

Article

# New estimates of core inflation, UK: 2022

Measures of consumer prices inflation excluding the items that record the more volatile price changes each month.

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# 1 . Main points

- The annual rate of inflation measured by the Consumer Prices Index including housing costs (CPIH) has in recent months been at a 30-year high.
- The annual rate of CPIH inflation in August 2022 was 8.6%, in part reflecting the effects of higher energy and commodity prices whose prices movements can be volatile.
- Core inflation is a complementary measure of consumer price inflation, which looks specifically at the underlying rate of inflation in an economy that puts lower weight on items subject to erratic and seasonal price movements.
- New estimates of a trimmed mean approach are published for the UK, which is a specific measure of core inflation, where certain percentages are cut from the top and the bottom of the distribution of item price changes, making up the overall index.
- Trimming the top 15% and bottom 15% of the distribution of item price changes in the CPIH produces a lower rate of annual inflation of 5.4% in August 2022, although importantly, this estimate of core inflation has still picked up over the last year indicating broader inflationary pressures; the median annual inflation rate in the CPIH was also lower at 4.0% in August 2022.

## 2 . Headline and core measures of consumer prices inflation

## Headline inflation

The current headline measure of inflation in the UK is the Consumer Price Index including housing costs (CPIH). This shows the changing cost of a basket of goods and services for a representative household, where weights attached to each individual item reflect the share in total expenditure. It is our [most comprehensive measure of consumer price inflation](#). In recent months, the annual rate of CPIH inflation has been at its highest since 1990 (Figure 1). In August 2022, the CPIH was 8.6% higher than twelve months previously.

**Figure 1: The annual rate of consumer prices inflation has accelerated during 2022**

Twelve month percentage change in the CPIH

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Twelve month percentage change in the CPIH



Source: ONS – Consumer price inflation and Consumer price inflation, historical data, (1950 to 1988)

## Core inflation

Core inflation is used to assess the underlying inflationary pressures in the economy, which aims to reflect the durable part of consumer price inflation. This is the part that is expected to persist into the medium or longer term. It acknowledges that in the short run, headline inflation rates may be driven by temporary supply shocks, or other effects that do not have a lasting impact, and as such, there may be less imperative for policymakers to respond.

Measures of core inflation have been closely followed by central banks around the world. As the former vice-chair of the Federal Reserve Board [Alan Blinder \(1997\)](#) states "The name of the game then was distinguishing the signal from the noise, which was often difficult. The key question on my mind was, typically, what part of each monthly observation on inflation is durable, and what part is fleeting?"

Interest in core inflation measures typically increases during periods of higher inflation volatility, as is the case now. [There is a plethora of different techniques for constructing measures of core inflation](#), but all are built on the same underlying principle of excluding or down weighting the more erratic components of consumer prices indices based on the assumption these provide less information about inflation in the longer term.

Core inflation measures can also be contentious. By excluding or down weighting items that are typically volatile but matter to the public, such as energy and food prices, they may be criticised as 'unrepresentative'. Furthermore, [Zeldes \(1994\)](#) argues that the erratic and volatile parts of the price distribution often contain new information about future price movements and should not be discarded. So, although core inflation measures may provide a useful perspective on inflation developments, consideration should be given to how they have been created, and care exercised when interpreting what they tell. We consider core inflation measures as complementary to the headline measures of consumer price inflation.

Several desirable properties of core inflation measures have been suggested by [Wynne \(1999\)](#):

- Timeliness: the measure should be computable in real-time and available alongside the headline figures.
- Unrevised: once constructed core measures should not then be revised unless there are revisions to the underlying data.
- Verifiable: techniques should easily be understood by the public and, if necessary, reproducible with limited resources.
- Un-biased: as core inflation measures seek only to remove transitory and/or reversible components from the price index the long run, average of core measures should be like the actual or headline rate.

### 3 . Exclusion-based measures of core inflation

Certain classes of goods and services within an aggregate price index are considered very prone to short-term supply-side shocks or strong seasonal movements, such as energy and food. Many National Statistics Institutes around the world publish estimates of inflation excluding these specific classes, which they typically label as 'core inflation'. The Office for National Statistics (ONS) publishes 13 exclusion-based estimates of inflation (Table 1), although the specific measure excluding energy, food, alcohol, and tobacco is the one we typically refer to as 'core'.

Table 1: Exclusion-based measures of CPIH inflation published by the ONS

<b>CPIH index - All items excluding:</b>	<b>% change over the 12 months to August 2022</b>
Energy	6.3
Energy, food, alcoholic beverages & tobacco	5.6
Energy & unprocessed food	6.1
Seasonal food	8.5
Energy & seasonal food	6.2
Tobacco	8.6
Alcoholic beverages & tobacco	8.7
Liquid fuels, vehicle fuels & lubricants	8.0
Housing, water, electricity, gas and other fuels	8.4
Owner occupiers' housing costs	9.7
Council tax and rates	8.8
Owner occupiers' housing costs and council tax and rates	10.0
Education, health & social protection	8.9

Source: ONS Consumer Price Index

#### Notes

1. The CPIH all items inflation rate in the 12 months to August 2022 was 8.6%.

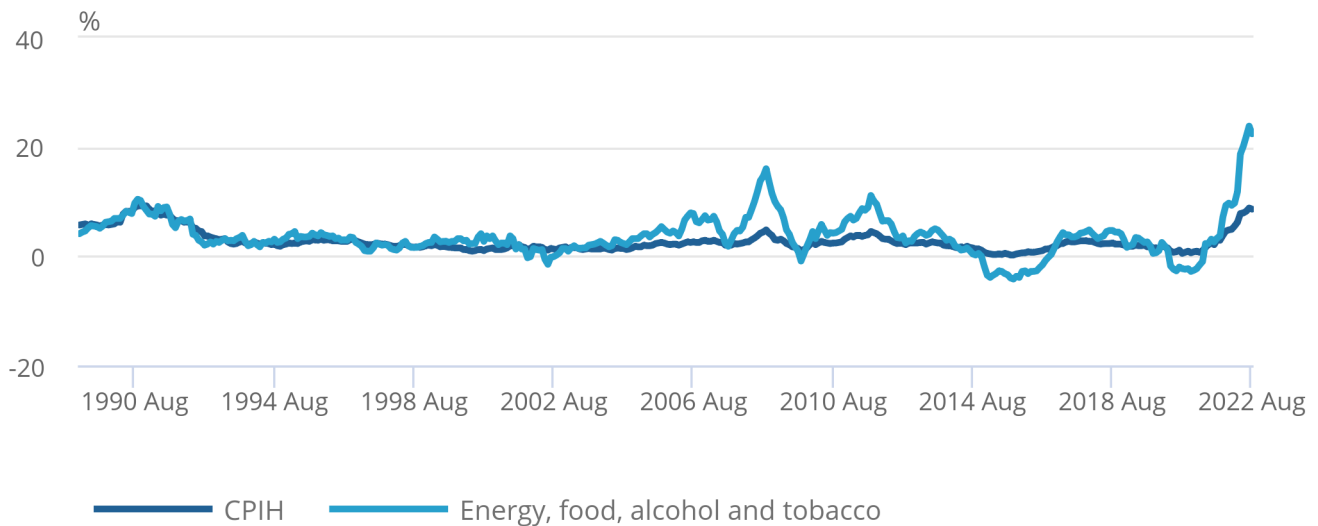
Figure 2 shows inflation in the headline measure of Consumer Prices Index including housing costs (CPIH) (all-items) along with the index for energy, food, alcohol, and tobacco goods. The latter exhibits considerable short-run volatility compared with the aggregate index. For instance, while the CPIH inflation rate was 8.6% in the 12 months to August 2022, the corresponding measure for the energy, food, alcohol, and tobacco index was considerably higher at 22.4%.

## Figure 2: Annual inflation in energy and food items has accelerated sharply in 2022

12 month percentage change in the CPIH and Energy, food, alcohol and tobacco indices.

### Figure 2: Annual inflation in energy and food items has accelerated sharply in 2022

12 month percentage change in the CPIH and Energy, food, alcohol and tobacco indices.



Source: ONS – Consumer Price Inflation

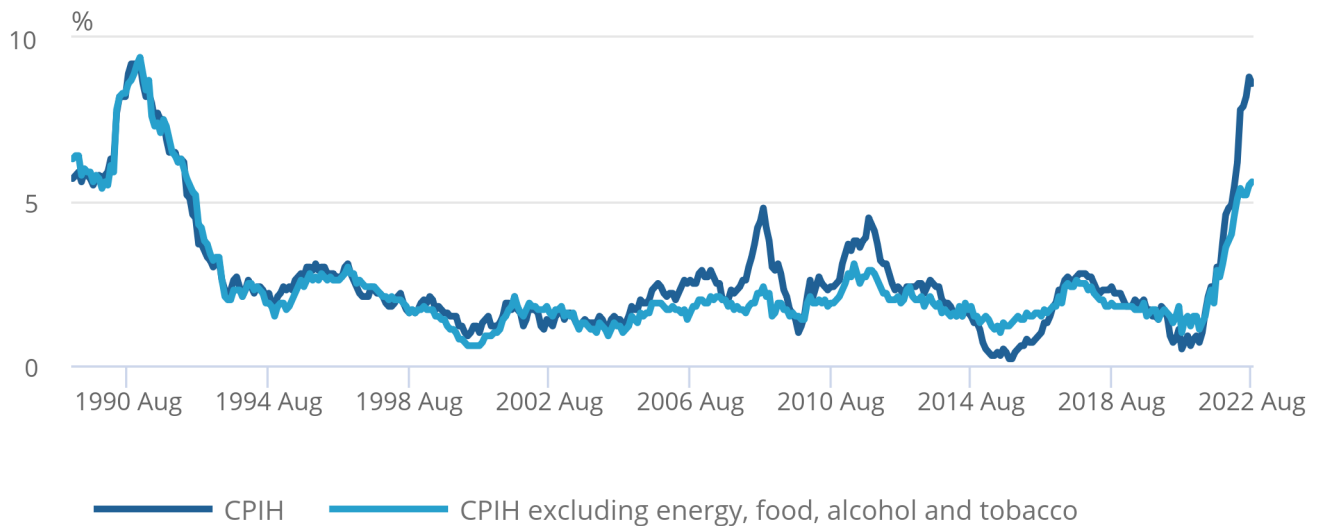
Figure 3 shows the 12 month inflation rate in the CPIH (all items) along with a measure that excludes energy, food, alcohol, and tobacco. This exhibits the broad movements in the headline index, but the peaks and troughs are typically less extreme. CPIH inflation excluding energy, food, alcohol, and tobacco over the twelve months to August 2022 was significantly lower than for the aggregate index at 5.6%. However, it should be noted that this is also the highest rate recorded for this index in the past 30 years.

### Figure 3: Consumer prices inflation is currently lower when excluding energy, food, alcohol, and tobacco

12 month percentage change in the CPIH (all items) and CPIH all items minus energy, food, alcohol and tobacco indices.

#### Figure 3: Consumer prices inflation is currently lower when excluding energy, food, alcohol, and tobacco

12 month percentage change in the CPIH (all items) and CPIH all items minus energy, food, alcohol and tobacco indices.



Source: ONS – Consumer Price Inflation

Core inflation measures based on the exclusion method are popular and have many of the desirable features listed previously. But they attract criticism on the grounds of the blanket approach to 'what's in' and 'what's out' may not always be considered helpful. For example, not all components of energy, food, alcohol, and tobacco are volatile so useful information on core inflation is potentially thrown away. On the other hand, there may be many volatile components of inflation outside of this group of items that are preserved when they provide little information about the longer-term inflation trends in the economy.

## 4 . The distribution of price changes

## Kurtosis

The headline measure of Consumer Price Inflation including housing costs (CPIH) is the weighted average of the inflation rates of each individual [class of goods and services](#) included in the representative basket.

The distribution of price changes across these classes is described as having 'fat tails' or 'leptokurtic' if large price movements relative to the average are relatively common when compared to what would be expected if they were normally distributed. For example, the month-on-month rate of CPIH inflation was 0.5% in August. However, the monthly change in consumer prices for individual classes ranged from negative 14.1% for liquid fuels to 13.4% for passenger transport by air. The month-on-month inflation figures for the classes of goods and services making up the aggregate index are highly dispersed, and even more so in periods of high inflation.

The 'fatness' of the tails for a particular distribution is measured by its kurtosis. Table 2 shows various measures of kurtosis in the distribution of monthly price changes for the 87 classes of goods and services in the CPIH. These are very high compared to the values under a normal distribution.

Table 2: Kurtosis measures for the 87-class distribution of monthly prices changes in the CPIH

<b>Kurtosis measure</b>	<b>CPIH – 87 classes</b>	<b>Value under normality</b>
Standard 4th moment	41.75	3
Moors	3.57	1.23
Hogg	5.07	2.59
Crow & Siddiqui	14.07	2.91

Source: Authors' calculations

### Notes

1. Kurtosis measures are calculated for the distribution of monthly prices changes across the 87 classes constituting the CPIH basket.
2. The figures presented in the table are the average of the monthly kurtosis measures between January 2001 and August 2022.

For a fat-tailed distribution, an alternative measure of central tendency to the arithmetic average might be considered where less weight is attached to the observations at each end of the distribution. A trimmed mean is where certain proportions of the top and bottom ends of the distribution are removed and can be justified if these observations at the extremities of the distribution are carry less information about the general pattern or trend in the data, partly because they are highly dispersed relative to the average. The median average is a special case of a trimmed mean, where the top and bottom halves of the distribution are cut leaving the middle observation alone as the summary measure for the distribution.



## Skewness

The distribution of price changes is skewed if it is not symmetrical, meaning for individual classes of goods and services price changes of a certain magnitude above or below the average are not equally observed. Table 3 presents various measures of skewness for the distribution of monthly price changes for the 87 classes of goods and services making up the aggregate CPIH. Each reports positive skewness. This means that large price movements above the average price change tend to be more common than changes of an equal magnitude below the average.

Table 3: Skewness measures for the 87-item distribution of monthly prices changes in the CPIH

<b>Skewness measure</b>	<b>CPIH - 87 classes</b>
Standard 3rd moment	0.84
Bewley	0.11
Pearson	0.14
Hogg	1.54
Groenweld & Meeden	0.10

Source: Authors' calculations

### Notes

1. Skewness measures are calculated for the distribution of monthly prices changes across the 87 classes constituting the CPIH basket.
2. The figures presented in the table are the average of the monthly skewness measures between January 2001 and August 2022.

For a positively skewed distribution the arithmetic average will exceed the median average and any trimmed mean where an equal percentage has been cut from the top and bottom of the distribution. This leads to a trade-off in how they are interpreted. On the one hand, they are less affected by very large movements at the top end of the distribution, so might be considered a more robust measure of central tendency. However, the median and symmetrically trimmed means would be downwardly biased estimate of central tendency over time.

## 5 . Estimates of trimmed mean and median CPIH inflation rates

Trimmed mean and median approaches provide many of the desirable criteria for measures of core inflation. Specifically, they are easy to produce, simple to communicate to users, and will not be revised providing the underlying data making up the overall price index are not revised. [These are routinely monitored by most of the world's major central banks with a responsibility for maintaining price stability.](#)

In the US, the Federal Reserve Banks of [Cleveland](#) and [Dallas](#) have produced long-standing measures of core inflation based on trimmed means. Up until 2012 the Board of Governors of the Federal Reserve System adopted a core inflation measure as the official inflation target for US monetary policy.

Estimating a trimmed mean Consumer Prices Index including housing costs (CPIH) inflation rate is straightforward once it has been decided how much of the distribution of price changes is to be trimmed. Too little and the core inflation measure will not be extreme to outliers in times of heavy inflation. Too much and the estimator might be too crude, omitting potentially valuable information on price changes.

A further consideration is whether the trim should be symmetric or asymmetric. When the distribution of price changes is skewed, a symmetric trim where an equal amount is cut from the top and bottom would mean the tails do not average out. The resulting measure would be a [biased estimate of the long-run average rate of inflation.](#)

This issue has been investigated by the [Federal Reserve Bank of Dallas](#) and the [Bank of England](#) by using asymmetric trims where different proportions are cut from the top and the bottom of the distribution of price changes to offset bias. The main downside to this approach is that the size of the asymmetric trims would need to be periodically re-estimated, leading to revisions in the core inflation measure.

Following [recent analysis undertaken by the European Central Bank](#), Figure 4 presents a 15% (symmetric) trimmed mean for UK CPIH inflation alongside the median and headline CPIH inflation rates. The trimmed mean estimate of CPIH inflation is by design much smoother than the headline measure, especially during periods of higher-than-usual inflation volatility.

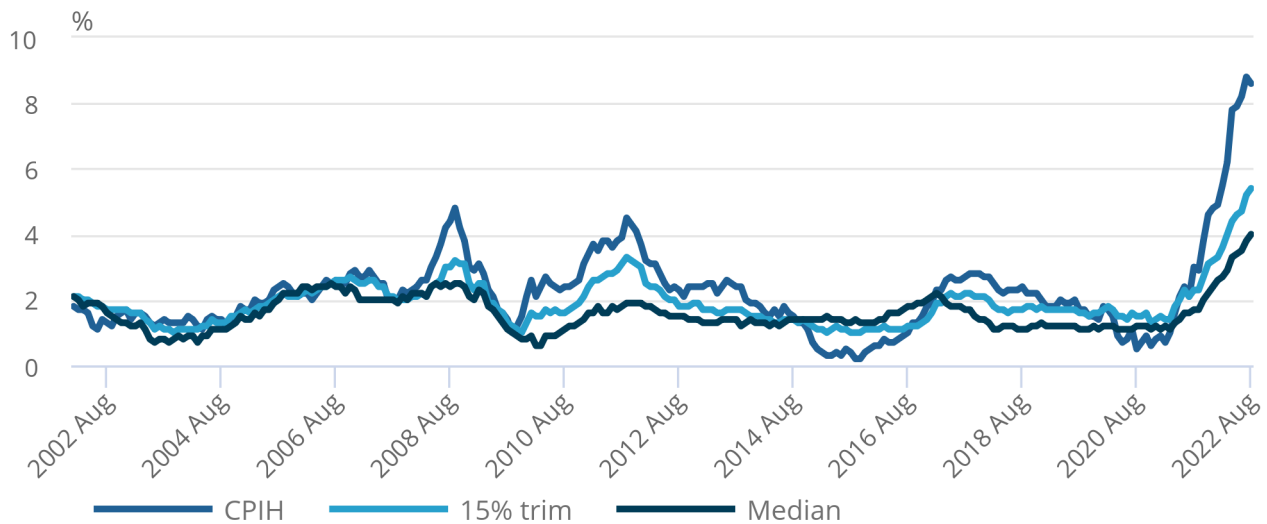
Over the 12 months to August 2022, the symmetric 15% trimmed mean CPIH index increased by 5.4% and the median CPIH by 4.0%. These estimates indicate that core inflation is currently below the headline rate of inflation. However, both measures have accelerated over the last year and are recording high rates of inflation by historical standards. This could be interpreted as a broadening of inflationary pressures in the economy, as evidence that prices are growing faster for the classes of goods and services towards the middle of the distribution of price changes and not just at the top end.

**Figure 4: Trimmed mean and median estimates of CPIH inflation are much lower than the headline rate**

12 month percentage change in the CPIH index, and the corresponding symmetric 15% trimmed mean and median rates.

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12 month percentage change in the CPIH index, and the corresponding symmetric 15% trimmed mean and median rates.



Source: ONS – Consumer Price Inflation and authors' calculations

Table 4 shows the classes of goods and services that are most-frequently trimmed when using a 15% symmetric trim. The most often trimmed items are passenger transport by air and water, and liquid fuels where energy price changes can play a key role in driving price movements. Other often trimmed classes include those that follow regular discount periods and where changes in taxes and duties can have regular impact on prices.

Table 4: The top-10 most-often trimmed classes in the CPIH

<b>CPIH class of goods and services (87 classes)</b>	<b>% of months trimmed</b>
07.3.3 Passenger transport by air	97.7
07.3.4 Passenger transport by sea and inland waterway	92.3
04.5.3 Liquid fuels	88.1
05.1.1 Furniture and furnishings	85.0
09.1.4 Recording media	80.8
05.2 Household textiles	79.6
09.5.1 Books	78.1
09.1.2 Photographic, cinematographic and optical equipment	76.9
09.1.3 Data processing equipment	76.5
02.1.1 Spirits	73.8

Source: Authors' calculations

#### Notes

1. Based on the monthly price changes for the 87 classes making up the overall CPIH index and a 15% symmetric trim.
2. Sample period is January 2002 to August 2022.

Table 5 shows the corresponding ten least often trimmed items. Owner-occupier's housing costs and actual rentals for housing tend to report stable price movements and are rarely trimmed. Several of these items, such as council tax and water supply are also subject to regulated price changes. Restaurants and cafes, and hairdressing and grooming establishments may also face relatively high physical costs of frequently changing prices, often referred to as menu costs, so price movements in these classes are less frequent.

Table 5: The top 10 least-often trimmed classes in the CPIH

<b>CPIH class of goods and services (87 classes)</b>	<b>% of months trimmed</b>
04.2 Owner occupiers' housing costs	0.0
11.1.1 Restaurants & cafes	1.2
04.1 Actual rentals for housing	5.0
12.1.1 Hairdressing and personal grooming establishments	6.9
04.4.1 Water supply	7.7
04.9 Council tax and rates	8.1
07.1.1A New cars	8.1
04.3.2 Services for maintenance and repair	8.5
04.4.3 Sewerage collection	8.5
05.3.3 Repair of household appliances	10.4

Source: Authors' calculations

#### Notes

1. Based on the monthly price changes for the 87 classes making up the overall CPIH index and a 15% symmetric trim.
2. Sample period is January 2002 to August 2022.

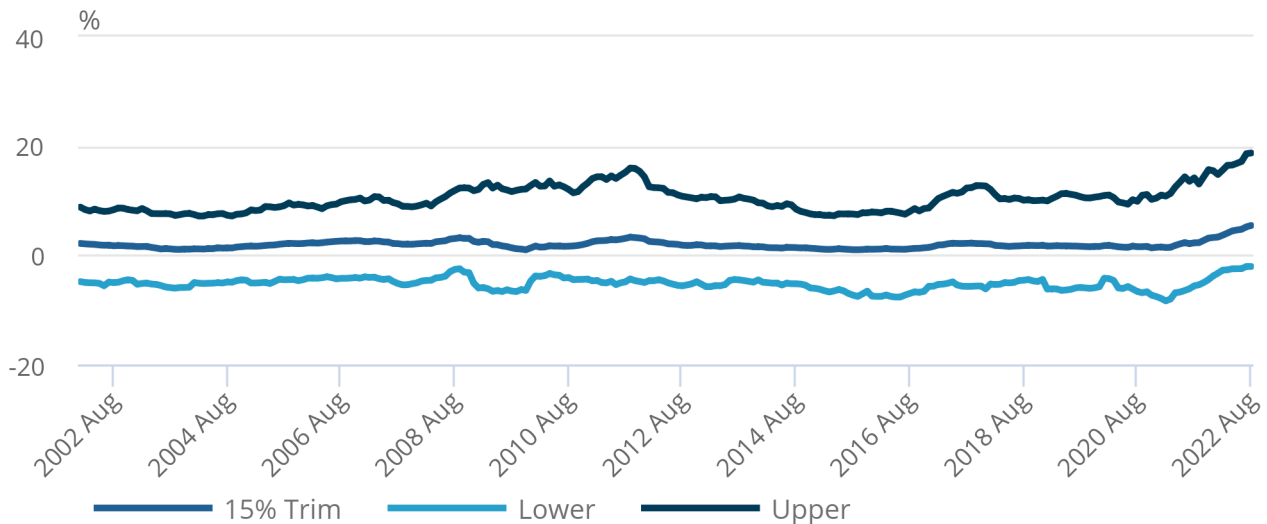
Figure 5 shows the 15% symmetrically trimmed mean estimate of CPIH inflation relative to the interval of class price changes that are included and excluded. The upper boundary is the inflation rate of the 85th percentile in the distribution of class price changes, and the lower boundary the inflation rate corresponding to the 15th percentile. For example, in August 2022 classes of goods and services in the CPIH basket where the annual rate of inflation was greater than 18.7% and lower than negative 2.1% were trimmed. The large width of this interval highlights the high degree of kurtosis that is a feature of the distribution of price changes in the CPIH.

**Figure 5: The interval for price changes of classes included in a symmetric 15% trim for the CPIH is very wide**

The CPIH annual inflation rates for a symmetric 15% trimmed mean, the 85th percentile (upper boundary) and the 15th percentile (lower boundary).

Figure 5: The interval for price changes of classes included in a symmetric 15% trim for the CPIH is very wide

The CPIH annual inflation rates for a symmetric 15% trimmed mean, the 85th percentile (upper boundary) and the 15th percentile (lower boundary).



Source: ONS – Consumer Price Inflation and authors' calculations

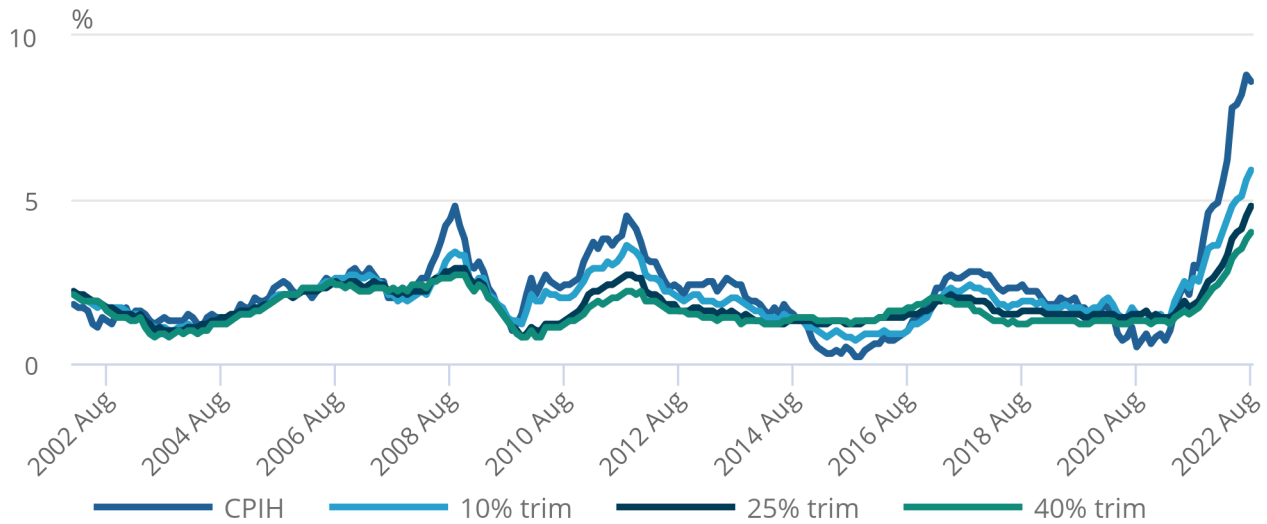
As the size of the trim becomes greater, these upper and lower boundaries would move inwards so more classes of goods and services at both ends of the price distribution are excluded. This would result in a smoother-trimmed mean estimate of CPIH inflation. For example, in Figure 6 the CPIH 12 month inflation rate in August 2022 for a 25% (symmetric) trim would fall to 4.8%, and for a 40% (symmetric) trim would fall further to 4.0%. Alternatively, as the size of the trim is reduced, these boundaries would move outwards so fewer classes are excluded and the estimated trimmed mean CPIH inflation rate would become more variable. For example, the CPIH 12 month inflation rate in August 2022 for a 10% (symmetric) trim would increase to 5.9%.

**Figure 6: The greater the size of the trim, the smoother the trimmed mean estimate of CPIH inflation**

The headline CPIH annual inflation rate and corresponding estimates for symmetric 15%, 25% and 40% trimmed mean rates

Figure 6: The greater the size of the trim, the smoother the trimmed mean estimate of CPIH inflation

The headline CPIH annual inflation rate and corresponding estimates for symmetric 15%, 25% and 40% trimmed mean rates



Source: ONS – Consumer Price Inflation and authors' calculations

## More detailed trimmed-mean estimates of CPIH inflation

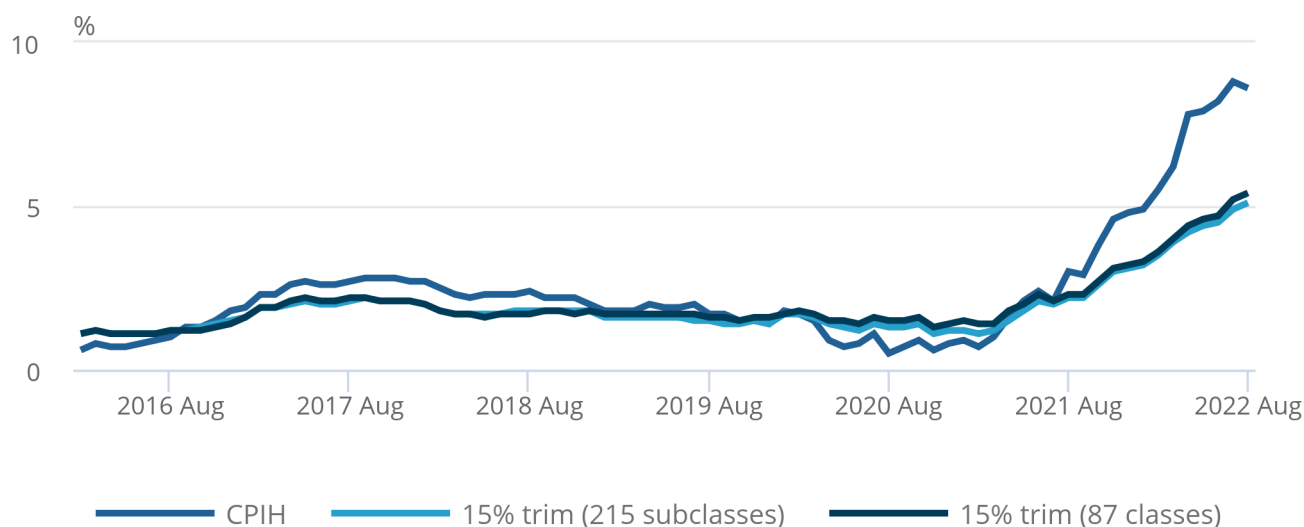
The analysis presented so far has been based on the 87 classes of goods and services making up the aggregate CPIH index. This level of disaggregation was chosen for the analysis because consistent time series are available back to 2001 for each class. Since 2017, the Office For National Statistics (ONS) has published the CPIH at a more detailed 215 subclass breakdown, but with a shorter time series available from the start of 2015 onwards. This allows CPIH trimmed mean estimates to be calculated with a greater level of precision for this smaller sample period. Figure 7 shows the 12 month change in CPIH inflation for headline CPIH, and symmetric 15% trims based on the 87-class and 215-subclass price distributions. The estimates of trimmed mean CPIH inflation are very similar.

**Figure 7: The estimated trimmed mean CPIH inflation rate is very similar when applied to both 87-class and 215-subclass distributions of price change**

**CPIH annual inflation rate and 15% trimmed mean CPIH inflation rates using the 87-class and 215-subclass distributions of price changes**

Figure 7: The estimated trimmed mean CPIH inflation rate is very similar when applied to both 87-class and 215-subclass distributions of price change

CPIH annual inflation rate and 15% trimmed mean CPIH inflation rates using the 87-class and 215-subclass distributions of price changes



Source: ONS – Consumer Price Inflation and authors' calculations

Table 6 provides a list of the most-often trimmed items using the more detailed 215-subclass distribution of price changes. Interestingly, more food subclasses appear, suggesting that the broader categories in the 87-class distribution of price changes may mask more volatile price changes in specific items. For instance, the milk, cheese, and eggs class in the 87-class distribution is excluded less than half the time, yet in the 215-subclass distribution yogurt is excluded nine months out of ten.



Table 6: The top 10 most-trimmed subclasses in the CPIH with a 15% symmetric trim

<b>CPIH subclass (215 subclasses)</b>	<b>% of months trimmed</b>
07.3.3 Passenger transport by air	97.8
01.1.5.2 Margarine and other vegetable fats	95.6
09.5.1.4 Binding services and e-book downloads	95.6
07.3.4 Passenger transport by sea and inland waterway	93.4
05.3.2.2 Coffee machines, tea makers and similar appliances	92.3
01.1.1.6 Pasta products and couscous	91.2
08.2.0.2 Mobile telephone equipment	90.1
01.1.4.4 Yoghurt	89.0
05.1.1.2 Garden furniture	89.0
09.1.3.3 Software	89.0

Source: Authors' calculations

#### Notes

1. Based on the monthly price changes for the 215 subclasses making up the overall CPIH index and a 15% symmetric trim.
2. Sample period is February 2016 to August 2022.

The list of least-trimmed subclasses in Table 7 shares similarities with the corresponding list for the 87-class distribution in Table 3, strongly reflecting housing and maintenance classes and subclasses of goods and services. However, medical, and veterinary services also appear as a subclass that is very infrequently trimmed compared to the broader 87-class categories.

Table 7: The top 10 least-trimmed subclasses in the CPIH with a 15% symmetric trim

<b>CPIH subclass (215 subclasses)</b>	<b>% of months trimmed</b>
04.1 Actual rentals for housing	0.0
04.2 Owner occupiers' housing costs	0.0
04.3.2.4 Services of painters	2.2
06.2.1/3 Medical services & paramedical services	2.2
09.2.3.0 Maintenance and repair of other major durables for recreation and culture	2.2
04.3.2.1 Services of plumbers	3.3
04.3.2.5 Services of carpenters	3.3
05.3.3 Repair of household appliances	3.3
09.3.5.0 Veterinary and other services for pets	3.3
11.1.1.1 Restaurants, cafes and dancing establishments	3.3

Source: Authors' calculations

#### Notes

1. Based on the monthly price changes for the 215 subclasses making up the overall CPIH index and a 15% symmetric trim.
2. Sample period is February 2016 to August 2022.

## 6 . Consumer price inflation data

[Consumer price inflation, UK: August 2022](#)

Dataset | Released 14 September 2022

Price indices, percentage changes, and weights for the different measures of consumer price inflation.

[Consumer price inflation, historical data, UK 1950 to 1988](#)

Dataset | Released 18 May 2022

This contains data tables of historical estimates modelled for the Consumer Prices Index including owner occupiers' Housing costs (CPIH) and CPI over the period 1950 to 1988 (1949 to 1987 for index values).

## 7 . Related links

### [Volatility components and their role in the Consumer Prices Index](#)

Article | Released 18 Jul 2019

Investigates whether the most volatile components of the Consumer Prices Index (CPI) basket make a larger contribution to the change in the 12 month growth rate of CPI in periods of relatively stable headline CPI growth.

### [Consumer price inflation basket of goods and services: 2022](#)

Article | Released 14 March 2022

The "shopping baskets" of items used in compiling the various measures of consumer price inflation are reviewed annually. The items in the baskets change so that the measures are up to date and representative of consumer spending patterns.

### [Consumer price indices, a brief guide: 2017](#)

Article | Released 3 November 2017

An overview of consumer price statistics. This briefly covers what consumer price indices are, what they are used for and how they are calculated.

### [Recent drivers of UK consumer price inflation: March 2022](#)

Article | Released 23 March 2022

A detailed look into recent drivers of UK consumer price inflation.

### [Consumer price inflation, historical estimates and recent trends, UK: 1950 to 2022](#)

Article | Released 18 May 2022

Analysis of the Consumer Prices Index including owner occupier's housing costs, extending back to 1950, incorporating the historical modelled estimates, 1988 to 2004.

## 8 . Cite This Article

Office for National Statistics (ONS), released 10 October 2022, ONS website, article, [New estimates of core inflation, UK, 2022](#)