ADVISORY PANEL ON CONSUMER PRICES – TECHNICAL

The use of unweighted indices in ONS's consumer price statistics

Status: final
Expected publication: alongside minutes

Purpose

1. The Lords Economic Affairs Committee is currently conducting an inquiry into the use of RPI. This has led to much additional commentary around the relative merits and de-merits of the Carli, Jevons and Dutot. Panel members are invited to review the material and comment. For convenience we summarise the main arguments put forward in the referenced material.

Actions

2. Members of the Panel are invited to:
   a) Review recent discussion around the use of unweighted index number methods
   b) Comment on the ONS position that Carli is flawed, and that Jevons and Dutot indices are preferred

Recent discussion around elementary aggregates

Royal Statistical Society (RSS) policy documents on the use of unweighted elementary aggregate formula

3. Please refer to documents on the Royal Statistical Society's Official and National Statistics Policy page for their detailed points regarding the use of unweighted elementary aggregate formulae: https://www.rss.org.uk/RSS/Influencing_Change/Official_and_National_Statistics/Official_statistics_policy/RSS/Influencing_Change/Official_and_national_statistics_sub/Official_and_national_statistics_policy.aspx?hkey=349e1320-e954-4a0a-ba57-5a6ec5d35219
4. In summary, the points raised include:
   - From a letter to Ben Broadbent, Deputy Governor of the Bank of England, regarding his evidence into the House of Lords Economic Affairs Committee's inquiry into the use of RPI –
     - The way that the Carli index is implemented in the Retail Prices Index (RPI) overcomes a number of the criticisms that have been made of the index (for example, the Carli index in RPI is a direct index, and is not chained)
     - The Jevons implies substitution towards goods with lower price rises, which may not always be the case
   - And from an RSS statement on RPI following the June event on the future of RPI –
     - Before 2010 the Consumer Prices Index (CPI) under-estimated clothing prices to a greater extent than RPI; it still probably under-estimates clothing to a certain extent, due to the nature of the Jevons index, which is very sensitive to large price decreases.
     - A full assessment of the use of different methods on different data is badly needed.
5. ONS considers that there is significant evidence that the use of the Carli index in RPI is not appropriate (see for example paragraphs 9, 10, and 14 to 17 below). Making changes to the

collection of clothing prices would not resolve this issue. A pilot was concluded in 2014, which suggested a negligible worsening of the formula effect. Significant changes to the collection would risk damaging CPI, as the changes were intended to resolve an existing bias. We recognise that there are issues with all unweighted methods; however, the failings of the Carli index are more significant.

The House of Lords Economic Affairs Committee Inquiry into the Use of RPI

6. Since June 2018, the House of Lords Economic Affairs Committee has been running an inquiry into the use of RPI. Please refer to the evidence pages for detailed submissions from correspondents: https://www.parliament.uk/business/committees/committees-a-z/lords-select/economic-affairs-committee/inquiries/parliament-2017/the-use-of-rpi/the-use-of-rpi-publications/
7. There are a range of different positions taken, both in favour of, and against the use of the Carli index. Some of the key points raised in favour of the Carli are:

    - There are issues with all of the unweighted index formulae; the case against Carli is overstated, whilst the case against Jevons is underplayed
    - The paper *APCP-T(18)08 Investigating the use of web scraped data to improve clothing measurement* provides evidence of a downward bias in the Jevons index
    - Issues with RPI clothing aggregates could be resolved by dropping clothing items from the basket, by using Dutot or Jevons instead, or by fixing the clothing price collection
    - The Carli is the only unweighted formula that gives an unbiased estimate of a Laspeyres index
    - Chain drift in the RPI is less than 0.02pp per annum

8. ONS accepts that there are limitations with all of the unweighted index number formulae; however, the failings of the Carli are more serious (see for example paragraphs 9, 10, and 14 to 17). We have committed to only make routine changes to the RPI, to maintain continuity of the series for existing users. The idea that APCP-T(18)08 highlights a serious downward bias in the Jevons index is a misunderstanding of the analysis, which simply shows that it is difficult to make a price index from web scraped clothing data.

Shortcomings of the Retail Prices Index as a Measure of Inflation

9. In March 2018, the ONS published an article entitled, 'Shortcomings of the Retail Prices Index as a Measure of Inflation'. Please refer to: https://www.ons.gov.uk/economy/inflationandpriceindices/articles/shortcomingsoftheretailpricesindexasameasureofinflation/2018-03-08

10. In summary, they key points relating to the use of the Carli index are:

    - The use of the Carli index in the compilation of consumer price statistics is not international best practice
    - The Carli formula is not transitive; that is, a direct Carli index will differ from a chained Carli index
    - In January 2016, based on the evidence from clothing, APCP-T recommended that the Carli formula is less suitable than the Jevons or Dutot

- When using the Carli the price index rise tends to be much higher than the rise in the typical price, whereas the Jevons is much closer to the expected value

Consumer Price Indices in the UK (Courtney, 2015)

11. In January 2016, APCP-T discussed the paper, 'Consumer Price Indices in the UK' with the author, Dr Mark Courtney. Please refer to: https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/11/Consumer-Price-indices-in-the-UK.pdf

12. In summary, the key points from the paper are:

    - Other countries don't use Carli because their product definitions are more tightly defined, meaning that the Dutot can be used instead; however, more heterogeneous product definitions allow for broader coverage of items in the UK
    - Any upward bias in the RPI due to chain linking is small
    - The Carli index is an unbiased estimator of a Laspeyres index
    - The difference between RPI and CPI is predominantly underestimation by CPI

13. For a reminder of the discussion at APCP-T, and the Panel's view, please refer to: https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/04/APCP-T1603-Minutes-Jan-16.pdf and the note: https://www.statisticsauthority.gov.uk/wp-content/uploads/2016/11/Dr-Courtneys-note-on-Jan-minutes.pdf. In summary, the panel found the mathematical properties of the elementary aggregate formulae finely balanced. However, the evidence based on the clothing shows that the Carli formula is less suitable than the Jevons and Dutot formulae.

UK Consumer Price Statistics: A Review (Johnson, 2015)

14. Please refer to Chapter 10 of the Johnson Review, published in January 2015: https://www.statisticsauthority.gov.uk/wp-content/uploads/2015/12/images-ukconsumerpricestatisticsarevie_tcm97-44345.pdf

15. In summary, the main points raised by Johnson regarding the use of elementary aggregate formulae are:

    - The Carli index fails a number of axiomatic tests, notably transitivity and time reversal
    - Chain drift is a serious problem for the RPI, based on evidence of an interaction effect due to chainlinking at higher levels
    - Use of the Carli index for consumer price statistics is not international best practice
    - The choice between Dutot and Jevons is not clear. Dutot is not suitable when there are substantial differences in price, whereas Jevons behaves differently from the other indices when there are substantial price rises or falls

Consumer Price Statistics in the UK (Diewert, 2012)

16. In 2012 the ONS commissioned Erwin Diewert to review the RPI. Please refer to: https://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.22/2014/WS1/WS1_1_Diewert_on_Diewert_Consumer_Price_Statistics__in_the_UK_v.7__06.08__Final.pdf

17. In summary, the key points raised in this review are:

- The RPI should drop its use of the Carli index as an elementary index and replace it by either the Jevons or the CSWD index
- The Carli's failure of the time reversal test is a fundamental flaw and, as a result, it will tend to give higher measured rates of inflation than a formula which satisfies the time reversal test
- The stochastic approach points to Jevons as the most suitable index
- The idea that Jevons or Carli are more or less appropriate depending on the amount of substitution within a stratum is based on a misinterpretation of Diewert's analysis in the ILO Manual

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