

# Assessing the new ONS CPIH back-cast

Note prepared for the Energy Networks Association

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## 1 Introduction

On 18 May 2022, the Office for National Statistics (ONS) published a new historical series for the CPI (Consumer Prices Index) and the CPIH (Consumer Prices Index including owner occupiers' housing costs) for the period 1950–88.<sup>1</sup>

In this note, we assess the impact of using the new CPIH inflation series published by the ONS on the average inflation between 1900 and 2021, and the estimate of the CPIH-real equity returns over the same period. We find that the new CPIH series is, on average, 0.82% lower than the old CPI back-cast in the period 1950–88. Over 1900–2021, this equates to average inflation being reduced by 0.24%, which translates into an increase in the CPIH-real equity returns of 0.24%.

This note is structured as follows.

- We first assess whether the methodology for computing the new CPIH series addresses the concerns previously raised with the historical CPI series previously published by the Bank of England (section 2).<sup>2</sup>
- We reconcile the differences between the new CPIH and CPI series and the series previously published by the Bank of England and adopted by Ofgem (section 3A).<sup>3</sup> We then assess the impact of using the new CPIH historical series on estimating the average inflation rate between 1900 and 2021, and

<sup>1</sup> See Office for National Statistics (2022), 'Consumer price inflation, historical data, UK 1950 to 1988', <https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceinflationhistoricaldatauk1950to1988> (last accessed 14 June 2022).

<sup>2</sup> See, for example, Oxera (2021), 'The cost of equity for RIIO-ED2', 4 June, pp. 24–25.

<sup>3</sup> Previously, the ONS had only a historical series covering CPI for this period. That is, there was no CPIH series available for the period 1950–88.

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the impact this would have on the long-term average CPIH-real equity return (section 3B).

## **2 Does the latest ONS methodology address our previous concerns?**

We previously raised a number of concerns with using the historical CPI series previously published by the Bank of England,<sup>4</sup> which have partially been addressed with the new inflation series.<sup>5</sup> In this section we explore the issues which remain unresolved and discuss the main changes to the inflation methodology adopted by the ONS.<sup>6</sup>

We find that the new methodology is superior to the previous estimates of historical CPI. Of particular relevance to RIIO-ED2 is that this series provides historical estimates of CPIH and therefore allows real historical equity returns to be calculated using the same measure of inflation as will be applied in RIIO-ED2.

In light of this new evidence, it would be an error not to incorporate the new historical estimates of CPIH into the determination of the Total Market Return (TMR) parameter for RIIO-ED2. It would also be an error to place any weight on real TMR estimates derived using the previous historical estimates of CPI.

### **2A Unresolved issues with the updated methodology**

It remains the case that, for the periods prior to 1997, the CPI and CPIH series have been estimated ex post. The historical estimates are essentially based on estimates of what the wedge between RPI and CPI(H) inflation would have been in the past, and in particular the ‘formula effect’.

The previous CPI back-cast used the O’Neill and Ralph econometric back-cast, which yielded estimates of the RPI–CPI ‘wedge’ that we considered to be surprisingly small and tended to zero as the back-cast is extended further back in time.<sup>7</sup> The updated methodology does not provide further detail on the size of the modelled formula effect.

### **2B Summary of changes**

That said, there are a number of changes to the methodology that seem to be improvements on the previous approach. This is also the first time that historical estimates for CPIH have been available for periods prior to 2005. As the calculation of CPIH uses the same model as the new CPI series, the methodological improvements identified below apply to both series.

- The coverage of modelled estimates over the earlier years of the series has been expanded from previous work. Now, every division within the Classification of Individual Consumption according to purpose (COICOP) structure, other than education, has modelled estimates from 1950 onwards.

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<sup>4</sup> See, for example, Oxera (2021), ‘The cost of equity for RIIO-ED2’, 4 June, pp. 24–25.

<sup>5</sup> Namely, the ONS was unable to locate the information used to construct the old CPI back-cast, and the 1950–88 back-cast was previously calibrated against an outdated CPI series for the 1989–96 period.

<sup>6</sup> Office for National Statistics (2022), ‘Consumer price inflation, historical estimates, UK, 1950 to 1988 – methodology’, 18 May,

<https://www.ons.gov.uk/economy/inflationandpriceindices/methodologies/consumerpriceinflationhistoricalestimatesuk1950to1988methodology> (last accessed 15 June 2022).

<sup>7</sup> Oxera (2019), ‘The cost of equity for RIIO-2: Q4 2019 update’, p. 16.

- To generate an overall ‘all items’ headline rate for CPI, divisional estimates are aggregated using RPI weightings, similarly mapped to CPI divisions and now rescaled so that they sum to one.
- The updated CPI series is now calibrated against the 2018 revision to the 1989–96 CPI series, with the ONS revising this series due to an error.<sup>8</sup>

There are also a few changes which seem reasonable but where it is unclear whether they are improvements on the original method.

- The main difference highlighted by the ONS in the calculation of the remodelled series is in the design specification of each model for the divisions of the CPI structure, which we interpret to mean the calibration of multiple ARIMA models rather than the single model that was previously calibrated. We do not see a clear reason why this would be a worse approach than the one previously employed.
- The mapping of RPI 12-month inflation rates onto COICOP classifications now follows the approach used in the ONS’s historical series of CPIH between 1988 and 2004, which seems broadly reasonable.

## 2C Unresolved issue with pre-1950 CPI time series

We have one additional issue which is not specific to the data update, but has to do with the lack of data on CPI and CPIH prior to 1950. This has led Ofgem to use the CED as a proxy for CPI and CPIH prior to 1950, in order to construct the inflation time series for 1900–2021. These historical estimates of CED are from Feinstein (1972),<sup>9</sup> and therefore predate the publication of CPI in 1997. Therefore, the construction of the CED is likely to be based on price series that are constructed in a similar way to the measure of inflation at that time, which was RPI. Specifically, it is likely that the underlying price series in the CED estimates are using the Carli method of averaging and not the Jevons formula method of averaging. Therefore, the CED inflation may include some degree of upward formula effect bias—that is, the same bias we get with the RPI. We previously discussed this hypothesis with the ONS, which expressed its agreement with this interpretation.<sup>10</sup>

## 3 Incorporating the new CPIH back-cast series into the 1900–2021 time series

In this section, we compare the new CPIH and CPI series with the previously published CPI series. The update from the ONS affects only the data points between 1950 and 1988, but we are interested in understanding the impact on average inflation over a longer time period, that is, 1900–2021. From 1989 onwards, a time series for both CPI and CPIH is readily available,<sup>11</sup> but there is no CPIH or CPI series available prior to 1950. To cover the pre-1950 period, we

<sup>8</sup> See Office for National Statistics (2018), ‘Consumer Prices Index including owner occupiers’ housing costs (CPIH) historical series: 1988 to 2014’, Annex A, <https://www.ons.gov.uk/economy/inflationandpriceindices/articles/consumerpricesindexincludingowneroccupiershousingcostshistoricalseries/1988to2004> (last accessed 16 June 2022).

<sup>9</sup> Feinstein, C.H. (1972), *National Income, Expenditure and Output of the United Kingdom 1855–1965*, Cambridge University Press, as referenced in National Grid (2020), ‘Total Market Return: The consistency of long-run CPI and RPI inflation series in the UK, and their relative suitability for use in calculating the actual historic long-run average equity market return in the UK on a “real” basis’, 23 January.

<sup>10</sup> Oxera (2019), ‘The cost of equity for RIIO-2: Q4 2019 update’, 29 November, p. 16.

<sup>11</sup> See Office for National Statistics (2022), ‘Consumer price inflation time series’, 18 May, <https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceindices> (last accessed 15 June 2022).

instead use Consumption Expenditure Deflator (CED) data published by the Bank of England in its Millennium database.<sup>12</sup> However, we note that this is an imperfect method as the CED is theoretically and empirically a closer proxy for RPI than CPI, which is explained further in section 2.<sup>13</sup>

We have compiled three different inflation time series, as shown in Table 3.1, which we subsequently use to estimate the impact of the updated inflation series published by the ONS on long-term inflation and real equity returns.

**Table 3.1 Compilation of inflation time series**

	<b>1900–49</b>	<b>1950–88</b>	<b>1989–2021</b>
<b>'Old CPI series'</b>	CED data, original method <sup>1</sup>	Old CPI back-cast, published July 2014	Current CPI series
<b>'New CPI series'</b>	CED data, original method <sup>1</sup>	New CPI back-cast, published May 2022	Current CPI series
<b>'New CPIH series'</b>	CED data, original method <sup>1</sup>	New CPIH back-cast, published May 2022	Current CPIH series

Note: <sup>1</sup> The Bank of England has both an 'original method' and a 'preferred measure'. Based on the 'original method' CPI series, the arithmetic average of CPI inflation over the period 1899–2016 amounts to 4.06%. Based on the 'preferred measure', the arithmetic average CPI over the period 1899–2016 amounts to 4.10%. We have relied on the original method. However, since all three inflation series use this data for pre-1950, changing to the preferred measure does not change the conclusions.

Source: Oxera analysis based on Bank of England and ONS data.

### **3A Reconciliation between new CPIH and CPI series and previous CPI series covering the period 1950–88**

The new CPI and CPIH series published by the ONS are both lower than the previous CPI back-cast.

As shown in Table 3.2, over the period 1950–88 the new CPI inflation series is, on average, **0.22%** lower than the previously published CPI series. Over the period 1900–2021, this is equivalent to a reduction in the average inflation rate of **0.07%**.

The difference in the new CPIH series is more material. Over the period 1950–88, the new CPIH inflation series is, on average, **0.82%** lower than the previously published CPI series. This is equivalent to a reduction in the average inflation rate over the period 1900–2021 of **0.24%**.

<sup>12</sup> Bank of England (2017), 'A millennium of macroeconomic data for the UK', 30 April, tab 'A47. Wages and prices'.

<sup>13</sup> See, for example, Oxera (2021), 'The cost of equity for RIIO-ED2', 4 June, Appendix A3.

**Table 3.2 Reconciliation of inflation series**

	Old CPI series	New CPI series	New CPIH series
<b>1950–1988 arithmetic average</b>	6.66%	6.44%	5.84%
<b>Difference from old CPI series</b>		-0.22%	-0.82%
<b>1900–2021 arithmetic average</b>	3.98%	3.91%	3.74%
<b>Difference from old CPI series</b>		-0.07%	-0.24%

Source: Oxera analysis based on ONS data.

Adopting a lower average inflation rate would mean that the CPIH-real equity return is higher over the period 1900–2021, which we explore below in section 3B.

### 3B Impact of using the new CPIH back-cast on CPIH-real equity return over the period 1900–2021

In order to assess the impact of the new CPIH back-cast on CPIH-real equity returns, we needed to gather data on nominal UK equity returns over the period. For this purpose, we relied on annual equity return data used by Dimson, Marsh and Staunton (DMS).<sup>14</sup> As shown in Table 3.3, using the new (lower) inflation series published by the ONS leads to a higher estimated average real equity return over the period 1900–2021. The average CPIH-real equity return over this period is 0.24% higher than the original CPI-real equity return.

**Table 3.3 Impact of new inflation series on real-equity returns**

	Old CPI series	New CPI series	New CPIH series
<b>1900–2021 arithmetic average inflation</b>	3.98%	3.91%	3.74%
<b>Difference from old CPI series</b>		-0.07%	-0.24%
<b>1900–2021 arithmetic average real equity returns<sup>1</sup></b>	6.85–6.94%	6.91–7.01%	7.09–7.18%
<b>Difference from old CPI series</b>		0.07%	0.24%

Note: <sup>1</sup> The range in real equity returns is driven by the range of potential values for the 2021 UK equity returns used by DMS. See footnote 14 for more detail.

Source: Oxera analysis based on ONS and DMS data.

The long-term average of real equity returns is generally used to inform the TMR assumption. The analysis in Table 3.3 highlights that the range of CPIH-real TMR adopted by Ofgem was based on incorrect data, as it was based on

<sup>14</sup> We had the yearly breakdown of the data used by DMS for the period 1900–2020, but not for 2021. However, we know that the average UK equity return over the period 1900–2020 was 10.93%, and that over the period 1900–2021 this increased to 11.0%. From this, we can infer that the equity returns in the DMS dataset for 2021 must lie roughly between 13% and 25%. A cross-check using data from other sources suggests that the 2021 equity return was near the middle of this range.

analysis that used the old CPI back-cast to convert nominal returns into CPI-real returns.

A UK Regulators Network (UKRN) study published in 2018 was one of the main sources used by Ofgem to inform its CPIH-real TMR range.<sup>15</sup> In the UKRN study, the authors referred to a previous study which proposed a long-run return on market equity of 5.5% (geometric average), with a range of 6.5–7.5% for the arithmetic average. The authors compared this to the geometric average of UK equity market returns between 1899 and 2016, deflated by the old CPI back-cast series, which amounted to 5.23%, as well as international evidence, with returns just above 5%. They also commented that the adjustment to convert from geometric to arithmetic returns seemed high. On this basis, principally due to employing a smaller (but undefined) adjustment to convert from geometric to arithmetic returns, they proposed a revised range of 6–7% for the CPI-real TMR.<sup>16</sup>

Ofgem used this study to inform its range of CPIH-real TMR of 6.25–6.75%.<sup>17</sup> Given that the new ONS data suggests that CPIH inflation was 0.24% lower than the old estimates of CPI inflation over the period 1900–2021, the CPIH-real TMR should be corrected upwards by c. 0.25% (i.e. Ofgem's own estimated CPIH-real TMR range should be corrected to 6.50–7.00% with a mid-point of 6.75%).

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<sup>15</sup> See Ofgem (2019), 'RIOO-2 Sector Specific Methodology Decision – Finance', 24 May, para. 3.50.

<sup>16</sup> UK Regulators Network (2018), 'Estimating the cost of capital for implementation of price controls by UK Regulators', March, Appendix E.

<sup>17</sup> See Ofgem (2021), 'RIOO-2 Final Determinations—Finance Annex (REVISED)', 3 February, para. 3.86.

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