

# Household Costs Indices: methodology

The methodology used in the Household Costs Indices and how it differs from the methodology used in our lead measure of consumer price inflation.

Contact:  
Helen Sands  
cpi@ons.gsi.gov.uk  
+44 (0)1633 456900

Release date:  
19 December 2017

Next release:  
To be announced

## Table of contents

1. [Introduction](#)
2. [Structure of this release](#)
3. [Future developments](#)
4. [The use of democratic weighting](#)
5. [The use of a payments approach to measuring owner occupiers' housing costs](#)
6. [The inclusion of a measure of interest costs on credit card debt](#)
7. [The use of gross expenditure to calculate the weight for insurance premia](#)
8. [Cumulative impact of changes](#)
9. [Annex A: Questionnaire](#)
10. [Annex B: Formulae for calculating plutocratic and democratic weights](#)
11. [Acknowledgements](#)

# 1 . Introduction

The Household Costs Indices (HCIs) are a set of experimental measures, currently in development<sup>1</sup>, that aim to more closely reflect UK households' experience of changing prices and costs. More specifically, they will aim to measure how much the nominal disposable income of different household groups would need to change, in response to changes in costs, to enable households to purchase the same quantity of goods and services of the same quality. Put simply, the broad approach of the HCIs is to measure the outgoings of households.

When considering the household experience of changing costs, it is informative to look at different groups within the population, as we would expect them to experience changes in prices and costs differently. Our analysis in [2014](#) and [2017](#) has demonstrated that different household groups (for example, retired households and low-income households) can experience different levels of inflation from time to time. Therefore the [preliminary estimates of HCIs](#) focus on measuring the experience of a number of different population groups, although an all-households index has been produced for reference.

The Consumer Price Index including owner-occupier Housing costs (CPIH), our lead measure of inflation, measures changes in the prices of goods and services as consumed by households. While measuring changes in the price of consumption is extremely important for measuring economic activity in the UK, it does not always reflect the changes in costs that are directly observed by UK households.

For example, the CPIH measures owner occupiers' housing costs (OOH)<sup>2</sup> using a rental equivalence approach. This approach estimates the cost of consuming housing services by calculating the price that would need to be paid to rent an equivalent property. The HCIs will look at using a measure of direct payments in place of rental equivalence (such as mortgage interest payments, dwelling insurance, ground rent and Stamp Duty Land Tax) to more closely reflect changes in costs as they are experienced by UK households.

This article describes the methodological differences between the CPIH and the preliminary estimates of the HCIs and explores the impact of each of these differences.

## Notes for: Introduction

1. To find out more about this development, please refer to our article [Developing the Household Costs Indices \(HCIs\)](#).
2. OOH are the costs of housing services associated with owning, maintaining and living in one's own home. This is distinct from the cost of purchasing a house, which is partly for the accumulation of wealth and partly for housing services.

## 2 . Structure of this release

The preliminary estimates of the [Household Costs Indices \(HCIs\)](#) differ to measurement of the Consumer Prices Index including owner occupiers' housing costs (CPIH) in four different ways. These are:

- the use of democratic weighting
- the use of a payments approach for measuring owner occupiers' housing costs (OOH)
- the inclusion of a measure of interest costs on credit card debt
- the use of gross expenditure to calculate the weight for insurance premia

Sections 4 to 7 of this article explore each of these components individually and all follow the same structure. Each section details the methodology that is currently used within the CPIH and the methodology that has been proposed for the HCIs. It then outlines the methodology that has been used to construct each component for use within this article and within the preliminary estimates of the HCIs. To help illustrate the scale of each change, the impact that each differing methodology would have were it to be applied uniquely to CPIH is explored. Finally the limitations of each proposal and the methodology that has been used are discussed.

Section 8 discusses the cumulative impact of the aforementioned differences, producing an all-households index that is compared to the all-households CPIH and the Retail Prices Index (RPI). Contributions to the difference between the all-households index and the all-households CPIH are also explored.

### 3 . Future developments

The components presented within this article are not the only suggestions that have been proposed for consideration in the [development of the Household Costs Indices](#); therefore this article marks an important step towards their development, while recognising that there are additional areas to be considered in the future.

There are two issues relevant to HCIs that have been considered during 2017 but that are not included in this article or in the [preliminary estimates of the HCIs](#) as they require further work. These are the cost of higher and further education payments and the cost of capital mortgage repayments. Methodology to calculate the cost of higher and further education payments has been investigated but concerns around data quality and methodology means that these costs have not been included in the HCIs at this time. The issue of capital repayments in mortgages has also been considered during 2017 and is conceptually more challenging. However it remains a priority in our work plan to continue to fully consider these issues, and investigate the impact including these costs would have on the HCIs as soon as it is practical.

Users are invited to comment on future priorities regarding the HCIs. An optional questionnaire is provided in Annex A and any feedback should be sent to [cpi@ons.gsi.gov.uk](mailto:cpi@ons.gsi.gov.uk) by Friday 23 February 2018.

### 4 . The use of democratic weighting

#### Background

Indices that measure changes in prices and costs for consumers and households are calculated based on changes to the total cost of a “basket” of goods and services by calculating the average price change of items within the basket. As households spend more of their household budget on some goods and services than others, price indices are weighted using the amount that is spent on these items by consumers. This ensures that price indices reflect the relative importance of the various items in the basket. For example, we would expect a 10% increase in the price of petrol to have a greater impact on the rate of inflation than a similar increase in the price of tea.

Different methods can be used to construct these weights<sup>1</sup>; this section discusses the method used in the Consumer Prices Index including owner occupiers’ housing costs (CPIH), and the method that is proposed for the Household Costs Indices (HCIs). It then provides details of the methodology used to produce democratic weighting for use in both this article and the [Household Costs Indices: preliminary estimates](#), and the impact the method would have, were it to be uniquely applied to the CPIH. Finally, limitations of the approach are discussed.

## CPIH method

CPIH uses a method of weighting known as plutocratic weighting. This method gives each item within the basket of goods and services a weight based on spending on that item relative to total spending within the economic territory. Plutocratic weights are calculated relative to the total pounds sterling value of all items bought in the economy, and therefore maintain the purchasing power of one unit of currency (in this case one pound) for each household. A secondary consequence of this is that higher spending households are implicitly given a greater weight within the index, and therefore have a greater influence over changes in the measured rate of inflation.

## HCIs proposal

The Household Costs Indices (HCIs) are proposed to use democratic weighting, which aims to give each household within the economy an equal weight. This method first calculates each household's expenditure share on a particular class of spending, by dividing each household's expenditure on that class by the household's total expenditure. The average of these expenditure shares for this class provides the democratic weight.

While using this method, each household's expenditure receives an equal weight within the index. A secondary consequence of this method is that the purchasing power of one pound differs between households. For example, a low-spending household may get more value from one pound than a high-spending household. Therefore, democratic weighting may result in an index that is more in line with the household's, as opposed to the total economy's experience of inflation.

## Methodology used to construct democratic weights

To produce democratic weights, expenditure data on each item at a household-level is required. Much of this data is available through survey sources, such as the Living Costs and Food Survey (LCF). However, the LCF only includes data from private households within the UK, meaning a proportion of the population are not included. There are known issues within the data, such as under-reporting within certain categories, and a declining sample size. Therefore when calculating plutocratic weights for the CPIH, expenditure totals calculated within the UK national accounts are used<sup>2</sup>. The national accounts expenditure totals are derived in part from the LCF, but adjustments are made to account for under-reporting and administrative data is used in part to improve the accuracy of expenditure estimates.

To ensure the most accurate representation of aggregate expenditure is being used, the methodology used to calculate household-level expenditure for democratic weights for the HCIs is consistent with the methodology used to calculate [CPIH-consistent inflation rates for UK household groups](#). This method involves reconciling LCF data with national accounts aggregate expenditure totals to arrive at adjusted expenditure data at the household level.

Once adjusted household-level expenditure is available, expenditure shares on each category of item for each household are calculated. A weighted average<sup>3</sup> of all sample households' expenditure shares is then calculated to obtain the average expenditure share on each category of item. The average expenditure share on each category of item is then expressed in parts per thousand.

The formulae for different weighting methods are provided in Annex B. A more thorough exploration of different methods of weighting and the different data sources that are used can be found in [Investigating the impact of different weighting methods on CPIH](#).

## Impact of democratic weighting on CPIH

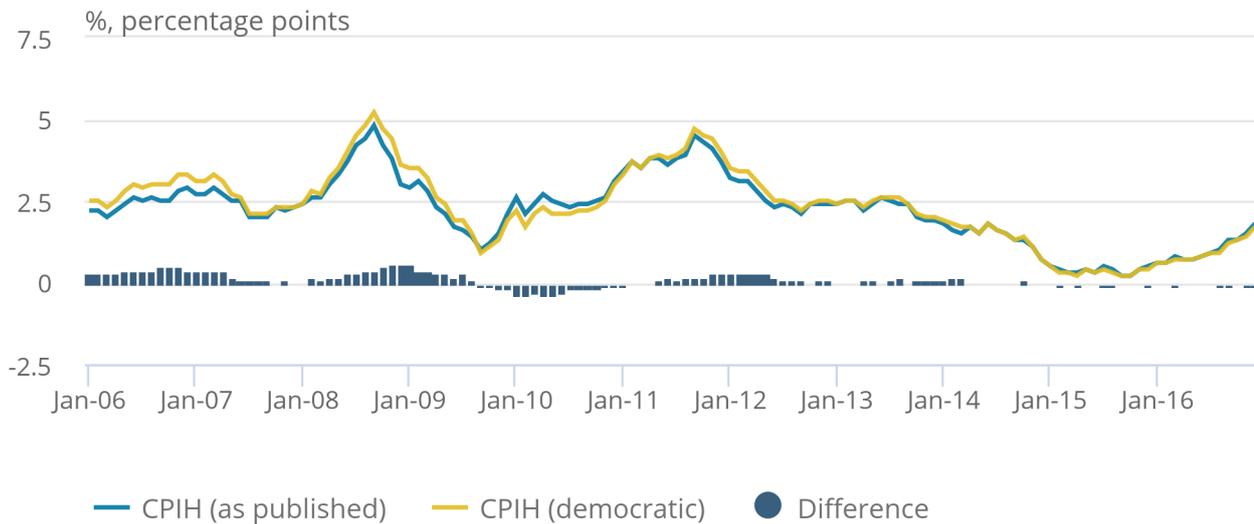
A comparison of the 12-month growth rates for plutocratically weighted CPIH and democratically-weighted CPIH is provided in Figure 1. These indices are referred to as CPIH (as published) and CPIH (democratic) respectively. This helps illustrate the expected scale of the difference when incorporated into the HCIs.

**Figure 1: CPIH (as published) and CPIH (democratic), 12-month growth rate**

UK, 2006 to 2016

Figure 1: CPIH (as published) and CPIH (democratic), 12-month growth rate

UK, 2006 to 2016



Source: Office for National Statistics

Historically, CPIH (democratic) typically grows at a faster rate of growth than CPIH (as published). This difference is greatest in earlier years of the analysis (2006 to 2010) but has converged in recent years (2014 to 2016). On average, the 12-month growth rate for CPIH (as published) is around 0.1 percentage points lower than CPIH (democratic) between 2006 and 2016.

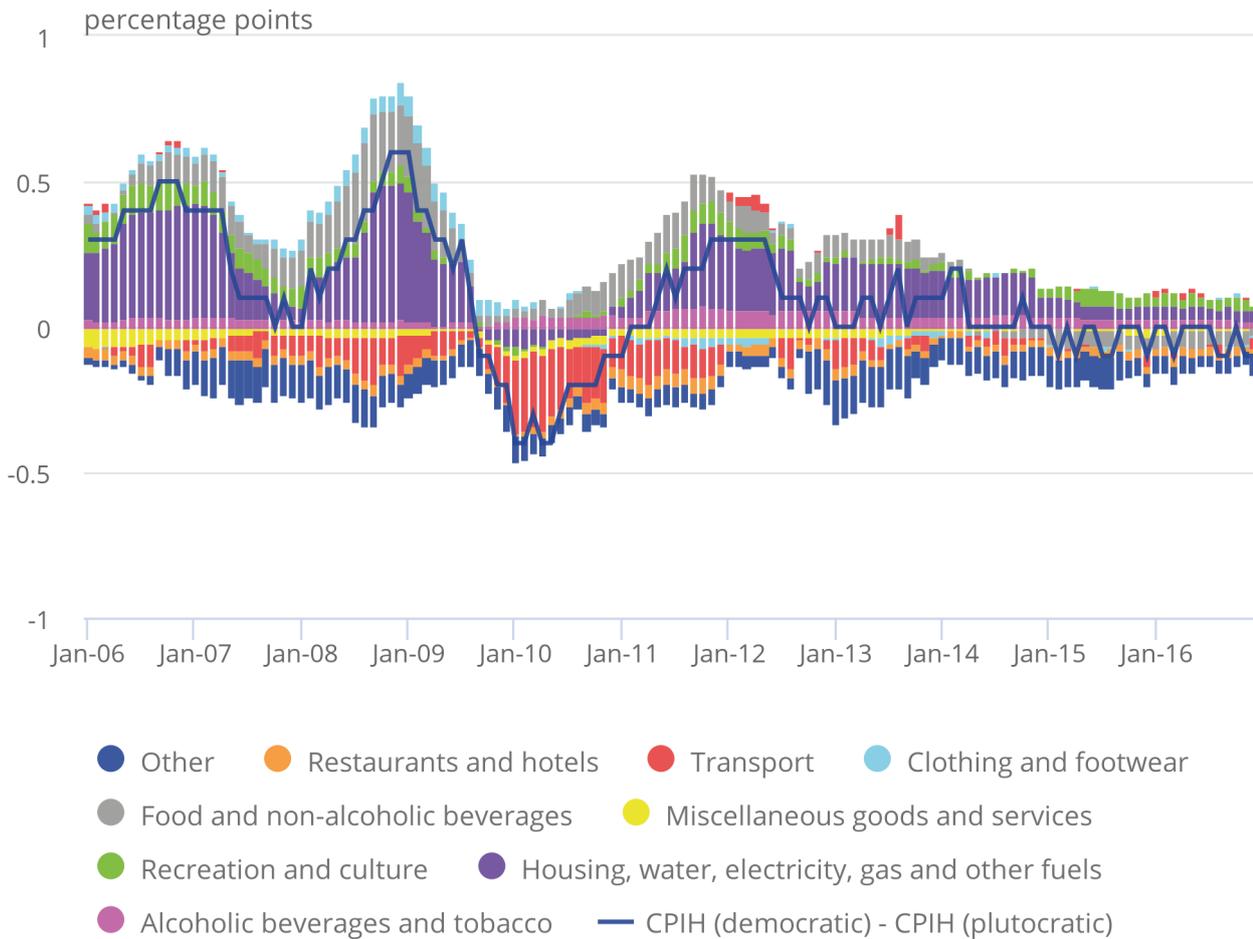
To explore these trends further, Figure 2 shows the differences in the contributions between the CPIH (democratic) and CPIH (as published) over this period. This shows the differences in the main drivers of the 12-month growth rates for the two indices.

**Figure 2: Contributions to the difference between 12-month growth rates for CPIH (as published) and CPIH (democratic)**

UK, January 2006 to December 2016

Figure 2: Contributions to the difference between 12-month growth rates for CPIH (as published) and CPIH (democratic)

UK, January 2006 to December 2016



Source: Office for National Statistics

Notes:

1. Stacked bar charts reflect the difference in percentage point contributions of 87 class level items the 12-month growth rate between CPIH (as published) and CPIH (democratic). The contribution of each of the 87 class level items is estimated separately, before being aggregated to 9 categories. Note that a reduction in the contribution to the 12-month growth rate need not imply falling prices; it could also reflect a lower rate of growth than observed in the previous year.
2. "Other" is comprised of the following divisions (as defined using COICOP categorisation): furniture, household equipment and maintenance; health; communication; and education. All other divisions are presented in their own right.
3. Contributions may not sum due to rounding.

When CPIH (democratic) is growing at a faster rate to CPIH (as published), the main contributions are from housing and housing services, and food and drink. These categories of spending receive a larger weight in the democratic index than the plutocratic index<sup>4</sup>, so when prices increase for these items, the increases naturally contribute more to the 12-month growth rate for CPIH (democratic). These are partially offset by higher contributions to the CPIH (as published) from transport, restaurants and hotels, and other items, which have a higher weight in the plutocratic index than the democratic index.

The differences in contributions since 2014 have converged and the contributions that would typically cause CPIH (democratic) to experience stronger growth (from housing and housing-related services) have declined and are offset by contributions that would typically cause CPIH (plutocratic) to experience stronger growth (from restaurants, hotels and other items). This results in the difference between the indices in this period being almost negligible.

## Limitations of approach

One of the primary limitations of this method relates to the intended coverage of the HCIs. As the HCIs are intended to measure the experience of changing prices and costs for UK households, it seems inherent that the expenditure used to weight the indices should reflect the expenditure of all UK households. The coverage of expenditure used to weight the indices is not clear cut when using the methods outlined in this section.

The LCF surveys private UK households, and therefore misses a proportion of the population that live in institutional households such as care homes and student halls. While the aggregate expenditure produced in the national accounts makes adjustments to ensure that the estimated expenditure covers the entire UK population (including those in institutional households), the expenditure is also adjusted so that it is reported on a “domestic” basis. This means that it excludes UK residents’ expenditure abroad, but includes foreign visitors’ expenditure within the UK. Therefore, when reconciling these sources, aggregate expenditure on a domestic basis for all-households is redistributed to private UK households.

It is also worth noting that democratic weighting does not lead to the production of a “true” democratic index. For a truly democratic index, individual price (or cost-of-living) indexes would need to be constructed for a representative sample of the whole population. These would then be averaged by assigning the same weight to each person, regardless of the magnitude of their total consumption expenditures. Therefore, although the method presented in this article may approximate a democratic index, it is not a true representation of a democratic index.

Further limitations of the data sources and methods used in constructing democratic weights, and democratic weights for household groups, can be found in Section 6 of the article: [Methodology to calculate CPIH-consistent inflation rates for UK household groups](#).

## Notes for: The use of democratic weighting

1. The formulae for different weighting methods presented in this article are provided in Annex B. Further details on different methodologies that are used to construct weights and the impact that they have are provided in [Investigating the impact of different weighting methods on CPIH](#).
2. [Consumer price inflation, updating weights: 2017](#) provides further details of the data sources and methods used in the construction of CPIH weights.
3. Each sample household is weighted in accordance with the proportion of the population it represents.
4. For more details regarding differences in weights constructed using different methodologies and the resulting indices refer to the article [Investigating the impact of different weighting methods on CPIH](#).

# 5 . The use of a payments approach to measuring owner occupiers' housing costs

## Background

Owner occupiers' housing costs (OOH) are the costs of owning, maintaining and living in one's own home. This is distinct from buying a house, which is partly for the accumulation of wealth and partly for housing services. There is no single defined measure of OOH because they can be calculated differently depending on what the target is. In particular, whether OOH should be measured at the point of acquisition of the housing service, the point of use, or the point at which it is paid for. Each of these three approaches has its own specific methodological strengths and weaknesses, and is measured using different approaches.

This section discusses the method used in the Consumer Prices Index including owner occupiers' housing costs (CPIH), and the method that is proposed for the Household Costs Indices (HCIs). It then provides details of the methodology used to produce the OOH series for use in both this article and the [Household Costs Indices: preliminary estimates](#), and the impact the method would have, were it to be uniquely applied to the CPIH. Finally, limitations of the approach are discussed.

## CPIH method

CPIH measures OOH using a rental equivalence (RE) approach. This approach estimates the cost of consuming housing services by calculating the price that would need to be paid to rent a property of an equivalent quality (including the location of the property). The [CPIH compendium](#) provides further details as to how this is calculated in practice.

## HCIs proposal

The HCIs use a "payments" approach to measuring OOH. The UK payments approach is an experimental method for measuring OOH that attempts to capture what households pay out as owner occupiers' when consuming housing (excluding capital repayments). This includes mortgage interest payments, transaction costs such as estate agency and legal fees, and running costs such as repairs and maintenance, ground rent and dwelling insurance.

It has also been proposed that the HCIs should measure changes in the cost of capital mortgage repayments. The inclusion of these payments has been considered throughout 2017 but is both conceptually and practically challenging. Therefore, it has not been feasible to include them in this analysis or in the [preliminary estimates of the HCIs](#).

## Method used to construct a payments approach to OOH

The payments approach used in this article is the same as that published in [understanding the different approaches of measuring owner occupiers' housing costs \(OOH\)](#). Table 1 presents a full list of the OOH (payments) component indices, as well as the source data for the prices and weights information used to construct the index. Most of the indices are drawn from the Retail Prices Index (RPI). The "major repairs and maintenance" component is currently proxied by the "regular repairs and maintenance" series from the CPIH due to lack of an alternative data source. The stamp duty index has been constructed using data from Gross Fixed Capital Formation (GFCF) and Household Final Consumption Expenditure (HHFCE) estimates formulated within the UK national accounts.

**Table 1: Source data for OOH (payments) sub-indices**

<b>OOH (payments) indices</b>	<b>Source of price data</b>	<b>Source of weights data</b>
Mortgage interest payments	RPI	RPI
Council Tax (Great Britain)	RPI	RPI
Northern Ireland rates	RPI	RPI
Dwelling insurance	RPI	RPI
Ground rent	RPI	RPI
Stamp duty	Stamp Duty index	HHFCE and GFCF
Estate agent fees	RPI	RPI
Home-buyers survey	RPI	RPI
Major repairs and maintenance	CPIH	HHFCE
House conveyancing	RPI	RPI

Source: Office for National Statistics

## **Impact of including a payments approach to OOH in CPIH**

The difference between CPIH constructed using a payments approach and CPIH constructed using rental equivalence are displayed in Figure 3. These indices are referred to as CPIH (payments) and CPIH (as published) respectively. This helps illustrate the expected scale of the difference when incorporated into the HCIs.

**Figure 3: CPIH (payments) and CPIH (as published), 12-month growth rate**

UK, 2006 to 2016

## Figure 3: CPIH (payments) and CPIH (as published), 12-month growth rate

UK, 2006 to 2016



Source: Office for National Statistics

Between January 2005 and December 2016, on average, CPIH (payments) is 0.3 percentage points lower than CPIH (as published). The difference between the two methodologies is largely driven by mortgage interest payments, which make up a large proportion of the payments approach basket of housing related goods and services.

### Limitations of approach

OOH (payments) is an experimental series and we therefore advise using it with some caution. Possible improvements to the current methodology and data sources are being considered as part of the work towards developing the [understanding different approaches to measuring OOH publication](#).

Using a payments-based approach is commonly considered to be the best construct for assessing changes in net money incomes over time<sup>1</sup>. This is in line with the stated aims of the HCIs, as briefly set out in section 1 of this article. However, the inclusion of nominal interest payments on mortgage debt is not without its problems conceptually. Its inclusion has been criticised as the treatment of interest flows is not consistent across persons (or households). For example, Charles Goodhart (2001) describes that if a borrower is worse off in some way when interest rates rise, then equivalently a lender owning an interest bearing asset is better off, and it may be analytically unsound to include one but not the other.

**Notes for: The use of a payments approach to measuring owner occupiers' housing costs**

1. With reference to the [International Labour Organisation Consumer Price Index Theory and Practice Manual](#), paragraph 10.22.

## 6 . The inclusion of a measure of interest costs on credit card debt

### Background

Interest costs are the amount paid to borrow money, or for delaying the repayment of a debt. One of the largest interest costs experienced by households is in relation to their mortgage; these payments are already considered with regard to the payments approach to measuring owner occupiers' housing costs (OOH). Interest costs can also be incurred on other forms of debt, such as credit cards, loans and finance schemes for cars and other durable goods, and these latter payments are considered within this section.

This section discusses the method used in the Consumer Prices Index including owner occupiers' housing costs (CPIH), and the method that is proposed for the Household Costs Indices (HCIs). It then provides details of the methodology used to produce the interest on credit card debt series for use in both this article and the [Household Costs Indices: preliminary estimates](#), and the impact that the method would have, were it to be uniquely applied to the CPIH. Finally, limitations of the approach are discussed.

### CPIH method

The CPIH does not include the cost of interest on any form of debt. This is because the CPIH is intended to measure the changing prices of consumption goods and services. Interest payments are not in scope under this definition as interest payments are affected by how purchases are financed rather than the prices. For CPIH, the price of a smartphone is the same whether it is purchased for cash or bought on credit. While it could be argued that a proportion of the interest payment is a service charge to the financial institution who has offered the loan, the practical difficulties in disentangling the service element render it currently unsuitable for inclusion in CPIH.

This is further complicated when considering that to obtain a "price" for interest payments, the effective interest rate has to be applied to a stock of debt. As prices for goods and services are rising (and falling) over time, households can purchase less (or more) with the same value of money. The value, or purchasing power, of money is therefore changing over time. As debt is a monetary value, it needs to be adjusted to account for this inflation, so a comparable price estimate is maintained throughout the year. This potentially leads to circularity issues, as an inflation index is needed to adjust for the changing value of money, but this would then feed back into the inflation measurement itself. Furthermore interest rates are typically linked to changes in inflation, which adds another level of complexity to the issue.

### HCIs proposal

As the HCIs measure changes in costs as experienced by households, it is proposed that interest incurred on all forms of debt should be included in the index. A rise in the interest rate will increase the costs or outgoings of any household that has any form of debt, and the change in cost to the household should be reflected in an index measuring household outgoings.

While the interest rates for numerous sources of debt are publically available through the Bank of England (BoE), the expenditure information on interest is fairly sparse, particularly at the household level (as discussed in section 2, household level expenditure information is vital in producing democratic weights). As such, the data presented in this article, and in the [Household Costs Indices: preliminary estimates](#) publication, is limited to interest costs on credit card debt.

## Method used to calculate an index for interest costs on credit card debt

The methodology used in this article and in the preliminary estimates of the HCIs is referred to as the “simple revaluation” approach. The approach takes the growth rate in the sterling weighted average interest rate between the base period and the current period and multiplies it by the change in CPIH (as HCIs are still in development) between these same periods. By multiplying the change in interest rate by the change in inflation, the index takes into account the fact that the value of money (and therefore debt) changes over time.

The price change in the proportional service charge is thus given by:

$$I_{\text{CC interest}}^{0,t} = \frac{r^t}{r^0} \cdot I^{0,t}$$

where :

$r^t$  is the interest rate in the current period,  $t$

$r^0$  is the interest rate in the base period, 0

$I^{0,t}$  is the index value for period  $t$ , based in period 0

The interest rates used to produce this series are published by the Bank of England (BoE). Between January 2005 and December 2015, series CFMHSDG is used. This is the monthly average of UK resident banks' sterling weighted average interest rate on credit card loans to individuals and individual trusts (in percent). This is not seasonally adjusted. Due to changes made to data collection and processing in the BoE, from January 2016 onwards series CFMZ6IR is used. This is the monthly average of UK resident monetary financial institutions' (excluding Central Bank) sterling weighted average interest rate on credit card loans to households (in percent). This is also not seasonally adjusted.

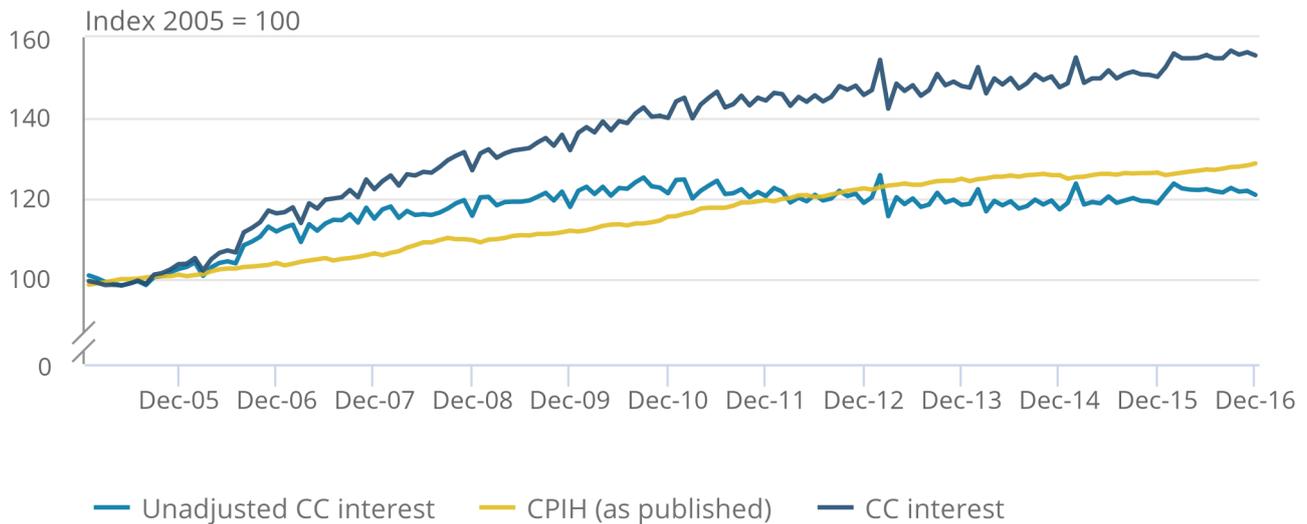
Changes in the aggregate CPIH are used to adjust the interest rates index for the change in the value of money over time. The resulting index is displayed in Figure 4, the unadjusted interest on credit card debt index and CPIH are provided for reference. The adjusted interest on credit card debt series is referred to as “CC interest”, the unadjusted interest on credit card debt series is referred to as “Unadjusted CC interest”, CPIH is referred to as “CPIH (as published)”.

**Figure 4: Credit card (CC) interest compared with unadjusted CC interest and CPIH (as published)**

UK, 2005 to 2016

Figure 4: Credit card (CC) interest compared with unadjusted CC interest and CPIH (as published)

UK, 2005 to 2016



Source: Office for National Statistics, Bank of England

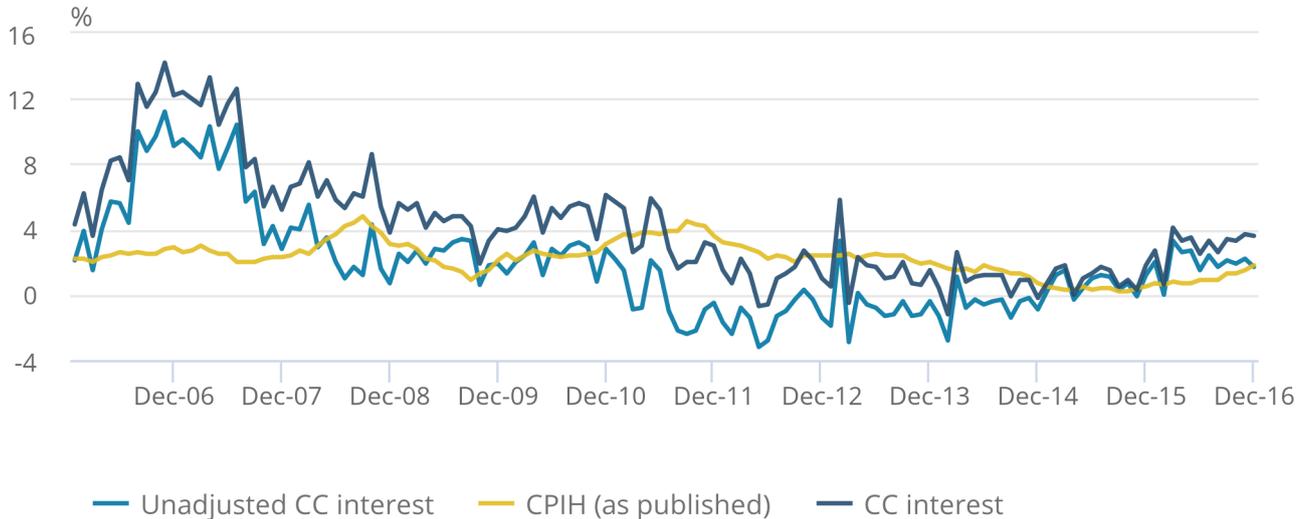
As CPIH has shown consistent growth over the period 2005 to 2016, the CC interest series also shows a consistent underlying trend of growth. This is in comparison to the unadjusted CC series, where growth in the average effective interest rates on credit card loans since 2012 has been relatively subdued. To explore this further, Figure 5 displays the 12-month growth rates for these series.

**Figure 5: Credit card (CC) interest compared with unadjusted CC interest and CPIH (as published), 12-month growth rate**

UK, 2006 to 2016

Figure 5: Credit card (CC) interest compared with unadjusted CC interest and CPIH (as published), 12-month growth rate

UK, 2006 to 2016



Source: Office for National Statistics, Bank of England

Naturally, the largest difference between the CC interest series (adjusted for inflation) and the unadjusted CC interest series are observed when CPIH is showing stronger positive growth. When growth is subdued (for example, in 2015) the difference between the adjusted and unadjusted CC interest growth rates is minimal.

### Impact of including interest costs on credit card debt on CPIH

The expenditure used to weight this series into CPIH in this article is obtained from the Living Costs and Food Survey (LCF). If this series were to be included in CPIH it would receive a weight of three parts per thousand in the years 2005 to 2008 and 2012 and two parts per thousand in the remaining years. Therefore, although the index shows fairly extreme changes during the period 2005 and 2016, the influence it has on the 12-month growth rate at the aggregate level is small.

The impact that including a measure of credit card interest would have on CPIH is demonstrated in Figure 6. CPIH including credit card interest is referred to as CPIH (CC interest), while CPIH without this component is referred to as CPIH (as published). This helps illustrate the expected scale of the difference when incorporated into the HCIs.

**Figure 6: CPIH (Credit card interest) compared to CPIH (as published), 12-month growth rate**

UK, 2006 to 2016

Figure 6: CPIH (Credit card interest) compared to CPIH (as published), 12-month growth rate

UK, 2006 to 2016



Source: Office for National Statistics

The maximum difference that can be observed during this period is 0.2 percentage points. Most of the differences observed are towards the beginning of the analysis (2006 to 2009) where the index was showing stronger movements and the weight is relatively larger than it is in later periods (albeit still small). Between 2010 and 2016 there are only four months where a difference between the CPIH including credit card interest and the CPIH (as published) are observed, and the difference is only 0.1 percentage points.

## Limitations of approach

Firstly, the approach used for this article and within the preliminary estimates of the HCIs is limited to interest costs on credit card debt. While this is a good starting point, there are a number of other forms of debt that are due consideration; these will be considered for future estimates of the HCIs.

The use of CPIH to adjust for changes in inflation may also raise questions. The purpose of adjusting for inflation is to keep the purchasing power of money (and therefore the stock of debt) consistent between the base period and subsequent periods. As plutocratic weighting maintains the purchasing power of the pound, it seems logical that a plutocratically weighted index (such as CPIH) should be used (as discussed in section 4, plutocratic weighting maintains the purchasing power of the pound). However, for internal consistency it may be argued that the HCIs would be more appropriate in adjusting the stock of debt to account for the changing value of money, as experienced by households.

The CPIH has been used in this article and in the preliminary estimates of the HCIs due to the fact that the HCIs are still in a preliminary phase, however feedback is welcomed on users' preferred approach.

The inclusion of nominal interest discussed in this section faces the same limitations as discussed with regards to mortgage interest payments in section 5.

## 7 . The use of gross expenditure to calculate the weight for insurance premia

### Background

Insurance is an arrangement that a company undertakes to provide a guarantee of compensation for loss (for example, through damage, theft, death, loss, illness) in return for a specified premium. Three types of insurance are considered in this section: insurance associated with the dwelling; insurance associated with transport; and insurance associated with health.

This section discusses the method used in the Consumer Prices Index including owner occupiers' housing costs (CPIH), and the method that is proposed for the Household Costs Indices (HCIs). It then provides details of the methodology used to produce weights for insurance premia for use in both this article and the [Household Costs Indices: preliminary estimates](#), and the impact that the method would have, were it to be uniquely applied to the CPIH. Finally, limitations of the approach are discussed.

### CPIH method

Insurance premia can be separated into two components; the first is a service charge paid directly to the insurance company, and the second is payment into a "claims pool" that is redistributed back to households when they make a claim. As CPIH measures changes in the cost of consuming goods and services, only the service charge element is included in the insurance weight. Furthermore, as the claims pool is redistributed back to the household sector, the effect of increased payments into the claims pool to the household sector should equal zero (as households are paying more in, but they will also be receiving more through claims). The expenditure total is calculated as the difference between expenditure on insurance premia and the amount paid out in claims, and is referred to as a "net weight".

In some years there may be extreme circumstances, such as severe flooding, that could result in the insurance companies paying out more than they are receiving through insurance premium payments. In this case, the net insurance weight could result in a negative figure. To avoid this phenomenon an average of the most recent three years of insurance expenditure is pooled to give an estimate of the net insurance expenditure for the most recent year.

As it is not practical to deduct a claim amount from the price index, the full cost of the premium is used when assessing the change in the price of insurance. This is referred to as a gross price. Therefore the CPIH uses a net weight and gross price approach to measuring changes in the cost of insurance premia.

### HCIs proposal

The full insurance premium is a direct cost faced by households and therefore the HCIs have been proposed to allocate the total expenditure on insurance premia to the relevant insurance categories (gross weight). It has also been suggested that to avoid double counting the expenditure resulting from the amount claimed should be deducted from the relevant heading. For example, if a claim was made following a car accident and a new car was bought, the money from the claim used to buy a new car should be deducted from the expenditure total for new cars.

The price index naturally should also be calculated without netting claim amounts from the prices. Therefore the HCIs are proposed to use a gross weight and gross price approach to measurement.

## Method of producing gross expenditure to calculate weights for insurance premia

To produce the insurance weights used in this article and in the preliminary estimates of the HCIs expenditure totals from the Retail Prices Index (RPI), that also uses the full cost of the premium to calculate expenditure weights, are used. Expenditure for a number of items in the RPI was used to recalculate class level expenditure for three classes within the CPIH: insurance associated with the dwelling, insurance associated with health, and insurance associated with transport. CPIH weights in parts per thousand (ppt) were then recalculated based on the new expenditure totals for each class. The average change in weight for each insurance class is provided in Table 2.

**Table 2: Average insurance weight (parts per thousand) using gross expenditure and net expenditure, 2005 to 2016**

Item	Net expenditure weight (ppt)	Gross expenditure weight (ppt)
Insurance associated with the dwelling	1.9	3.5
Insurance associated with health	1.7	2.3
Insurance associated with transport	3.3	13.3

Source: Office for National Statistics

Notes:

1. Figures shown are rounded to 1 decimal place.

## Impact of using gross expenditure to weight insurance premia on CPIH

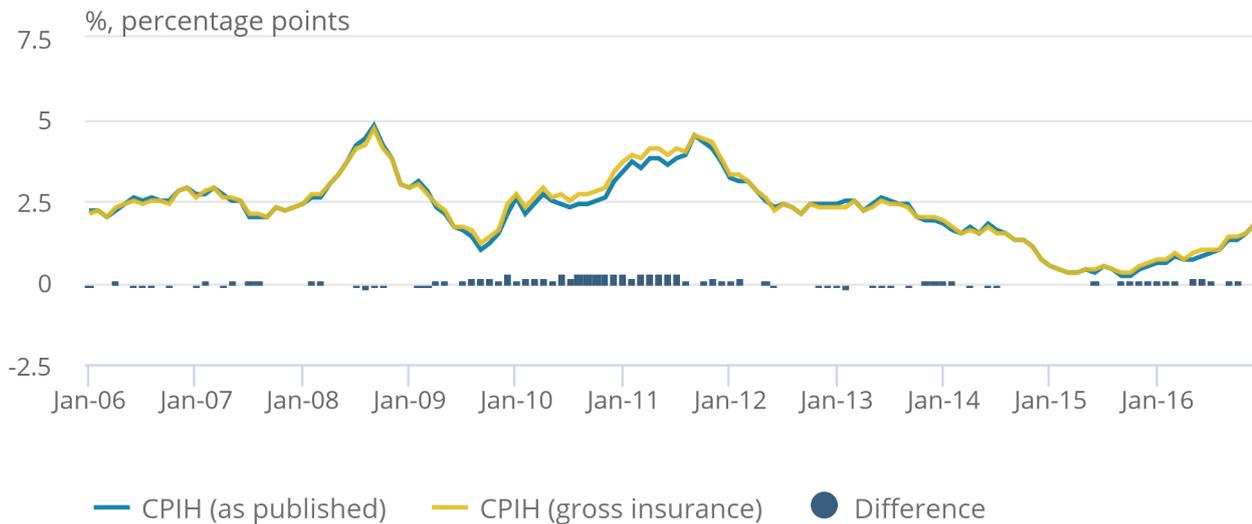
The impact that using gross insurance premia to weight the three class-level insurance categories has on the CPIH 12-month growth rate is provided in Figure 7. This index is referred to as CPIH (gross insurance) while CPIH calculated using net expenditure is referred to as CPIH (as published). This helps illustrate the expected scale of the difference when incorporated into the HCIs.

**Figure 7: CPIH (gross insurance) compared to CPIH (as published), 12-month growth rate**

UK, 2006 to 2016

Figure 7: CPIH (gross insurance) compared to CPIH (as published), 12-month growth rate

UK, 2006 to 2016



Source: Office for National Statistics

While for most of the period the differences are negligible, stronger growth can be observed in 2010 and 2011 when gross expenditure is used to calculate the weight for insurance premiums. This is mainly driven by insurance associated with transport, which displayed strong growth over this time period, and receives a considerably larger weight when using this approach to constructing the weights. The greatest differences observed are 0.3 percentage points; however a number of months are observed where there is a difference of 0.1 and 0.2 percentage points. On average over this period, CPIH (gross insurance) displays marginally stronger growth than CPIH (as published).

## Limitations of approach

The main limitation to this approach is the current lack of available data to deduct insurance payouts from the relevant insurance categories. This means that the index presented in this article (and used for the preliminary estimates of the HCIs), incurs an element of double counting expenditure, with regards to any goods or services bought using insurance claims.

## 8 . Cumulative impact of changes

## Introduction

While sections 4 to 7 of this article explored the impact of each change were it applied uniquely to the CPIH, this section explores the cumulative impact of these four changes. The main analysis presented in this section focuses on how the aggregate index (referred to as the all-households HCI) differs from the aggregate Consumer Prices Index including owner occupiers' housing costs (CPIH), our lead measure of inflation (referred to as the all-households CPIH). Comparisons between these indices are analytically straightforward, as they are composed in the same way, with the only differences being those discussed in this article.

The Retail Prices Index (RPI) is also presented in this section for comparison. However, as the RPI is no longer a National Statistic, and its use has been discouraged, the analysis in this section focuses on differences between the all-households HCI and the all-households CPIH.

When considering the measures against the RPI it should be noted that there are a number of other differences between the CPIH and RPI that lead to considerably different results (particularly the use of a different elementary aggregate formula). For details of how the RPI differs from the CPIH, please refer to the article [users and uses of consumer price inflation statistics](#).

## Results

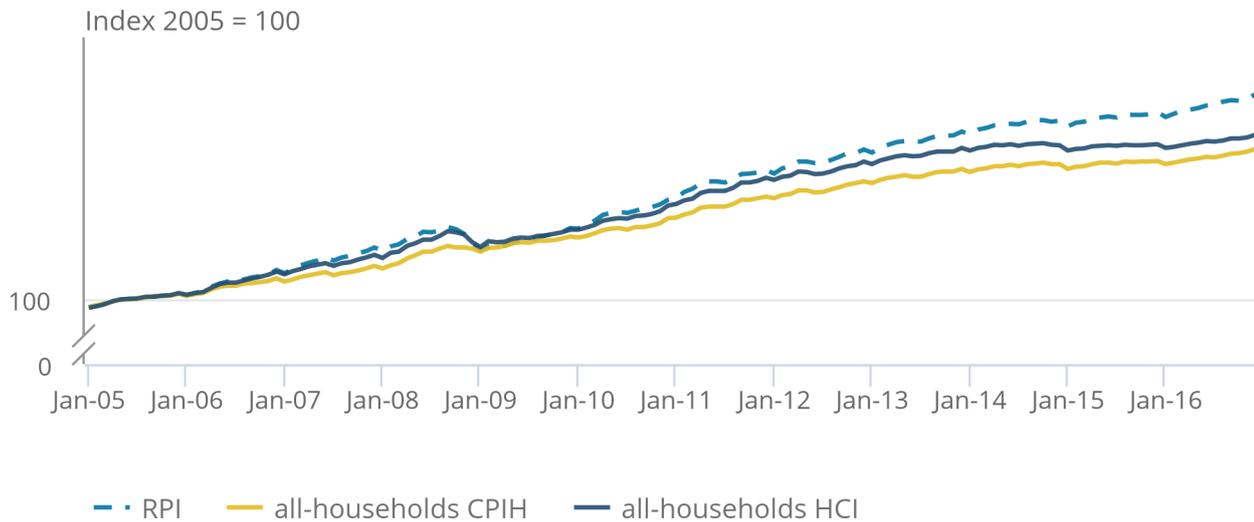
Figure 8 provides the cumulative price changes as measured by the all-households HCI, CPIH and RPI. Between January 2005 and December 2016, prices as measured using all-households CPIH were observed to grow 29%. The all-households HCI showed prices and costs to grow slightly more, at 31%, over this same period.

**Figure 8: Cumulative price changes, all-households HCI, CPIH, RPI**

UK, 2005 to 2016

Figure 8: Cumulative price changes, all-households HCI, CPIH, RPI

UK, 2005 to 2016



Source: Office for National Statistics

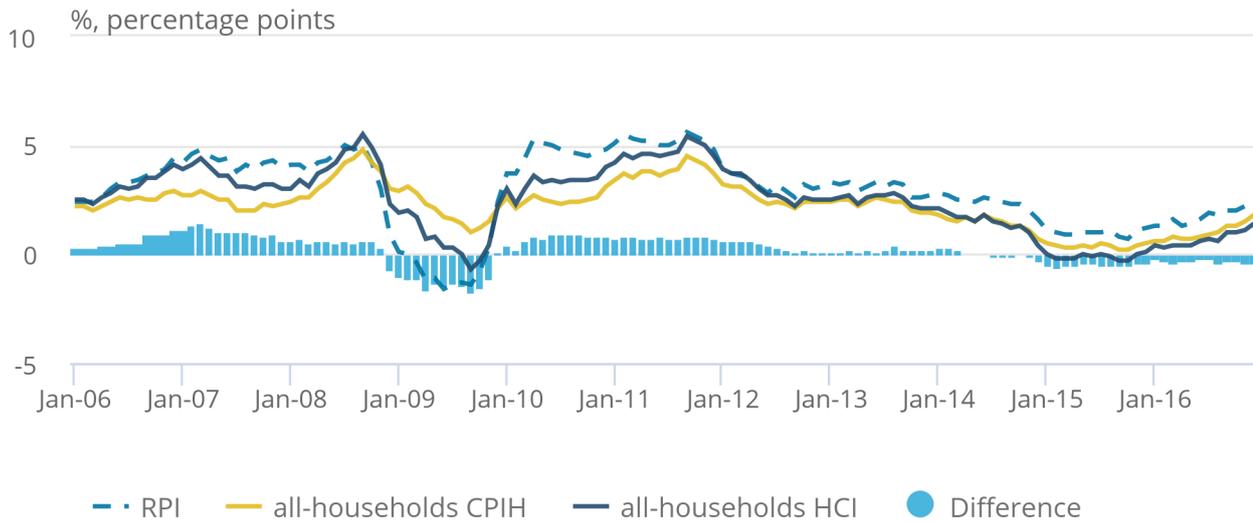
To explore these trends further, Figure 9 displays the 12-month growth rate for the three indices, and provides the percentage point difference between the all-households HCI and CPIH. On average, over the period 2006 to 2016, the all-households HCI has grown at an annual rate 0.2 percentage points faster than the all-households CPIH. However, the index is considerably more volatile, and there are periods where the all-households HCI is displaying growth up to 2 percentage points lower than the all-households CPIH. There are also periods in 2009 and 2015 where the all-households HCI shows negative inflation, while the all-households CPIH shows positive growth.

**Figure 9: All-households HCI, CPIH, and RPI, 12-month growth rate, percentage point difference between all-households HCI and CPIH**

UK, 2006 to 2016

Figure 9: All-households HCI, CPIH, and RPI, 12-month growth rate, percentage point difference between all-households HCI and CPIH

UK, 2006 to 2016



Source: Office for National Statistics

These differences are driven largely by the different approach to measuring owner-occupiers' housing costs, which not only affect the index used, but also the resulting weights. The weights are further modified through the use of democratic weighting, and the inclusion of gross weights for insurance premia and interest costs on credit card debt. Although the impact of the latter components was shown to be minimal, the cumulative impact of these four changes has led to noticeable differences between the all-households HCI and the all-households CPIH.

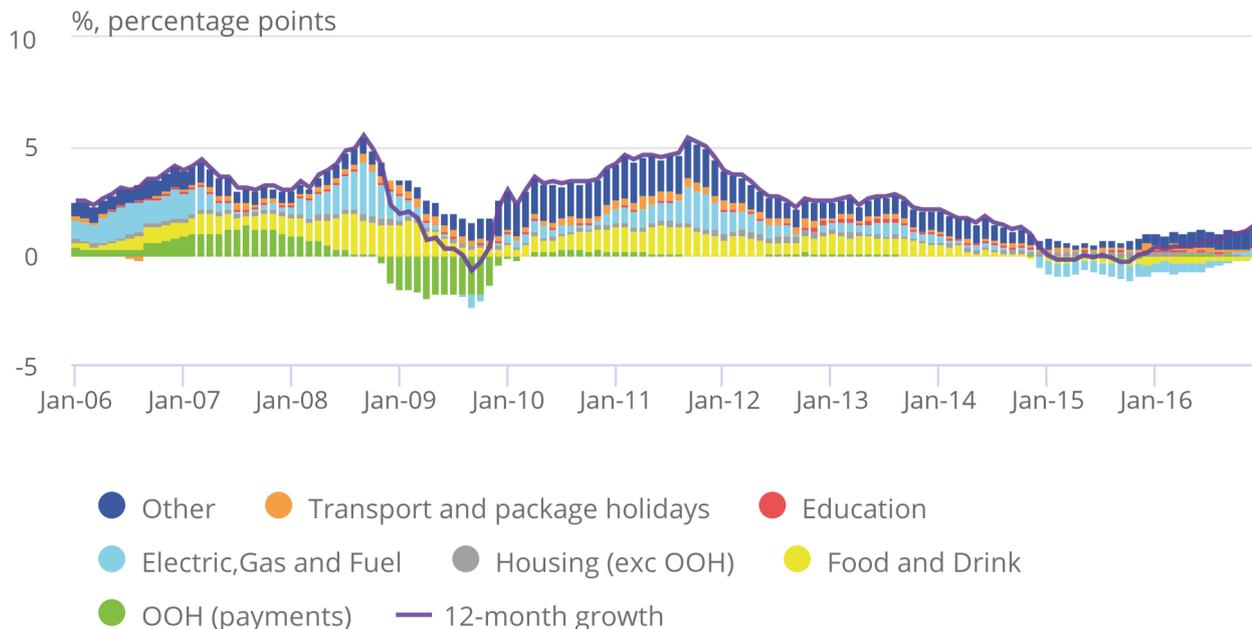
To explore this further, the contributions of different categories of spending to the 12-month growth rates for the all-households HCI and CPIH, and the differences between these contributions, are provided in figures 10, 11 and 12 respectively.

## Figure 10: Contributions to the 12-month growth rates for the all-households HCI

UK, January 2006 to December 2016

### Figure 10: Contributions to the 12-month growth rates for the all-households HCI

UK, January 2006 to December 2016



Source: Office for National Statistics

#### Notes:

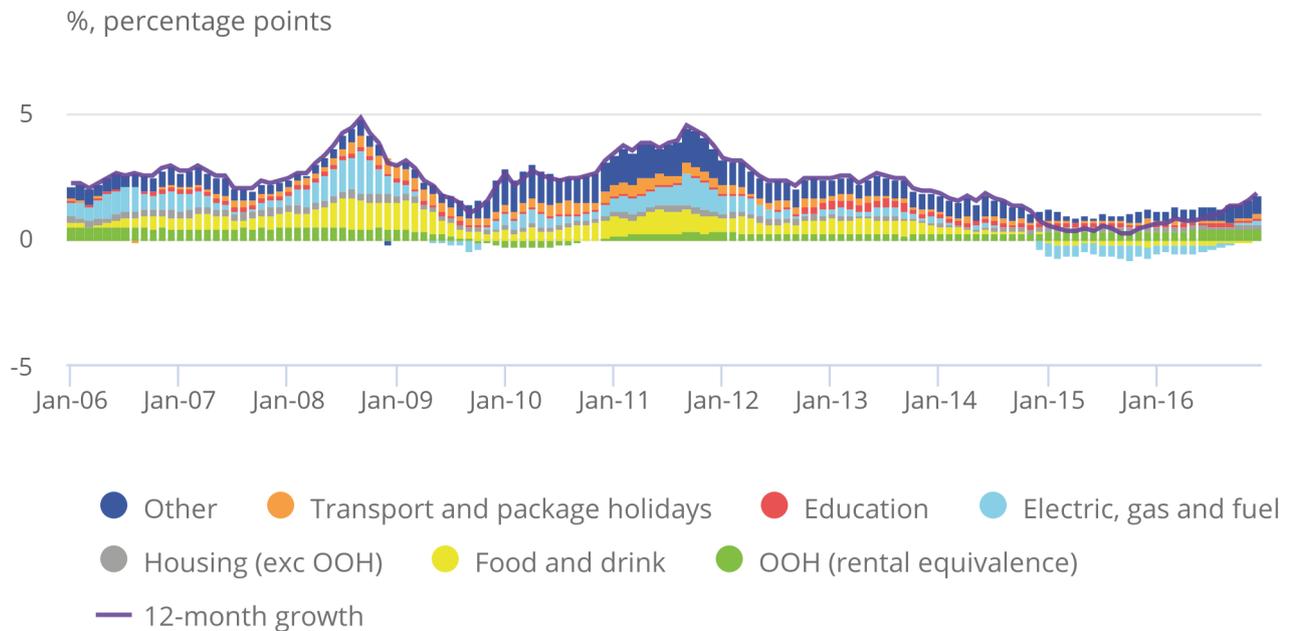
1. Stacked bars reflect the percentage point contributions of each of the 87 class-level items to the 12-month growth rate, or the difference in 12-month growth rates. The contribution of each of the 87 class-level items is estimated separately, before being aggregated to 7 distinct categories.
2. A reduction in the contribution of series to the annual rate of change need not imply falling prices, but could also reflect a lower rate of increase than the previous year.
3. "Food & Drink" is composed of food, non-alcoholic and alcoholic beverages and tobacco. "Housing (exc. OOH)" is composed of actual rents and products and services for the repair of dwellings. "OOH (payments)" reflects the class level contribution from the payments approach to measuring owner occupiers' housing costs (OOH). "Elect., gas and fuel" is composed of electricity, gas and other household fuels as well as fuels and lubricants for motor vehicles. "Transport and package holidays" includes passenger transport by road, rail, air and sea, as well as package holidays. "Education" reflects the division-level contribution. The "other" category reflects the combined contributions of the remaining class-level items, bringing the sum of contributions to the inflation rate.
4. Contributions may not sum due to rounding.

## Figure 11: Contributions to the 12-month growth rates for the all-households CPIH

UK, January 2006 to December 2016

### Figure 11: Contributions to the 12-month growth rates for the all-households CPIH

UK, January 2006 to December 2016



Source: Office for National Statistics

#### Notes:

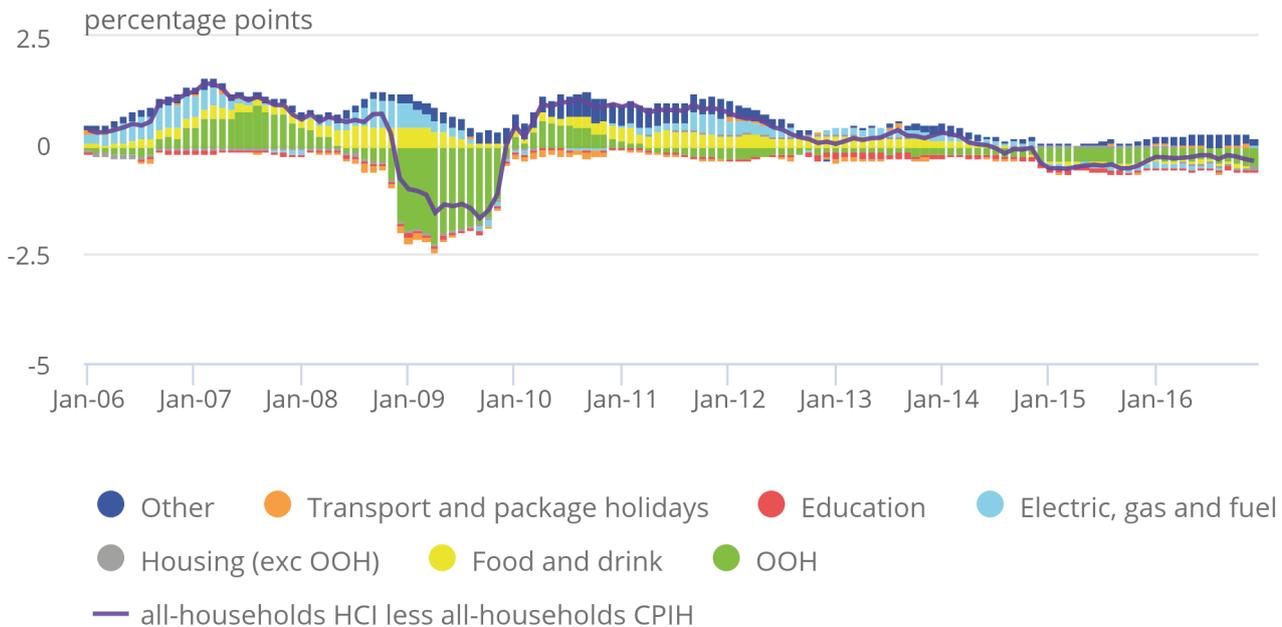
1. Stacked bars reflect the percentage point contributions of each of the 87 class-level items to the 12-month growth rate, or the difference in 12-month growth rates. The contribution of each of the 87 class-level items is estimated separately, before being aggregated to 7 distinct categories.
2. A reduction in the contribution of series to the annual rate of change need not imply falling prices, but could also reflect a lower rate of increase than the previous year.
3. "Food & Drink" is composed of food, non-alcoholic and alcoholic beverages and tobacco. "Housing (exc. OOH)" is composed of actual rents and products and services for the repair of dwellings. "OOH (rental equivalence)" reflects the class level contribution from the rental equivalence approach to measuring owner occupiers' housing costs (OOH). "Elect., gas and fuel" is composed of electricity, gas and other household fuels as well as fuels and lubricants for motor vehicles. "Transport and package holidays" includes passenger transport by road, rail, air and sea, as well as package holidays. "Education" reflects the division-level contribution. The "other" category reflects the combined contributions of the remaining class-level items, bringing the sum of contributions to the inflation rate.
4. Contributions may not sum due to rounding.

**Figure 12: Difference in contributions to the 12-month growth rates between the all-households HCI and the all-households CPIH**

UK, January 2006 to December 2016

Figure 12: Difference in contributions to the 12-month growth rates between the all-households HCI and the all-households CPIH

UK, January 2006 to December 2016



Source: Office for National Statistics

Notes:

1. Stacked bars reflect the percentage point contributions of each of the 87 class-level items to the 12-month growth rate, or the difference in 12-month growth rates. The contribution of each of the 87 class-level items is estimated separately, before being aggregated to 7 distinct categories.
2. A reduction in the contribution of series to the annual rate of change need not imply falling prices, but could also reflect a lower rate of increase than the previous year.
3. "Food & Drink" is composed of food, non-alcoholic and alcoholic beverages and tobacco. "Housing" is composed of actual rents and products and services for the repair of dwellings. "OOH" reflects the class level contribution from owner occupiers' housing costs (OOH). "Elect., gas and fuel" is composed of electricity, gas and other household fuels as well as fuels and lubricants for motor vehicles. "Transport and package holidays" includes passenger transport by road, rail, air and sea, as well as package holidays. "Education" reflects the division-level contribution. The "other" category reflects the combined contributions of the remaining class-level items, bringing the sum of contributions to the inflation rate.
4. Contributions may not sum due to rounding.

Between 2006 and 2011, OOH (payments) contributes significantly to the volatility in the all households HCI index, which reflects patterns in the mortgage interest rates over that period of time. Meanwhile, OOH contributes steadily to the growth in all-households CPIH index, except in 2010 when there was a slight downward pull from this component. Between 2014 and 2016, all-households CPIH index has continued to see an upward push from OOH, while OOH in the all-households HCI index contributes a negligible amount. This results in considerably weaker growth in the all-households HCI index than the all-households CPIH index during this time period.

Because of the methodology used to calculate HCIs, and because of the use of democratic weighting, categories of spending on items such as food and drink, and electricity, gas and fuel receive a greater weight in the all-households HCI index than in all-households CPIH index. While in periods prior to 2014 this contributed towards the stronger growth seen in the all-households index, in periods where prices are stable or falling (for example, since 2014), these also contribute to the all-households CPIH index showing stronger growth.

Another difference in the contributions to the 12-month growth rate between the all-households CPIH and the all-households HCI is seen in the “other” category. The three insurance categories sit within this categorisation and the growth in insurance prices is the main driver behind the difference in the 12-month growth rate from this category of spending.

## 9 . Annex A: Questionnaire

We have provided the following questions as a guideline for responses to this article, but any additional comments or observations will also be appreciated.

Please ensure you include your name or organisation in your response and submit it by email to [cpi@ons.gsi.gov.uk](mailto:cpi@ons.gsi.gov.uk) or in writing to FAO Helen Sands, Prices Division, Office for National Statistics, Cardiff Road, Newport, NP10 8XG by Friday 23 February 2018. This will help guide our future work programme for 2018 and beyond.

1. What is your name or organisation?
2. What is your interest in the Household Costs Indices (HCIs)? (for example: personal interest, analytical interest, business need)
3. Is there a specific purpose that you would wish to use the HCIs for? If so, what?
4. Would you consider the HCIs as presented in this article and in the [preliminary estimates of the HCIs](#) suitable to meet this purpose?
5. If the HCIs presented are not suitable to meet this purpose, how can we improve the HCIs so that they do meet this purpose?
6. A number of suggestions have been put forward as to how the HCIs should differ from the CPIH (see section 4 of [developing the Household Costs Indices](#)). Which of these proposals do you think are most important to consider when producing HCIs?
7. A number of limitations around the current methodologies are presented in this article. Do you think our focus for 2018 should be on:
  - a) improving the current estimates which use the methodologies discussed in this article
  - b) expanding the scope of the HCIs
  - c) other (please specify)
8. What do you think our longer term objectives for developing the HCIs should be?
9. A number of different household groups are presented for the [preliminary estimates of the HCIs](#). Are there any other household groups that you would like to see published?
10. Do you have any further comments or suggestions?

## 10 . Annex B: Formulae for calculating plutocratic and democratic weights

In producing a democratically-weighted index, each household receives an “equal weight”, regardless of their level of expenditure. The index therefore becomes:

$$I_{Demo}^{0,t} = \sum_h \frac{1}{n} \cdot I_h^{0,t}$$

where :

$n$  is the number of households

$I_h^{0,t}$  is the index value for period  $t$ , based in period 0 for household  $h$

To explore this further we consider the following alternative formation. Consider a household's budget share  $s$  on item  $i$ :

$$s_{h,i} = \frac{e_{h,i}}{\sum_i e_{h,i}}$$

where :

$e_{h,i}$  is the expenditure on item  $i$  for household  $h$

The democratic weight for item  $i$  is therefore equal to the arithmetic mean of the households' budget shares for item  $i$ :

$$W_{Demo,i} = \frac{1}{n} \sum_h s_{h,i}$$

With plutocratic weighting, each household budget share is weighted by their household expenditure as a proportion of total whole-economy household expenditure  $E$ , where:

$$E = \sum_h e_h$$

The plutocratic weight for item  $i$  is therefore equal to:

$$W_{Plut,i} = \frac{1}{E} \sum_h e_h s_{h,i} = \frac{1}{E} \sum_h e_{h,i} = \frac{E_i}{E}$$

where :

$E_i$  represents the expenditure of all households on good  $i$

## 11 . Acknowledgements

This work has benefitted from the input of a range of ONS experts including, but not limited to, Ruth Donovan, Arturas Eidukas, Tanya Flower, Philip Gooding, Chris Jenkins, Gemma Keane, Andrea Lacey, Chris Payne, Andreas Soteriades and James Tucker. We also acknowledge the useful advice provided by external experts on the Advisory Panels on Consumer Prices (Technical and Stakeholder). In particular we are grateful to John Astin and Jill Leyland for their continued support towards the development of this work.