently but only have a temporary impact on measured inflation. It can be appropriate to look past price changes of this type if the Bank does not believe that they will affect the long-term inflation outlook.

No single method stands out as the best way to measure underlying inflation; therefore, the Bank utilises a number of measures, each of which has its strengths and weaknesses. These measures can be broadly divided into two categories. In the first category are core indices that exclude predefined subcomponents from the CPI, such as the price of agricultural products, petrol, and public services, as well as the effects of indirect taxes (for further information, see Pétursson, 2002). The second category comprises price indices estimated using statistical methods; for instance, the trimmed mean, where the most volatile components in a given month are excluded,[1] and the weighted median, which measures the median price change of all subcomponents of the CPI.

Estimating underlying inflation using a factor model
In recent years, the Bank has also taken account of underlying inflation as estimated using a dynamic factor model, where statistical methods are used to identify price changes that are common to all subindices of the CPI and should therefore reflect underlying developments in inflation rather than temporary fluctuations in individual subcomponents.[2] In addition to this, the Bank has begun using another measure of underlying inflation that is also based on identifying common price changes in CPI subcomponents using a factor model (see Gudlaugsdóttir and Kro, 2018). This method is a simpler version of the dynamic factor model and has been selected by the central banks of Canada and Norway as one of their main methods of estimating underlying inflation (see Khan *et al.*, 2015, and Husabø, 2017).

As with other factor models, measured inflation is divided into two parts: one or more factors that attempt to explain the covariance of all CPI subcomponents, and a residual that reflects idiosyncratic price changes in specific subcomponents. These idiosyncratic price changes are then filtered out and underlying inflation interpreted as the price changes that are common to all subcomponents of the CPI.

Box 4

Underlying inflation as measured by the common component of the CPI
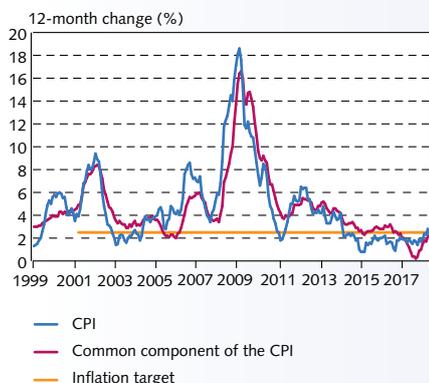
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1. Unlike the core indices, the subcomponents excluded from the trimmed mean may vary from one month to another.
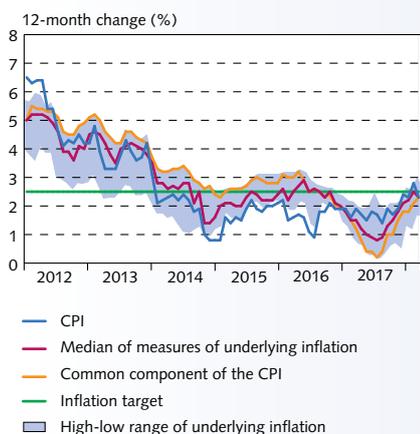2. See Box 5 in *Monetary Bulletin* 2015/2 and Einarsson (2014).

Chart 1

Headline and underlying inflation

January 1999 - April 2018

12-month change (%)

- CPI
- Common component of the CPI
- Inflation target

Sources: Statistics Iceland, Central Bank of Iceland.

Chart 2

Headline and underlying inflation[1]

January 2012 - April 2018

12-month change (%)

- CPI
- Median of measures of underlying inflation
- Common component of the CPI
- Inflation target
- High-low range of underlying inflation

1. Underlying inflation measured using a core index (which excludes the effects of indirect taxes, volatile food items, petrol, public services, and real mortgage interest expense) and statistical measures (weighted median, trimmed mean, a dynamic factor model and the common component of the CPI).
Sources: Statistics Iceland, Central Bank of Iceland.

In order to estimate the common component of the CPI, 38 subcomponents of the index are used which cover the entire consumption basket, and these are standardised so that the average twelve-month change is zero and the standard deviation is one. The common component is then estimated using the method of principal components. Further analysis reveals that the first factor suffices to explain a large share of the changes in the CPI, about 78%, and it was deemed unnecessary to add another factor. The first factor is therefore interpreted as underlying inflation, and it tracks measured inflation relatively well, as Chart 1 shows. The majority of the subindices (33 of 38) have a positive correlation to the common component, which explains an average of 50% of the variability in the subindices over the period 1999-2017. This indicates that a considerable share of price changes in the subindices can be explained with the common component. If this same relationship is examined over the period 2011-2017, however, it can be seen that the share of the variability of the subindices explained by the common component has fallen to an average of about 40%. The contribution of underlying inflation to developments in measured inflation has therefore declined, and the weight of relative price changes has increased accordingly. It is likely that this can be attributed in part to the fact that inflation has fallen and become more stable, which in turn is due in part to more firmly anchored inflation expectations (see Pétursson, 2018).

Chart 2 shows more clearly the comparison between recent developments in measured and underlying inflation. The new measure indicates that underlying inflation exceeded measured inflation at the beginning of the period, but that this turned around at the end of 2016. Since then, house prices have risen sharply and have been the main driver of measured inflation but have had a negligible impact on the common component of the CPI. Underlying inflation subsided, however, when imported goods prices fell markedly in response to the appreciation of the króna and when the rise in private services prices began to ease.

Chart 2 also compares the new measure of underlying inflation with other measures that the Bank has been using. The new measure lies at the upper boundary of the high-low range in the first half of the period. This turns around at the end of 2016, and from that time onwards, the new measure indicates lower underlying inflation than most of the others do. The difference has narrowed in the recent term, however, and all of the measures indicate that underlying inflation has been on the rise since autumn 2017. The new measure and the median value of the measures of underlying inflation indicate that underlying inflation measured 2.3% in April.

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