



HM Treasury



UK Statistics  
Authority

# A Consultation on the Reform to Retail Prices Index Methodology

11 March 2020

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# General information

## Consultation details

**Issued:** 11/03/2020

**Respond by:** 23:59pm on 21/08/2020

### Enquiries to:

RPIConsultation@hmtreasury.gov.uk

## Summary of consultation questions

1. Do you agree that this proposed approach is statistically rigorous?
2. What will be the impact on the interests of holders of 'relevant' index-linked gilts (i.e. 2½% IL 2020, 2½% IL 2024 and 4 1/8% IL 2030) of addressing the shortcomings of the RPI in a) 2025 b) 2030 or c) any year in between?
3. What will be the impact on the interests of holders of all other index-linked gilts of addressing the shortcomings of the RPI in a) 2025 b) 2030 or c) any year in between?
4. What will be the impact on the index-linked gilt market or those dependent on it of addressing the shortcomings of the RPI in a) 2025 b) 2030 or c) any year in between?
5. What other impacts might the proposed changes to address the shortcomings of the RPI have in areas or contracts where the RPI is used?
6. Are there any other issues relevant to the proposal the Authority is minded to make of which the Authority or the Chancellor ought to be aware?
7. Which lower level or supplementary RPI indices are currently used, and what are they used for?
8. What guidance would users of lower level or supplementary RPI indices find most useful for the ONS to provide?

### Territorial extent:

This consultation relates to statistics for the United Kingdom.

### After the consultation

We will publish a summary of the comments in due course after the consultation closes.

## How to respond

We encourage you to respond on the e-Consultation platform when submitting responses.

However, responses in writing or via email submitted to the addresses below will also be accepted. Should you wish to submit your main response via the e-Consultation platform and any supporting information via hard copy or email, please be clear that this is part of the same consultation response.

**To respond to the consultation go to:**

<https://consultations.ons.gov.uk/rpi/2020>

or

**For other enquiries, or for responses which cannot be submitted to the e-Consultation platform, please email:**

RPIConsultation@hmtreasury.gov.uk

Please note that responses to this email address will be shared with the UK Statistics Authority.

or

**Write to:**

RPI Consultation Team  
HM Treasury  
1 Horse Guards Road  
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RPI Consultation Team  
Room 2.001  
Office for National Statistics  
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Newport NP10 8XG

Please note that we will be sharing written responses between each other as appropriate, unless you request us not to do so.

When responding, please state whether you are responding as an individual or representing the views of an organisation. Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

## Accessibility

All material relating to this consultation can be provided in braille, large print or audio formats on request. British Sign Language interpreters can also be requested for any supporting events.

## Confidentiality and data protection

This consultation is being run jointly by the UK Statistics Authority (the Authority) and HM Treasury, and your responses will be seen and held by both organisations. We would like to know as much as possible about what you think of our proposals.

We aim to be as open and transparent as possible, so all responses to this consultation will be published. By default, this will include your name and the name of your organisation, but you can ask us not to publish your name. Responses will be moderated before publication to identify and remove any offensive, hateful, inappropriate, commercially sensitive or market sensitive content.

For full details of how we will handle your data, please see [the Authority privacy notice](#) and the [HM Treasury privacy notice](#). Please note, the Authority and HM Treasury may contact you in future to discuss your response to this consultation.

Please indicate in your response if you do not want your name to be published when we respond to this consultation. Please note, the Authority and HM Treasury are subject to the Freedom of Information Act, so we cannot guarantee names won't be published under any circumstances. However, we will do everything possible to respect your wishes.

# 1. Overview

1. The Retail Prices Index (RPI) is the oldest measure of inflation in the UK and is used widely across the economy and in financial contracts. However, it has a number of shortcomings meaning that it has at times greatly overestimated, and at other times underestimated, the rate of inflation.
2. The UK Statistics Authority (the Authority) is independent from government and responsible for official statistics on inflation measures in the UK. But, in certain circumstances, changes to the RPI require the consent of the Chancellor of the Exchequer before they can be implemented. The circumstances giving rise to this requirement to seek the Chancellor's consent expire in 2030.
3. In March 2019, the Authority made a recommendation to the then Chancellor to address all of the shortcomings of the RPI. The then Chancellor stated that he was unable to consent to the introduction of the change proposed based on the available information at the time. Instead, the then Chancellor announced in September 2019 that he would consult publicly on whether this change should be made at a date other than 2030, and if so when between 2025 and 2030.
4. The Authority has a proposed technical approach that they intend to take to transition between the current and new methods and data sources of RPI. As part of this consultation, the Authority is seeking responses on their proposed approach in Section 4 of this document.
5. In making its recommendation to the Chancellor, the Authority did not expressly identify when its proposal would be implemented – a factor which is relevant both to whether the Chancellor's consent is required and to the Chancellor's decision on whether to consent. The Chancellor's limited role in changes to the measurement of the RPI stem from its use as the reference rate for certain index-linked gilts. The framework for this role is set out in legislation.
6. As a result, the Chancellor's decision on consent may only consider factors related to the government's issues of index-linked gilts. Therefore, the Chancellor is seeking responses on the potential impact of the Authority's proposal on the holders of index-linked gilts and potential broader impacts on the index-linked gilt market in Section 5. Specifically,

Section 5 seeks views on whether the Authority’s proposal should be made for a date other than 2030 and, if so, when between 2025 and 2030.

7. The Authority and the government are also mindful that they do not have full sight of the use of the RPI in the economy and financial contracts, and that the change to the RPI could have unintended and diverse impacts. The Authority is also aware that its intended method of implementing its proposal to address the shortcomings of the RPI will make publishing sub-indices of the RPI no longer feasible. These factors are unlikely to be relevant to any decision that the Authority is minded to make as regards addressing the shortcomings of the RPI or that may fall to the Chancellor under legislation. But this consultation welcomes evidence on the use of the RPI and its sub-indices more widely to inform future policy decisions. Section 6 sets out how and why the Authority and government are seeking evidence on these broader issues, which are likely to be outside of scope of the potential decisions by the Authority and the Chancellor referred to in other sections of this document.

## 2. Background

### 2.1 The landscape of inflation measures

8. The Office for National Statistics (ONS) carries out the collection, production and dissemination of official statistics in its role as the executive office of the independent Authority. It is the largest producer of official statistics in the UK. It publishes three main measures of inflation: the Consumer Prices Index including owner occupiers’ housing costs (CPIH)<sup>1</sup>, the Consumer Prices Index (CPI), and the RPI.<sup>2</sup> They use different data sources and methodologies, have different coverage and produce different estimates of the rate of inflation.
9. The government, though a key user of ONS statistics, does not interfere in the independent Authority’s judgement on statistics. This is an important principle in the UK statistical system, which seeks to maintain public trust in the broader macroeconomic framework.

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<sup>1</sup> The CPIH is identical to CPI, in line with international best practice, with the additional inclusion of a measure of owner occupiers’ housing costs (OOH). These are the costs associated with owning, maintaining and living in one’s home. They represent a large proportion of consumption expenditure and are an important addition to the basket of goods and services.

<sup>2</sup> The ONS is also developing Household Cost Indices as announced by the National Statistician. See: <https://www.ons.gov.uk/news/statementsandletters/nationalstatisticiansstatementonthefutureofthehouseholdcostsindices>

10. The RPI was formally introduced in 1956, and, as such, is the oldest measure of inflation still published by the ONS. But it has significant shortcomings, including in: the index formulae it uses to aggregate some price changes, the treatment of housing costs, population coverage, weights, classification, and geographic coverage<sup>3</sup>.
11. Reflecting the problems with its construction, the RPI lost its National Statistic status in 2013.<sup>45</sup> At this time, the Authority judged that the RPI did not comply with the *Code of Practice for Statistics*<sup>6</sup> (the Code).

This view was based primarily on:

- the finding that the methods used to produce the RPI (notably the use of the Carli<sup>7</sup> index formula) did not meet current international statistical standards<sup>8</sup>, and;
  - the decision in 2013 effectively to freeze the methods used to produce the RPI, and only to consider ‘routine’ changes, was inconsistent with the requirement in the Code to seek to achieve continuous improvement.
12. Accordingly, the National Statistician<sup>9</sup> has discouraged the use of the RPI, deeming it “a very poor measure of general inflation, at times greatly overestimating and at other times underestimating changes in prices and how these changes are experienced.” However, it remains widely used in

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<sup>3</sup> Office for National Statistics, ‘Shortcomings of the Retail Prices Index as a measure of inflation’, March 2018. See:

<https://www.ons.gov.uk/economy/inflationandpriceindices/articles/shortcomingsoftheretailpricesindexasameasureofinflation/2018-03-08>

<sup>4</sup> See UK Statistics Authority, ‘Assessment of compliance with the Code of Practice for Official Statistics: The Retail Price Index’, March 2013. See: <https://www.statisticsauthority.gov.uk/news/retail-prices-index/>

<sup>5</sup> The Office for Statistics Regulation, the regulatory arm of the Authority, assesses official statistics and publishes reports of compliance with the principles and practices of the Code of Practice for Statistics. Official statistics assessed as fully compliant with the Code are designated as National Statistics.

<sup>6</sup> This assessment was based on a previous version of the Code. That said, the RPI does not comply with the latest version of the Code of Practice, which can be found here: <https://www.statisticsauthority.gov.uk/code-of-practice/the-code/>

<sup>7</sup> The Carli index formula is used at the lowest stage of aggregation where expenditure weights are unavailable, and is defined as the arithmetic mean of price changes. For more information please refer to the Consumer Price Indices Technical Manual:

<https://www.ons.gov.uk/economy/inflationandpriceindices/methodologies/consumerpricesindicestechmanua2019>

<sup>8</sup> For more information on the drawbacks of the Carli formula, please refer to the article ‘Shortcomings of the Retail Prices Index as a measure of inflation:

<https://www.ons.gov.uk/economy/inflationandpriceindices/articles/shortcomingsoftheretailpricesindexasameasureofinflation/2018-03-08>

<sup>9</sup> The National Statistician is the principal adviser to the UK Statistics Authority (UKSA) and government on official statistics. See: <https://www.statisticsauthority.gov.uk/about-the-authority/meet-the-board/about-the-national-statistician/>

the economy, both in the private and public sector. The government has reduced its use of the RPI over time, but continues to use the RPI in a number of areas.

13. One major use of the RPI by government is in its issuance of index-linked gilts which use the RPI to adjust their coupon payments and in the repayment of the principal. There is substantial demand from defined benefit pension funds seeking to match RPI-linked liabilities, and from other investors seeking to match other indexed liabilities. The longest-dated outstanding index-linked gilt extends out to 2068.
14. The CPI was introduced in 1997, and has been a National Statistic since the introduction of the Code. The CPI does not suffer from the same shortcomings as the RPI and in 2003, the government set the CPI as the basis for the Bank of England's inflation target.
15. However, the CPI does not include a measure of owner-occupiers' housing costs, that is, the cost of living in and maintaining one's own home. The ONS introduced the CPIH in 2013 to address this. After the need for improvements to the methodology for owner-occupiers' housing costs was identified, the CPIH lost its National Statistic status in 2014. Following an extensive period of methodological development, scrutiny and challenge, the CPIH regained its National Statistic status in July 2017. It has been the ONS's lead measure of inflation since March 2017.
16. Since 2010, the measured rate of RPI annual inflation has been on average one percentage point per annum above the CPIH. The effect of the different formulae that the RPI uses accounts for around 0.7 percentage points of this difference. This can predominantly be attributed to clothing prices, which account for 0.4 percentage points of the formula effect since 2010.<sup>10</sup> A fuller explanation of the 'wedge' between the RPI and the CPIH can be found in Annex A.

## **2.2 The institutional and legislative framework**

17. The Statistics and Registration Service Act 2007 (the Act) established the Authority as an independent body, which operates at arm's length from government, and reports directly to the UK Parliament, the Scottish Parliament, the National Assembly for Wales, and the Northern Ireland Assembly. The Authority has the statutory duty to promote and safeguard the production and publication of official statistics that serve the public

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<sup>10</sup> Prior to 2010, the average formula effect from clothing prices was 0.15 percentage points, this increased to 0.4 percentage points from 2010 onwards following changes to the way that clothing prices were collected.

good. The Authority is responsible for official statistics and National Statistics in the UK, with the ONS as its executive office responsible for the statistical production of official and National Statistics on UK consumer price inflation.

18. The Act requires the Authority to compile and maintain the RPI, which is calculated and published by the ONS. A purpose of this requirement was to acknowledge the use of the RPI in specific index-linked gilts. In compiling and maintaining the RPI, the Authority is principally concerned with statistical methodology and best practice.
19. Section 21 of the Act sets out the process by which changes to the RPI should be implemented. It states that before making any change to the coverage or the basic calculation of the RPI, the Authority must consult the Bank of England. The Bank of England must judge whether the change constitutes a “fundamental” change in the index that would be “materially detrimental” to the interests of the holders of relevant index-linked gilt-edged securities. It also includes provision for a role for the Chancellor if there are such changes to the RPI during the remaining life of the ‘relevant gilts’.<sup>11</sup> Specifically, if the Bank of England judges the proposed change meets both of these conditions, section 21 states that the Authority may not make the change without the consent of the Chancellor.
20. Such ‘relevant gilts’ were issued by the government until 2002. The terms of these gilts require a redemption offer to be made in the event of any changes to the coverage or basic calculation of the RPI that the Bank of England judges to constitute a “fundamental change” in the RPI that would be “materially detrimental” to the interests of the holders of these specific gilts. If triggered, these clauses require HM Treasury to offer redemption to the holders of the relevant gilts at their inflation-uplifted par value.
21. More broadly, all government-issued index-linked gilts use the RPI as their reference rate. In the financial year 2019-20, the Debt Management Office financing remit included a plan to sell £22.6bn index-linked gilts. Issuing index-linked gilts has proven to be a cost-effective approach to raising debt, alongside conventional gilts, owing in part to the substantial

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<sup>11</sup> ‘Relevant gilts’ refers to index-linked gilts issued before 2002, which are subject to a provision in their prospectuses relating to early redemption offers in the event of certain changes to the RPI. There are three remaining gilts with this provision, which redeem in April 2020, July 2024 and July 2030. There are no plans to issue any more gilts with this clause.

demand from pension fund managers to match RPI-linked liabilities stemming from defined-benefit pension funds.

22. In the instance where requests for redemption are made, the government would be required to raise finance, via the issuance of new debt, to repay the holdings, in addition to its existing financing programme. Dependent on when the change is made, and on prevailing market conditions, the government would need to consider the differing impacts of financing such redemptions on the public finances and on the wider gilt market. Disruption to the gilt market impedes the government's ability to finance itself in a smooth, cost-effective and predictable manner.
23. Section 21 of the Act was drafted with reference to this specific use of the RPI in index-linked gilt contracts, and, in turn, the important use of index-linked gilts as part of the government's overall debt management strategy. Changes which impact on the government's debt management strategy can have substantial impacts on the public finances. As such, this limited and specific role for the Chancellor was incorporated into the Act, while seeking to uphold the principle established in the Act that the Authority's judgement on statistics should be independent of government.
24. The Chancellor's role in the process is shaped by the scope of section 21, meaning that the Chancellor may only consider factors related to index-linked gilts – as set out in Section 5 of this document.

## **2.3 The path to a recommendation**

25. In 2012, the then National Statistician ran a consultation on several options for changes to how the RPI is calculated.<sup>12</sup> This was primarily in response to concerns at the widening wedge between the RPI and the CPI which had been driven by the change in the collection of clothing prices in 2010. Following the consultation, the then National Statistician concluded that the formula used to produce the RPI “does not meet international standards”. Despite this, the then National Statistician stated that there was “significant value to users” of the RPI remaining unchanged.

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<sup>12</sup> National Statistician's consultation on options for improving the Retail Prices Index. Archived at: <https://webarchive.nationalarchives.gov.uk/20160108013321/http://www.ons.gov.uk/ons/about-ons/get-involved/consultations-and-user-surveys/archived-consultations/2012/national-statistician-s-consultation-on-options-for-improving-the-retail-prices-index/index.html>

26. In 2015, the independent Review of UK Consumer Price Statistics, led by Paul Johnson (the Johnson Review), concluded that the RPI “should be considered a legacy measure to be used only where contractually required”. The Johnson Review also stated that “no further changes should be made to the RPI”, and “over the long term the Authority should look to phase out production of the RPI in consultation with users.”<sup>13</sup> The Johnson Review also argued that the ONS and the Authority should “restate its position that RPI is a flawed statistical measure of inflation”. The ONS and the Authority accepted these recommendations.
27. The Johnson Review also concluded that the CPIH “provides a good estimate of price changes across the economy” and “should be the main headline index produced by ONS.” The Johnson Review stated that producing the CPI and the CPIH to the best possible statistical standard should be “the first priority.”
28. The response of the Authority and the ONS to the Johnson Review can be found in a letter between the then National Statistician and the then Chair of the Authority in March 2016<sup>14</sup>, and a subsequent statement by the then National Statistician in November 2016.<sup>15</sup>
29. At Budget 2018, the government set out its objectives on the use of inflation statistics. It noted that the CPIH was conceptually the best measure of inflation and that its objective is that the CPIH will become its headline measure over time. Reflecting that it remains a relatively new measure, the government noted work is ongoing to understand its properties relative to other price measures. The government also stated that it will continue to reduce the use of the RPI when and where practicable. It committed to not introducing new uses of the RPI. Further, it noted any change will require an orderly transition, probably over an extended period of time.
30. In June 2018, the House of Lords Economic Affairs Committee (EAC) launched an inquiry into the use of the RPI. Its report Measuring Inflation, made several recommendations to the government and the Authority, including that the Authority should ‘fix’ the measurement of clothing prices

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<sup>13</sup> Paul Johnson, ‘UK Consumer Price Statistics: A Review’, January 2015. See: <https://www.statisticsauthority.gov.uk/reports-and-correspondence/reviews/uk-consumer-price-statistics-a-review/>

<sup>14</sup> The letter can be found here: <https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/03/Letter-from-John-Pullinger-to-Sir-Andrew-Dilnot-090316.pdf>

<sup>15</sup> The statement can be found here: <https://www.ons.gov.uk/news/statementsandletters/statementonfutureofconsumerpriceinflationstatisticsintheuk>

and that the Chancellor should consent to the change if the Authority proposed it. By not acting to ‘fix’ the RPI, the EAC argued that the Authority could be seen to be failing in its statutory duty to promote and safeguard the quality of official statistics.<sup>16</sup>

31. The EAC report referenced the work of the Advisory Panels for Consumer Prices.<sup>17</sup> On 19 February 2019, Dame Kate Barker, as Chair of the Advisory Panel on Consumer Prices (Stakeholder) wrote to the then National Statistician, detailing the views of the Panel on the EAC’s recommendations.<sup>18</sup>

## 2.4 The recommendation

32. The meeting of the Authority Board in January 2019 requested the formal advice of the National Statistician on the future of the RPI. This advice was considered by the Board at its meeting in February 2019. The Board developed two recommendations:

- a) That the publication of the RPI should cease, and;
- b) in the interim, the shortcomings of the RPI should be addressed by bringing the methods and data sources of CPIH into it.<sup>19</sup>

The second proposal recognised that the abolition of the RPI would require primary legislation, the legislative route would take time, and there would be substantial implementation issues that the government would need to consider.

33. Prior to making its recommendation to the Chancellor, the Authority sought the necessary assessment from the Bank of England. On 4 March 2019, the Bank of England confirmed that the second proposal, if implemented imminently, would require the Chancellor’s consent.

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<sup>16</sup> Economic Affairs Committee, ‘Measuring Inflation’, January 2019. See: <https://www.parliament.uk/the-use-of-rpi>

<sup>17</sup> There are two Advisory Panels for Consumer Price statistics: A Technical panel, to provide the National Statistician with advice on technical aspects of the statistics, and a Stakeholder Panel, to advise the National Statistician on uses and applications of the statistics. Members of the Technical Panel are appointed based on their technical expertise (see: <https://www.statisticsauthority.gov.uk/about-the-authority/committees/advisory-panels-for-consumer-price-statistics/technical/>) whereas members of the Stakeholder Panel are appointed based on their affiliation to a particular organisation (see: <https://www.statisticsauthority.gov.uk/about-the-authority/committees/advisory-panels-for-consumer-price-statistics/stakeholder/>)

<sup>18</sup> See: <https://www.statisticsauthority.gov.uk/about-the-authority/committees/advisory-panels-for-consumer-price-statistics/stakeholder/>

<sup>19</sup> A full description of the National Statistician’s advice to the Authority Board can be found at <https://www.statisticsauthority.gov.uk/correspondence/national-statisticians-advice-to-the-uk-statistics-authority-board-on-the-retail-prices-index/>.

## 2.5 The then Chancellor's initial response

34. In his letter to Sir David Norgrove (Chair of the Authority Board) on 4 September 2019, the then Chancellor stated that he was not minded to promote legislation that would remove the requirement for the Authority to produce and publish the RPI.
35. On the Authority's second proposal, the then Chancellor set out that he could "see the statistical arguments for the Authority's proposed approach to addressing the shortcomings of RPI." He said that the "continued publication of a widely used, but flawed statistic could be seen to undermine the integrity and credibility of the UK statistical system." Further, he stated that the Authority's proposal to address the shortcomings in the RPI would ensure existing uses would automatically be based on a more robust methodology and that addressing the shortcomings in the RPI in this way "may be a more efficient approach than continuing to ask users to stop using it and rewriting existing contracts."
36. However, the then Chancellor did not consent to the introduction of the proposed change before 2025, on the basis that he did not have full information about the widespread use of the RPI, and the impact of any change. Instead, the then Chancellor agreed to undertake a joint consultation with the Authority to determine whether the proposal should be implemented at a date other than 2030, and if so, when between 2025 and 2030. The last 'relevant' gilt expires in 2030, after which section 21 provides no role for the Chancellor in the process for changes to the RPI.
37. In making its recommendation to address the shortcomings in the RPI, the Authority had not settled on an approach to transition between the current and new methods and data sources of the RPI. Therefore, the Authority confirmed that the consultation would also seek views on the technical approach to implementing its proposal.
38. There are two key elements of the Authority's proposal (which it remains minded, subject to the requirements of section 21, to implement) which have yet to be established and are now being consulted on. These are:
  - a) The technical approach the Authority will take to bring robust methods and data sources (the methods and data sources of the National Statistic, the CPIH) into the RPI, and;

b) a specific date at which the Authority's proposal would be implemented and the impacts of that which may be relevant to any decision the Chancellor has to make under section 21 of the Act.

39. This consultation addresses those issues in the proposal that the Authority is minded to implement.
40. Beyond gilts, the RPI is used widely in the economy. The impacts on these wider uses from the Authority's proposal being implemented are likely to fall outside the factors the Chancellor can consider in his decision under section 21 of the Act. For instance, the RPI is used to uprate some taxes and benefits; to determine changes in rail fares, reflecting industry costs; and to determine the rate of interest on student loans. In the private sector, the RPI is used in some wage agreements; to uprate certain pension payments, particularly defined benefit pensions; in calculating rent increases for some leasehold properties; and in financial markets. The government welcomes information on the potential wider impacts from the Authority's proposal.
41. Finally, there are a range of supplementary indices produced by the ONS that are based on the RPI. They are not cited in the Act and therefore the Authority and the ONS do not require the Chancellor's consent to make any changes to them. These supplementary indices are based on the lower level item indices that are aggregated to produce the RPI. These are discussed further in Section 6 of this document.

### 3. How the RPI will change

42. The Authority is required by the Act to compile and maintain the RPI, and publish it every month. The government's position remains that it has no plans to promote legislation that would remove this requirement.
43. The Authority remains minded to address the shortcomings of the RPI by bringing the methods and data sources from the National Statistic, the CPIH, into the RPI. In practice this means that, from the implementation date, the RPI index values will be calculated using the same methods and data sources as are used for the CPIH. Monthly and annual growth rates will then be calculated directly from the new index values.
44. Monthly growth rates will be identical to CPIH monthly growth rates from the outset; however, annual growth rates will differ from CPIH annual growth rates for a further year. This difference is simply an artefact of the way that annual growth rates are defined. Comparisons are made relative to the index in the same month of the previous year. Therefore both the current month and the same month in the previous year need to be on the same methodological basis to yield the same annual growth rates as the CPIH. For the transition period there is no reason why RPI annual growth rates should be higher (or indeed lower) than CPIH annual growth rates. A worked example of how the change would be made is provided in Box 1, and a mathematical description of the change is provided in Annex B. Once fully implemented, the annual and monthly growth in the CPIH and the RPI will be equal.
45. The RPI and the CPIH will continue to be calculated separately on an ongoing basis, and will be published as separate indices and growth rates in the Consumer Price Inflation, UK Statistical bulletin. Only an all-items RPI will continue to be published; supplementary indices and lower level detail will be discontinued, with guidance provided on the equivalent CPIH indices.
46. Based on recent experience, the introduction of the more robust data source and methods to the RPI would see its annual measured rate of inflation be lower, on average, by 1 percentage point per annum. However, that can vary over time as is indicated by a comparison between the RPI and the more robust CPIH, and can be positive or negative - for example around the 2008-09 economic downturn due to lower mortgage interest payments. A more detailed explanation of the differences between the RPI and the CPIH can be found in Annex A, while Table 5a

of the Consumer Price Inflation, UK statistical bulletin<sup>20</sup>, provides a breakdown of those differences since 2012.

47. The proposal would ensure users of the RPI were using a statistically robust measure of inflation by applying the more robust methods and data sources used for the National Statistic, the CPIH.
48. The Authority will continue to produce the CPIH and the CPI, but also continue to produce the RPI as a separate measure. This will ensure there is a consistent time series of all three measures.

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<sup>20</sup> <https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/consumerpriceinflation/previousReleases>

## **4. The technical approach to bringing CPIH methods and data sources into the RPI**

49. The Authority is seeking views on how to move from the current RPI and the new approach using the methods and data sources of the CPIH.
50. The ONS has discussed the approach for transitioning the RPI to the better methods and data sources with its Advisory Panel on Consumer Prices (Technical). A range of options was considered; however, the option proposed in this section was felt by the Panel to be the most statistically robust. Further information on the options also considered can be found in Annex C.
51. The standard statistical procedure for introducing a new methodology into an index series is through the use of a chain link. Put simply, the growth in the new series under the new methodology is applied to the long-run series based on the old methodology. This approach is widely used internationally for introducing new methods, new basket items, and new expenditure weights to ensure that the index reflects changing consumer preferences.
52. In the RPI such updates are made annually for the February index, published in March. The Authority therefore propose to use a chain link to introduce the methods and data sources of the CPIH, as the more robust statistic, into the RPI. This will be done with the February index of the implementation year in line with regular RPI updating procedures.
53. The RPI series includes index values, and monthly and annual growth rates – all of which have different uses. It is not possible to implement the Authority’s proposal across all three rates at the same time and achieve a consistent set of measures. This is because to calculate annual growth rates, index values are required for two years. During the first year of transition, the annual growth rate calculation will be based on the previous year’s RPI and the current year’s CPIH, making the annual growth rates for the newly calculated RPI and CPIH inconsistent.
54. A worked example of how the change would be made is provided in Box 1. A detailed technical description of how the change would be made is provided in Annex B.

## Box 1: Worked example of how CPIH methods and data sources will be introduced into the RPI

This worked example illustrates how addressing the shortcomings of the RPI using improved data sources and methods from CPIH practice would have been brought into the RPI had the change been implemented in February 2017.

### Notation

$RPI_{Index}(m y)$	The RPI index for month $m$ in year $y$ calculated on the current methodological basis
$RPI^*_{Index}(m y)$	The RPI index for month $m$ in year $y$ calculated using CPIH methods
$RPI^*_{1M-rate}(m y)$	The RPI 1-month growth rate for month $m$ of year $y$ , where the RPI index for month $m$ has been calculated using CPIH methods
$RPI^*_{12M-rate}(m y)$	The RPI 12-month (annual) growth rate for month $m$ of year $y$ , where the RPI index for month $m$ has been calculated using CPIH methods
$Agg_{Index}(m y)$	The unlinked aggregate index for month $m$ in year $y$ constructed from CPIH methods and data

The data in Table 1 are based on published data from the RPI and CPIH tables in 2016, 2017 and 2018. For ease of interpretation, figures are rounded to 1 decimal place. The orange highlighted cells in the table refer to RPI values that have been calculated using the CPIH methods and data sources. We refer to the RPI calculated in this way as RPI\* in the following discussion. The ‘unlinked aggregates’ in the table are calculated using CPIH methods and data. Unlinked aggregates are a basic component of long-run price index calculations. They are calculated by taking the expenditure weighted sum of lower-level indices over the recent short-run series. The long-run price index is then extended with the unlinked aggregate through a calculation known as chain linking.<sup>21</sup>

<sup>21</sup> For more information please refer to our Consumer Price Indices Technical Manual: <https://www.ons.gov.uk/economy/inflationandpriceindices/methodologies/consumerpricesindicestechmanual2019>

**Table 1: Published RPI and CPIH estimates**

	Feb 16		Jan 17	Feb 17		Feb 18
RPI index	260.0		265.5	267.1		273.6
RPI 1-m growth	...		...	0.6%		...
RPI 12-m growth	...		...	2.7%		2.4%
CPIH index	100.1	:	101.8	102.4	:	...
Unlinked aggregates (CPIH methods & data)	...	:	100.0	100.6	:	...
CPIH 1-m growth	...		...	0.6%		...
CPIH 12-m growth	...		...	2.3%		2.4%

For the index series we want to chain link the unlinked aggregates, which use CPIH methods and data sources, to the RPI from February 2017. This involves taking the growth in the unlinked aggregates between January and February 2017, and applying it to the January 2017 RPI index value. This is done as follows:

$$\begin{aligned}
 RPI_{Index}^*(Feb\ 17) &= RPI_{Index}(Jan\ 17) \times \frac{Agg_{Index}(Feb\ 17)}{Agg_{Index}(Jan\ 17)} \\
 &= 265.5 \times \frac{100.6}{100.0} \\
 &= 267.1.
 \end{aligned}$$

Users should note that, despite introducing CPIH methods and data sources into the RPI, the index values are different. This is because the two indices were at different levels to begin with. Should the RPI and CPIH both be rebased to the same date at some point in the future, then the two indexes would be identical from the implementation date. However, this is not possible, as it would result in the CPIH and the CPI having different reference years, due to the fact that the CPI reference period is specified by Eurostat.

However, the monthly growth in both series is exactly the same from the point of introduction.

Because of this the CPIH and RPI\* series will share the same monthly growth rates from the point of implementation:

$$\begin{aligned}
RPI_{12M-rate}^*(Feb\ 17) &= \left( \frac{RPI_{Index}^*(Feb\ 17)}{RPI_{Index}(Jan\ 17)} - 1 \right) \times 100\% \\
&= \left( \frac{267.1}{265.5} - 1 \right) \times 100\% \\
&= 0.6\%.
\end{aligned}$$

However, the annual growth rates will initially differ from the point of implementation:

$$\begin{aligned}
RPI_{12M-rate}^*(Feb\ 17) &= \left( \frac{RPI_{Index}^*(Feb\ 17)}{RPI_{Index}(Feb\ 16)} - 1 \right) \times 100\% \\
&= \left( \frac{267.1}{260.0} - 1 \right) \times 100\% \\
&= 2.7\%,
\end{aligned}$$

which is not the CPIH annual growth rate for February 2017. The reason the annual growth rates for the CPIH and the RPI\* (which is the RPI including the more robust methods and data sources of the National Statistic, the CPIH) differ is because they do not share the same denominator. The date from which CPIH and RPI\* annual growth rates will converge is January 2018, since January is the link month, and then February is the first date on which both the numerator and the denominator in the equation will be calculated on the basis of CPIH methods.

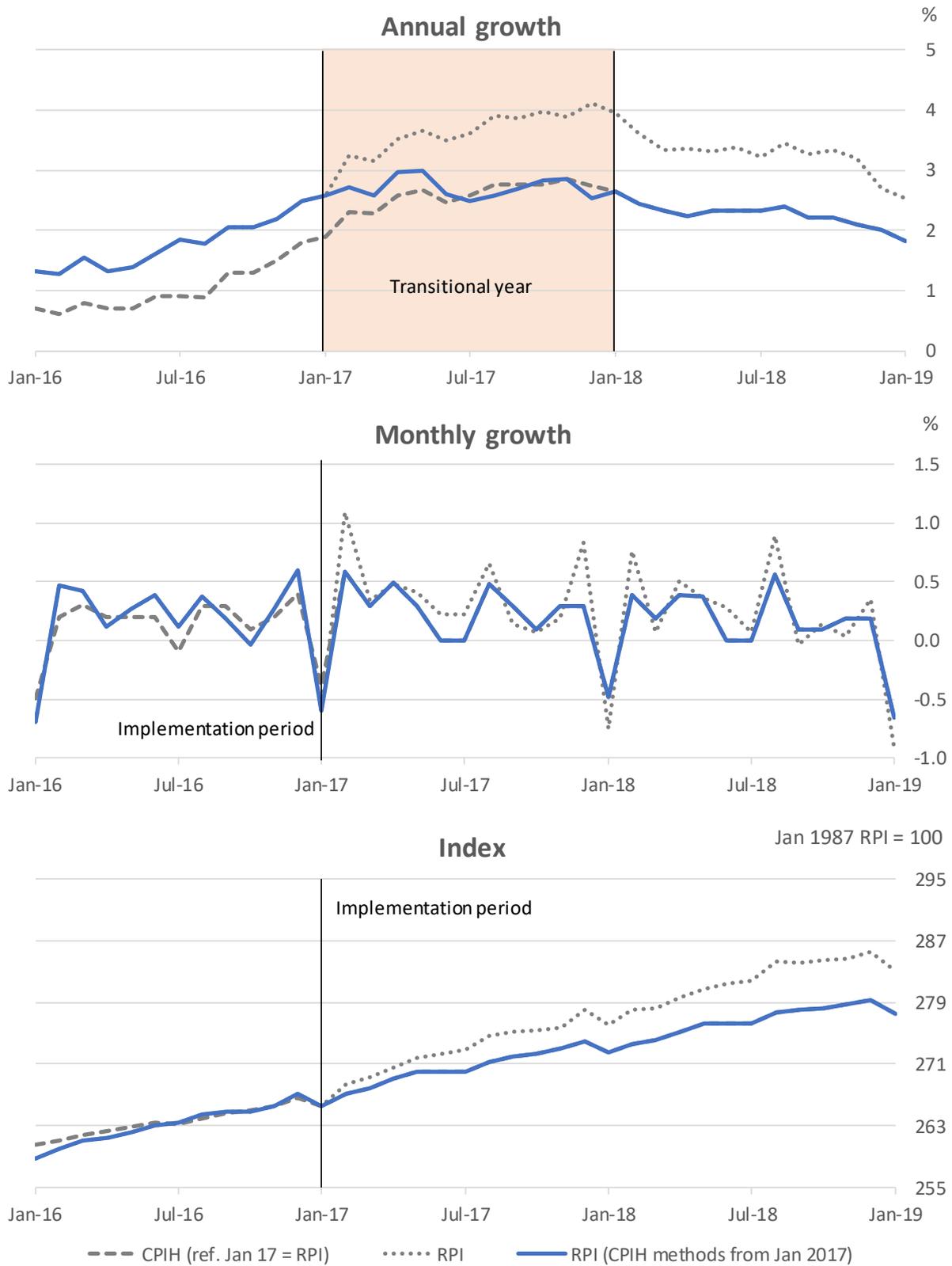
For example, for February 2018, and given a February 2018 RPI\* index value of 273.6 (calculated using the method described above), we derive the annual growth as:

$$\begin{aligned}
RPI_{12M-rate}^*(Feb\ 18) &= \left( \frac{RPI_{Index}^*(Feb\ 18)}{RPI_{Index}^*(Feb\ 17)} - 1 \right) \times 100\% \\
&= \left( \frac{273.6}{267.1} - 1 \right) \times 100\% \\
&= 2.4\%,
\end{aligned}$$

which is the same as the CPIH annual growth rate in Table 1.

Therefore, following the transition, monthly growth rates for the RPI and the CPIH will be the same, whereas annual growth rates will converge after the first year. Whilst the RPI and CPIH index values will not match, the growth in the two indexes will be identical from the implementation date. This is illustrated in Figure 1.

**Figure 1: Impact on a) 12-month % growth b) 1-month % growth and c) index values, 2017 implementation**



## Consultation question:

1. Do you agree that this proposed approach is statistically rigorous?

## 5. Establishing the timing for implementing the Authority's proposal

55. In Sir David Norgrove's letter to the then Chancellor on 4 March 2019, he outlined that timing was a matter open for discussion. The Authority has stated that the earliest this change could be made is February 2021. As the then Chancellor set out in his letter to Sir David Norgrove of 4 September 2019, he was unable to consent to the introduction of the Authority's proposed change any earlier than February 2025, based on the information he had available.
56. Though the Chancellor cannot dictate the date at which the Authority proposes to address the shortcomings in the RPI, he can indicate a date or range of dates at which he would consider, based on the scope of his role under section 21 of the Act, consenting to the proposal the Authority is minded to make.
57. The scope of section 21 of the Act indicates that the following factors are likely to be relevant to the Chancellor's decision under that section:
  - a) The impact of the Authority's proposed change to the RPI on the interests of the holders of the 'relevant' index-linked gilts
  - b) Any consequent impact of the Authority's proposed change on the interests of the holders of the wider stock of index-linked gilts and on the index-linked gilt market
  - c) Any consequent impacts on the public finances
  - d) The independence and integrity of the UK statistical system
  - e) The procedure which the Authority has followed in making its recommendation

This list of factors is not necessarily exhaustive, but appears to include the considerations most likely to be relevant to his decision under section 21.

58. As set out in Section 2 of this document, the direct impact of the Chancellor consenting to the Authority's proposal would be that HM Treasury may be required to offer to redeem outstanding 'relevant' index-linked gilts. This could increase the government's financing requirement and therefore represent a direct cost to the public finances. The scale of any increase in the government's financing requirement depends on when the change happens (which determines the amount of relevant gilts outstanding in the market) and the response of those holding relevant gilts (namely, whether they choose to take up the offer of redemption, which will largely be a function of the prevailing market conditions at the time).
59. On the other hand, a change to the methodology of the RPI that, on average, lowers its measured rate of inflation, would reduce the debt interest and principal that the government pays on the entire outstanding stock of index-linked gilts. This saving represents a benefit to the public finances, with the extent of this impact also being dependent on the timing for when the change happens. The net effect of these potential direct costs and benefits to the index-linked gilt market and public finances is uncertain and the consultation is therefore seeking information to understand this more clearly.
60. Beyond these impacts, there are several further effects of the Authority's proposal on the holders of index-linked gilts and the gilt market more broadly. For instance, as set out in Section 2 of this document, many – but not all – holders of index-linked gilts hold them to hedge RPI-linked liabilities. Therefore, a change to the methodology for the RPI will affect both the assets and liabilities of those holders of gilts. The net effect on these investors' balance sheets is uncertain in aggregate, and will also vary by individual investor. But these changes to investors' balance sheets may affect their future demand for gilts and wider spending and investment decisions, which in turn could impact on the public finances. The consultation is also therefore seeking information on the impact on those holders of index-linked gilts and these indirect effects on the gilt market.
61. Therefore, the consultation is seeking responses to the following questions:

### **Consultation questions:**

- 2. What will be the impact on the interests of holders of 'relevant' index-linked gilts (i.e. 2½% IL 2020, 2½% IL 2024 and 4 1/8% IL 2030)**

**of addressing the shortcomings of the RPI in a) 2025 b) 2030 or c) any year in between?**

- 3. What will be the impact on the interests of holders of all other index-linked gilts of addressing the shortcomings of the RPI in a) 2025 b) 2030 or c) any year in between?**
- 4. What will be the impact on the index-linked gilt market or those dependent on it of addressing the shortcomings of the RPI in a) 2025 b) 2030 or c) any year in between?**

## Section 6 – Broader impacts

62. As outlined in Section 5 of this document, in order to uphold the independence of the statistical system, and in the context of the Authority's proposal, the Chancellor cannot consider factors which are not relevant under section 21 of the Act. Similarly, the Authority's decision-making process on the proposal to address the shortcomings of the RPI must be based on its assessment of the statistical integrity of the RPI.
63. However, both the government and the Authority are mindful of the potentially wide-ranging impacts of the proposed changes to the RPI and of their responsibilities as public sector bodies to consider these impacts in future policy making.
64. They are aware that they do not have full sight of the use of the RPI in the economy, including in financial contracts. Impacts from the change to the RPI could therefore have unintended and diverse impacts, affecting the public finances, economy, financial markets or certain groups of users. Therefore, responses are welcomed outlining what those impacts are so that the government and Authority can have full sight of the potential impacts.
65. Responses in this section are unlikely to be relevant to the Chancellor's decision regarding the Authority's proposal to address the shortcomings of the RPI by improving the methods and data sources used in compiling the index; however, they may be relevant in wider policy contexts.
66. For the Authority, there may be potential unknown impacts which will inform future statistical work. Information provided in this section may inform future approaches by the Authority on related issues.

### **Consultation questions:**

- 5. What other impacts might the proposed changes to address the shortcomings of the RPI have in areas or contracts where the RPI is used?**
- 6. Are there any other issues relevant to the proposal the Authority is minded to make of which the Authority or the Chancellor ought to be aware?**

## Supplementary indices

67. The CPIH lower level indices are produced according to the Classification of individual consumption by purpose (COICOP), which is an internationally recognised classification structure, whereas the RPI uses a bespoke UK-based classification structure. When the change to the RPI happens, it will not be possible to chain link the new CPIH-based indices in the same way at lower levels and produce a coherent set of indices. It would be possible to create a mapping between the RPI and CPIH classifications; however, this would alter the structure of component-level indices and would result in reconciliation differences with the all-item index. Therefore, only a headline RPI index, and growth rates, will be published.
68. The ONS produces a number of supplementary indices, based on the lower level item indices that are aggregated to produce the RPI. A summary of supplementary indices can be found in Annex D. Under the proposals in this consultation, this level of detail would be unavailable with the current RPI classification structure.
69. It is the ONS's intention to stop publishing supplementary indices, such as the RPIX, and other RPI sub-indices below the all-items level, once the transition to the new methods and data sources has occurred.
70. The ONS will provide guidance to direct users of lower level or supplementary RPI indices towards the most appropriate alternative price indices. Details of the CPIH supplementary indices that best map to the RPI supplementary indices can be found in Annex D.

### Consultation questions:

- 7. Which lower level or supplementary RPI indices are currently used, and what are they used for?**
- 8. What guidance would users of lower level or supplementary RPI indices find most useful for the ONS to provide?**

# Annex A: Explaining the CPIH – RPI ‘wedge’

## Introduction

The changes to the clothing price collection that were introduced in 2010 increased the difference (or ‘wedge’) between the RPI and the CPI. The changes included increasing the monthly sample size by relaxing the criteria for what could be considered a comparable replacement, and the introduction of sale prices in new collection locations in the base period. The changes were introduced to correct a known downward bias in both the CPI and the RPI. Whilst the changes had the intended consequence in the CPI, they led to an over-estimation of price change for clothing in the RPI, highlighting a methodological shortcoming of the RPI.

These changes increased the ‘formula effect’, which is the difference between the RPI and the CPI (or the CPIH) that is purely attributable to the different formulae used at the lowest level of aggregation. This remains the biggest difference between the RPI and the CPIH/CPI; however, there are other differences that reflect different coverage and methodologies. This annex explains these differences in more detail.

## Conceptual differences

The historical contexts of the RPI and the CPIH are very different.

The RPI replaced the Cost of Living Index, a compensation index, developed as an aid to protect ordinary workers from price increases associated with the First World War. This index was stopped shortly after the Second World War, and the RPI (initially the Interim Index of Retail Prices) replaced it, incorporating more up to date expenditure data and a broader coverage. It was only much later, after a number of significant developments, that it came to be used as the main domestic measure of inflation. This run ended in the early 2000s, culminating in the loss of its National Statistic status in 2013.

The CPIH was launched in 2013. As discussed earlier in this document, the CPIH extends the coverage of the CPI, an internationally comparable measure of inflation which employs methodologies and structures that follow international legislation and guidelines, to include a measure of owner-occupiers’ housing costs. The Authority therefore consider it to be its most comprehensive measure of inflation. The CPIH measures the change in price of a wide range of goods and services consumed by households and is based on recognised economic principles.

## Methodological differences

The basic approach to the measurement of inflation adopted by both the CPIH and the RPI is the same. Both track the changing cost of a fixed basket of goods and services over time and both are produced by combining together around 180,000 individual prices for over 700 representative items. Differences arise due to coverage, the population base of the indices and the way in which individual price quotes are combined at the first stage of aggregation. In summary:

**Table 1: Methodological differences between RPI and CPIH**

	<b>RPI</b>	<b>CPIH</b>
<b>Coverage</b> – the actual goods and services included in the indices	Covers several items excluded from the CPIH, including: <ul style="list-style-type: none"> <li>- mortgage interest payments</li> <li>- house depreciation</li> <li>- buildings insurance</li> <li>- ground rent</li> <li>- other house purchasing costs such as estate agents' and conveyancing fees</li> </ul>	Covers several items excluded from the RPI, including university accommodation fees and foreign students' tuition fees.
<b>Population base</b> – the expenditure, as covered by the index and, the source for the expenditure data	Includes expenditure by private households but excludes households whose income lies within the top 4% of the income distribution and pensioner households with at least three-quarters of their income coming from state pensions and benefits. Expenditure data (or 'weights') used to represent this population are derived from a number of sources but mainly from ONS's Living Costs and Food Survey.	Expenditure data (or weights) used to represent the population are derived in the main from the HHFCE component of the UK national accounts. The weights are based on expenditure within the domestic territory by all private households, foreign visitors to the UK and residents of institutions (such as nursing homes, retirement homes and university halls of residence).
<b>Index construction formulae</b> – how the index is calculated	At the first stage of aggregation, the RPI is constructed using an arithmetic mean. There are two different methods, applied to different items but, for example, the 'Carli' would be calculated as follows; if one price increased by 5/4 from the base period (which=100) and another decreased by 4/5 their new index values would be 125 and 80 respectively. The arithmetic mean of these is: $\frac{125 + 80}{2} = 102.5$ indicating an 'average' price increase of 2.5%.	At the same level, the CPI largely uses a geometric mean (GM) which, taking the values used in the adjacent example is calculated thus, $\sqrt{125 \times 80} = \sqrt{10000} = 100,$ indicating that there has been no change in prices.

Over the five years from January 2014 to June 2019 the 12-month growth in the CPIH has on average been 0.9 percentage points lower than the 12-month growth in the RPI.

Table 3 presents 1, 3 and 5-year average contributions to the ‘CPI-RPI wedge’. The 1-year average refers to the average contribution for 2018, the 3-year average refers to the average contribution between 2016 and 2018, and the 5-year average refers to the average contribution between 2014 and 2018.

**Table 3: Average impacts of correcting RPI and CPIH differences**

	Formula effect	Owner occupiers’ housing (RPI)	Owner occupiers’ housing (CPIH)	Differences in the basket	Differences in weights, and other residual differences <sup>22</sup>
1-year average	-0.69	-0.41 of which MIPs - 0.09	+0.20	0	-0.16
3-year average	-0.72	-0.42 of which MIPs +0.04	+0.31	0.03	-0.13
5-year average	-0.76	-0.44 of which MIPs + 0.03	+0.30	0.03	0

The data presented in this table are based on the reconciliation of differences between the CPIH and the RPI presented in Table 5a of the *Consumer Price Inflation, UK bulletin*.<sup>23</sup> The reconciliation differences have been constructed by breaking down the RPI and the CPIH into additive contributions from each component. The method also makes use of other measures such as the RPIX (RPI excluding mortgage interest payments).

<sup>22</sup> Specifically, the residual includes:

- Differences in the source of weights; the RPI uses the Living Costs and Food Survey (LCFS), whereas the CPIH primarily uses the national accounts
- Coverage difference implied by the different sources of weights; for example, the LCFS excludes spending by foreign visitors to the UK, and institutional households
- Differences in the coverage of weights; the RPI removes the top 4% of wealthy households and 1 and 2 pensioner households mainly dependent on the state pension
- Insurance weights; in the CPIH insurance weights are net of claims pool expenditure, whereas the RPI uses gross expenditure
- Classification differences; the CPIH uses COICOP, an internationally recognised classification structure, whereas the RPI uses a bespoke system
- The difference in chain linking; the CPIH is chain linked twice, once in December and again in January; weights are also price updated twice from February 2017
- Temporal sampling of fruit and vegetable items; price quotes for these items are also collected on the Friday preceding index day in the CPIH
- Petrol and oil prices, which are collected on index day in the RPI (the second or third Tuesday of the month), but averaged over the month in the CPIH
- Rounding; RPI growth rates are calculated from rounded data, whereas CPIH rates are calculated from unrounded data

<sup>23</sup> <https://www.ons.gov.uk/economy/inflationandpriceindices/bulletins/consumerpriceinflation/previousReleases>

## Annex B: Technical description of changing the RPI such that its methods and data sources are based on a robust measure, the CPIH

Suppose that some implementation year  $b$  is chosen to address the shortcomings of the RPI. For the implementation year, aggregate unchain-linked indices with a January base period will be calculated using the methods and data sources of the CPIH.<sup>24</sup> The CPIH index will then be calculated in the usual way, for example, in February of year  $b$ :

$$CPIH_{Index}(Feb, b) = CPIH_{Index}(Jan, b) \times \frac{Agg_{Index}(Feb, b)}{Agg_{Index}(Jan, b)}$$

The methods of CPIH will then be linked in to the RPI series in the same way:

$$RPI_{Index}^*(Feb, b) = RPI_{Index}(Jan, b) \times \frac{Agg_{Index}(Feb, b)}{Agg_{Index}(Jan, b)}$$

where  $RPI_{Index}^*(Feb, b)$  is the RPI index based on CPIH methods and data sources in February of the implementation year  $b$ ,  $RPI_{Index}(Jan, b)$  is the RPI index based on current methods in January of the same year, and  $Agg_{Index}(Feb, b)$  is the aggregate unchained index based on the methods and data sources of the CPIH, with a base period of January of year  $b$ . Base and reference periods are omitted from the notation for simplicity. Note, however, that it is not necessary for this description that that RPI and the CPIH should share a common reference period.

New items, weights and methodological improvements will continue to be introduced through annual chain-linking.<sup>25</sup> We can expand the previous equation to future years as follows (generalising the notation to reflect any month  $m$  of any year  $y > b$ , and taking the base period for each term as the period given in the denominator):

---

<sup>24</sup> For more information on the construction of consumer price statistics please refer to the [Consumer Price Indices Technical Manual, 2019](#)

<sup>25</sup> note that under the methods of CPIH this involves chain linking twice: once to introduce new weights in December, and again to introduce a new price reference period in January

$$RPI_{Index}^*(m, y) = RPI_{Index}(Jan, b) \times \frac{Agg_{Index}(Dec, b)}{Agg_{Index}(Jan, b)} \times \frac{Agg_{Index}(Jan, b + 1)}{Agg_{Index}(Dec, b)} \times \frac{Agg_{Index}(Dec, b + 1)}{Agg_{Index}(Jan, b + 1)} \\ \times \dots \times \frac{Agg_{Index}(m, y)}{Agg_{Index}(Jan, y)},$$

which is a sequence of annually (double) chain-linked indices. Without loss of generality we can rewrite the above equation as:

$$RPI_{Index}^*(m, y) = RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(m, y)}{Agg_{C,Index}(Jan, b)}$$

Where the new  $Agg_{C,Index}$  term is simply the sequence of chain-linked indices beginning in January of the implementation year  $b$ . This is constructed from CPIH methods and data sources.

We use this new index series to calculate the  $RPI^*$  1-month and 12-month growth rates, defined as the 1-month and 12-month change in the index series respectively. In the month of implementation, 1-month growth rates are calculated as:

$$RPI_{1m-rate}^*(Feb, b) = \left( \frac{RPI_{Index}^*(Feb, b)}{RPI_{Index}(Jan, b)} - 1 \right) \times 100\%.$$

This will be the same as the CPIH 1-month growth rate since:

$$RPI_{1m-rate}^*(Feb, b) = \left( \frac{RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(Feb, b)}{Agg_{C,Index}(Jan, b)}}{RPI_{Index}(Jan, b)} - 1 \right) \times 100\% \\ = \left( \frac{Agg_{C,Index}(Feb, b)}{Agg_{C,Index}(Jan, b)} - 1 \right) \times 100\%,$$

which is the same as the CPIH 1-month growth rate for February of the implementation year. Thereafter, 1-month growth rates are calculated as:<sup>26</sup>

$$RPI_{1m-rate}^*(m, y) = \left( \frac{RPI_{Index}^*(m, y)}{RPI_{Index}^*(m - 1, y)} - 1 \right) \times 100\%.$$

This will also be the same as the CPIH 1-month growth rate since:

<sup>26</sup> Note that when  $m$  is January ( $m - 1, y$ ) will be ( $m + 11, y - 1$ ); that is, December of the previous year

$$RPI_{1m-rate}^*(m, y) = \left( \frac{RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(m, y)}{Agg_{C,Index}(Jan, b)}}{RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(m-1, y)}{Agg_{C,Index}(Jan, b)}} - 1 \right) \times 100\%$$

$$= \left( \frac{Agg_{C,Index}(m, y)}{Agg_{C,Index}(m-1, y)} - 1 \right) \times 100\%,$$

which can similarly be shown to be the CPIH 1-month growth rate for month  $m$  of year  $y$ .

In the implementation year ( $m =$  February to December) RPI\* 12-month annual growth rates are calculated as:

$$RPI_{12m-rate}^*(m, b) = \left( \frac{RPI_{Index}^*(m, b)}{RPI_{Index}(m, b-1)} - 1 \right) \times 100\%.$$

This will not be the same as the CPIH 12-month annual growth, since

$$RPI_{12m-rate}^*(m, b)$$

$$= \left( \frac{RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(m, b)}{Agg_{C,Index}(Jan, b)}}{RPI_{Index}(m, b-1)} - 1 \right)$$

$$\times 100\%$$

$$= \left( \frac{RPI_{Index}(Jan, b)}{CPIH_{Index}(Jan, b)} \times \frac{CPIH_{Index}(m, b-1)}{RPI_{Index}(m, b-1)} \times \frac{CPIH_{Index}(m, b)}{CPIH_{Index}(m, b-1)} - 1 \right) \times 100\%^{27}$$

$$= \left( f_1 \times f_2 \times \frac{CPIH_{Index}(m, b)}{CPIH_{Index}(m, b-1)} - 1 \right) \times 100\%$$

which is not the CPIH 12-month annual growth rate. Instead it represents the CPIH 12-month annual growth rate scaled by two linking factors: the first ( $f_1$ ) is the ratio between the RPI and the CPIH in the link month, and the second ( $f_2$ ) is the ratio between CPIH and RPI in the same month  $m$  of the previous year.

Thereafter, the CPIH 12-month annual growth rate will be the same as RPI\* growth, since:

<sup>27</sup> By rewriting  $CPIH_{Index}(m, y) = CPIH_{Index}(Jan, b) \times Agg_{Index}(m, b) / Agg_{Index}(Jan, b) \Rightarrow$   
 $CPIH_{Index}(m, y) / CPIH_{Index}(Jan, b) = Agg_{Index}(m, b) / Agg_{Index}(Jan, b)$  and multiplying through by  
 $CPIH_{Index}(m, b-1) / CPIH_{Index}(m, b-1)$

$$\begin{aligned}
RPI_{12m-rate}^*(m, y) &= \left( \frac{RPI_{Index}(Jan, b) \times \frac{Agg_{c,Index}(m, y)}{Agg_{c,Index}(Jan, b)}}{RPI_{Index}(Jan, b) \times \frac{Agg_{c,Index}(m, y-1)}{Agg_{c,Index}(Jan, b)}} - 1 \right) \times 100\% \\
&= \left( \frac{Agg_{c,Index}(m, y)}{Agg_{c,Index}(m, y-1)} - 1 \right) \times 100\%,
\end{aligned}$$

which can similarly be shown to be the CPIH 12-month annual growth rate for month  $m$  of year  $y$ .

## Annex C: Alternative linking options

In addition to our preferred option, as set out in the main report and in Annex B, we also considered a range of further options for implementation. We considered how 12-month annual growth rates and index values could be set equal to the CPIH at a single point in time (rather than allowing the annual growth rates to converge after a year).

### 1. Fix the annual growth rates

On the implementation date (February's index in the implementation year) the CPIH will be chain-linked to the RPI series as described earlier. Rather than calculating annual growth rates directly from index values, annual growth rates in the implementation year will be set equal to the CPIH. Using the notation of Annex B we have:

$$RPI_{Index}^*(m, b) = RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(m, b)}{Agg_{C,Index}(Jan, b)}$$

and

$$\begin{aligned} RPI_{12m-rate}^*(m, b) &= CPIH_{12m-rate}(m, b) \\ &= \left( \frac{CPIH_{Index}(m, b)}{CPIH_{Index}(m, b-1)} - 1 \right) \times 100\% \\ &= \left( \frac{CPIH_{Index}(Jan, b)}{RPI_{Index}(Jan, b)} \times \frac{RPI_{Index}(m, b-1)}{CPIH_{Index}(m, b-1)} \times \frac{RPI_{Index}^*(m, b)}{RPI_{Index}(m, b-1)} - 1 \right) \times 100\% \\ &= \left( \frac{1}{f_1} \times \frac{1}{f_2} \times \frac{RPI_{Index}^*(m, b)}{RPI_{Index}(m, b-1)} - 1 \right) \times 100\% \end{aligned}$$

where  $m$  = February to December. Note that this differs from the actual annual growth rate by the inverse of the previously derived factors  $f_1$  and  $f_2$ . This is to be expected as these factors simply represent the difference between the CPIH and actual RPI\* annual growth rates.

After the implementation year, the 12-month annual growth rates will converge to the correct values and will be the same rates as those calculated directly from the index. Therefore, after the implementation year the RPI

series including index values, annual and monthly growth rates will be as described earlier in this report.

For example, had the Authority's proposal been implemented in February 2017, the February 2017 RPI would have been 267.1, and the 1-month growth rate would have been 0.6%, as described in Box 1. However, the February 2017 12-month annual growth rate would have been set as 2.3%, to match the CPIH 12-month annual growth. It would not be 2.7%, the figure calculated directly from the index values in Box 1.

## 2. Fix the index values

We also considered splicing annual growth rates directly rather than chain-linking the index. Index values would then be derived as a residual. For the implementation year  $b$  the annual growth rate for CPIH is used as the annual growth rate for the RPI. The RPI\* index values are then *implied* by the relationship between the new annual growth rates and CPIH index values in the previous year.

We define annual growth as:

$$RPI_{12m-rate}^*(m, b) = CPIH_{12m-rate}(m, b)$$

and index values as:

$$RPI_{Index}^*(m, b) = RPI_{Index}(m, b - 1) \times \left( \frac{CPIH_{12m-rate}(m, b)}{100} + 1 \right).$$

However, under this approach the 1-month growth rates will not be equal to CPIH 1-month growth rates, (for  $y \geq b$ )<sup>28</sup>. Consider the 1-month ratio for month  $m$  of year  $y$ , which we define as:

$$RPI_{1m-rate}^*(m, y) = [RPI_{1m-ratio}^*(m, y) - 1] \times 100\%:$$

$$RPI_{1m-ratio}^*(m, y) = \frac{RPI_{Index}^*(m, y - 1) \times \left( \frac{CPIH_{12m-rate}(m, y)}{100} + 1 \right)}{RPI_{Index}^*(m - 1, y - 1) \times \left( \frac{CPIH_{12m-rate}(m - 1, y)}{100} + 1 \right)}$$

<sup>28</sup> For simplicity we have removed terms which are not time-dependent

$$\begin{aligned}
&= \frac{RPI_{Index}^*(m, y - 1) \times \left( \left[ \frac{CPIH_{Index}(m, y)}{CPIH_{Index}(m, y - 1)} - 1 \right] + 1 \right)}{RPI_{Index}^*(m - 1, y - 1) \times \left( \left[ \frac{CPIH_{Index}(m - 1, y)}{CPIH_{Index}(m - 1, y - 1)} - 1 \right] + 1 \right)} \\
&= \frac{RPI_{Index}^*(m, y - 1)}{RPI_{Index}^*(m - 1, y - 1)} \times \frac{CPIH_{Index}(m - 1, y - 1)}{CPIH_{Index}(m, y - 1)} \times \frac{CPIH_{Index}(m, y)}{CPIH_{Index}(m - 1, y)} \\
&= RPI_{1m-ratio}^*(m, y - 1) \times \frac{1}{CPIH_{1m-ratio}(m, y - 1)} \times CPIH_{1m-ratio}(m, y).
\end{aligned}$$

In other words, RPI and CPIH 1-month growth will only be equal if their 1-month growth was equal in the same period in the previous year. This is not normally the case; for example, in February 2016, RPI 1-month growth was 0.5%, whereas for the CPIH it was 0.2%. Since this is unlikely to hold in the implementation year, by recursion it is unlikely to hold in later years. Therefore, while RPI and CPIH annual growth rates will match, index values and monthly growth will differ.

For example, had the addressing of the shortcomings in the RPI happened in February 2017, the February 2017 annual growth would have been set equal to CPIH annual growth, which was 2.3% (see Box 1). The corresponding index value for February 2017 would have been calculated as

$$\begin{aligned}
RPI_{Index}^*(Feb\ 17) &= RPI_{Index}(Feb, 16) \times \left( \frac{CPIH_{12m-rate}(Feb\ 17)}{100} + 1 \right) \\
&= 260.0 \times \left( \frac{2.3}{100} + 1 \right) \\
&= 266.0,
\end{aligned}$$

which is not the same as the index calculated from chain-linking the CPIH series to the RPI (our preferred option). Given a March RPI\* index value of 267.1, calculated by applying the index value formula described above, we derive March 2017 1-month growth as:

$$\begin{aligned}
RPI_{1m-rate}^*(Mar\ 17) &= \left( \frac{RPI_{Index}^*(Mar\ 17)}{RPI_{Index}^*(Feb\ 17)} - 1 \right) \times 100\% \\
&= \left( \frac{267.1}{266.0} - 1 \right) \times 100\%
\end{aligned}$$

$$= 0.4\%,$$

which is not the same as CPIH monthly growth for March 2017.

### 3. Re-referencing

Under our preferred option, RPI\* index values will not match CPIH index values. This is because the reference periods for the two indices differ, and because the indices are at different levels when CPIH methods are chain-linked into the RPI. Nonetheless the two series will share the same 1-month growth rates.

The problem of different index values could be resolved by re-referencing both the CPIH and the RPI to the implementation year  $b = 100$ , in the year following implementation,  $b + 1$ , as follows:

$$\frac{RPI_{Index}^*(m, y)}{RPI_{Index}^*(b)} = \frac{RPI_{Index}(Jan, b) \times \frac{Agg_{C,Index}(m, y)}{Agg_{C,Index}(Jan, b)}}{RPI_{Index}^*(b)} = \frac{CPIH_{Index}(m, y)}{CPIH_{Index}(b)}$$

since

$$RPI_{Index}^*(b) = \frac{1}{12} \sum_m RPI_{Index}^*(m, b) = \frac{RPI_{Index}(Jan, b)}{CPIH_{Index}(Jan, b)} \times \frac{1}{12} \sum_m CPIH_{Index}(m, b).$$

and

$$\frac{Agg_{C,Index}(m, y)}{Agg_{C,Index}(Jan, b)} = \frac{CPIH_{Index}(m, y)}{CPIH_{Index}(Jan, b)}$$

The issue with this approach is that there is no longer a common reference period between the CPIH and the CPI, which is an internationally comparable measure of inflation with a reference period specified by Eurostat. It is considered that the benefit of a common CPIH and CPI reference period outweighs any benefit of having identical index values for the CPIH and the RPI after CPIH methods have been introduced, particularly since the index growth will in any case be identical.

### 4. Analysis

We analysed these two options against our preferred option using the six dimensions of quality defined by the European Statistical System. Our

analysis is presented in Table 4. Based on this analysis, our preferred option maintains the consistency of RPI index values, annual and monthly growth rates (although the RPI\* and CPIH index values will differ due to different reference points) and, unlike other options, manages the transition to the new approach without the need for a step change. Fixing annual growth rates suffers from internal inconsistency and a step change, which may cause unnecessary confusion, and fixing index values means that the series is calculated as a residual, rather than directly from price and expenditure data.

**Table 4: Analysis of each of the proposed options based on the European Statistical System quality dimensions**

	<b>Preferred option</b>	<b>Alternative option 1</b>	<b>Alternative option 2</b>
<i>Method</i>	Chainlink on the CPIH index in February of the implementation year; Allow annual growth to converge over time Do not revise RPI history	Chainlink on the CPIH index in February of the implementation year; Switch to CPIH annual and monthly growth in February of the implementation year; Do not revise RPI history	Switch to CPIH annual growth in February of the implementation year; Use implied year 1 index values directly from annual growth
<i>Relevance</i>	Correcting the flaws in the RPI may cause some confusion around the prices landscape; The change could be implemented at the earliest opportunity (February 2021); Annual growth rates will take one year to converge to CPIH growth	Correcting the flaws in the RPI may cause some confusion around the prices landscape; The change could be implemented at the earliest opportunity (February 2021)	Correcting the flaws in the RPI may cause some confusion around the prices landscape; The change could be implemented at the earliest opportunity (February 2021)
<i>Accuracy</i>	This approach maintains the consistency of RPI index values, monthly and annual growth rates; index values will not match until the CPIH is re-referenced to a more recent time period	Annual growth calculated directly from the index values in year 1 will not match the reported annual growth; index values will not match until the CPIH is re-referenced to a more recent time period	The index values are derived as a residual from the CPIH annual growth and are not an accurate measure of cumulative growth in their own right;
<i>Timeliness &amp; Punctuality</i>	No impact – the RPI can still be compiled and published with a 1-month lag	No impact – the RPI can still be compiled and published with a 1-month lag	No impact – the RPI can still be compiled and published with a 1-month lag

<i>Accessibility &amp; clarity</i>	The reason for the difference in index values may not be clear to users; it may not be obvious why annual growth rates differ from the CPIH for the first year; it's difficult to communicate why there is no easy solution to set the RPI = the CPIH without re-referencing	The reason for the difference in index values may not be clear to users; the inconsistency between annual growth and index values in the RPI may be difficult to communicate; it's difficult to communicate why there is no easy solution to set the RPI = the CPIH without re-referencing; potential for confusion between the reported and index-based annual growth rates	The derivation of index values may be hard to explain, as it is not calculated from data and is instead derived from the annual growth; It may be difficult to communicate why monthly growth differs from the CPIH; it's difficult to communicate why there is no easy solution to set the RPI = the CPIH without re-referencing
<i>Comparability &amp; coherence</i>	This option gradually introduces the change, softening the impact (Figure 1); Annual growth rates will converge to CPIH growth over time; the CPIH index values will not match RPI index values; RPI annual growth can be calculated directly from index values; there may be small differences between RPI and CPIH growth due to rounding	This method will introduce a noticeable jump in the RPI annual growth series in the month of introduction (Figure 1); Annual growth will be consistent with CPIH from the outset; The RPI index and annual growth are not internally consistent in year 1; CPIH index values will not match RPI index values; there may be small differences between RPI and CPIH growth due to rounding	This method will introduce a noticeable jump in the RPI annual growth series in the month of introduction (Figure 1); Annual growth will be consistent with the CPIH from the outset; the CPIH index values will not match RPI index values; RPI monthly growth will differ from CPIH monthly growth; RPI annual growth can be calculated directly from index values; there may be small differences between RPI and CPIH growth due to rounding

## Annex D: Supplementary RPI indices

**Table 5: Supplementary RPI indices currently produced by ONS**

CDID*	Index description
CHMK	ALL ITS EXPT MORTGAG (RPIX)
DOBH	BEER
DOBK	WINES AND SPIRITS
CHON	ALL EX MIPS & HOU D
CHBY	CONSUMER DURABLES
CHBP	SEASONAL FOOD
CHBB	FOOD excluding Seasonal Food
DQAD	ALL X MIPS & COMM C
CHOL	PETROIL [HMT]
CHOK	HMT OTHER GOODS PROG
CHOF	HMT ALL GOODS
CHOH	HMT UTILITIES (PRU)
CHOI	HMT SHOP SERVICES
CHOJ	HMT NON SHOP SERVICE
CHOG	HMT ALL SERVICES
CHAY	ALL ITS EXPT FOOD
CZIF	ALL ITS EXPT HOUSING
CHAX	ALL ITS EXPT S FOOD

\*CDID is ONS's four-character identification code