Office for National Statistics

Consultation

National Statistician's consultation on options for improving the Retail Prices Index

October 2012

Contents

Introduction

1. The Retail Prices Index (RPI) measures changes over time in the cost of goods and services that people buy. The National Statistician is consulting about aspects of the methodology used to calculate the RPI:
    i) the formulae used in parts of the calculations and
    ii) the measurement of private housing rental prices.
2. The National Statistician invites views on options for amending the way the RPI is constructed at the lowest level of aggregation. Differences between the RPI and Consumer Prices Index (CPI) estimates of inflation are due in part to different formulae used in the indices. This is known as the formula effect.
3. On the advice of the National Statistician, the UK Statistics Authority agreed two priorities for the development of consumer price statistics and these were reflected in the Consumer Prices Advisory Committee's (CPAC) annual report for 2011 and the Office for National Statistics (ONS) programme of work. The first was the inclusion of owner occupiers' housing costs (OOH) in a measure of consumer price inflation. A consultation on the method for including OOH in a new additional measure of inflation closed on 31 August 2012 and ONS will publish its response to the consultation towards the end of October 2012. The second was the formula effect between the RPI and CPI, and that is what this consultation is about. A list of the papers taken to CPAC on these two priorities can be found in Annex H.
4. ONS has been undertaking a programme of work to understand the causes of the formula effect since late 2010. The decision to undertake a consultation on these issues now was taken by the National Statistician after receiving evidence on statistical best practice and discussion with CPAC, which suggested the use of the Carli method for aggregating price change data at the very detailed level in the RPI should be reconsidered.
5. The National Statistician is setting out four options and welcomes views. Respondents should note that the consultation is on statistical methodology and best practice, though the consequences of any potential change are noted.
6. This consultation also includes, in part 2, a proposal to change the way private housing rental prices are measured in the RPI and CPI through the use of a new data source. Views are also sought on this proposal.
7. ONS has an ongoing programme of work that reviews different aspects of its statistics, including price statistics. Details on the forward work programme for price statistics, which will continue beyond this consultation, are included in CPAC's annual report for 2012, which will be published in October 2012.

The formula effect

8. After consideration of the evidence ONS has gathered, including advice from experts, the National Statistician is seeking views on the following options:
    1) **No change.** This option would leave the formula effect as it is.
    2) **Change one particular approach to averaging changes in prices,** which calculates the average of price relatives (the amount a price changes over time for the same type of item where there is no information about consumers' precise expenditure), **for clothing**. It is for the clothing category that the difference between the CPI and RPI formulae has the greatest effect. Options for the method to be used in its place are discussed in this document. This would reduce but not remove the formula effect as some differences between the RPI and CPI formulation would remain.
    3) **Change one particular approach to averaging changes in prices,** which calculates the average of price relatives, **for all categories** that use it. Options for the method to be used in its place are discussed in this document. This would reduce the formula effect, although some difference between the RPI and CPI formulation would remain.
    4) **Change the RPI so that its formulae align fully with those used in the CPI.** This would remove the formula effect between the RPI and CPI, although there would remain differences between the estimates produced by each because of the different coverage, weights and scope used.

Private housing rental data

9. Both the RPI and CPI include measures of change in the price of private housing rents. This consultation invites views on proposals to improve the measurement of these prices. Subject to the consultation responses, this change will be implemented alongside one of the options set out above to address the formula effect.

Consultation timetable

10. The National Statistician announced on 18 September her intention to consult on changes to the RPI and the four options which would be the subject of that consultation. The consultation period begins with the publication of this document on 08 October 2012 and will close on 30 November 2012. Please ensure that your response reaches ONS by this date.
11. Responses to the consultation can be submitted by completing the feedback form or by sending comments by email to: RPIConsultation@ons.gsi.gov.uk

Alternatively, responses can be sent to:

National Statistician (RPI consultation)
Government Buildings
Cardiff Road
Newport
South Wales
NP10 8XG

12. A feedback form[1] has been included with a set of guideline questions that respondents are asked to consider.
13. When responding, please state whether you are responding as an individual or representing the views of an organisation. If responding on behalf of an organisation, please make clear who the organisation represents and, where applicable, how the views of members were assembled.
14. This consultation reflects the specific legal duties that govern changes to the RPI. In that respect, there is a duty to consult with the Bank of England and possibly the Chancellor of the Exchequer.

Confidentiality and data protection

15. Information provided in response to this consultation, including personal information, may be subject to publication or release to other parties or to disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 and the Environmental Information Regulations 2004).
16. If you would like the information, including personal data, that you submit to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, among other things, with obligations of confidence. In view of this it would be helpful if you could explain to ONS why you regard the information as confidential. If ONS receives a request for disclosure of the information ONS will take full account of your explanation, but cannot give an assurance that confidentiality can be maintained in all circumstances. Before disclosing any information that is personal to you, ONS will inform you of this in advance of any disclosure. An automatic

[1] 'National Statisticians consultation on options for improving the Retail Prices Index: Feedback form', ONS: http://www.ons.gov.uk/ons/about-ons/user-engagement/consultations-and-surveys/national-statistician-s-consultation-on-options-for-improving-the-retail-prices-index/index.html

confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on ONS.

17. If you would prefer your response and your name to be kept confidential, please make this clear in your response. Confidential responses will be included in any summary of comments received and views expressed.

After the consultation

18. A response to the consultation, with a summary of the responses provided, will be published within 12 weeks of the consultation closing.

How to comment on the consultation process

19. If you would like to make any comments about the consultation process, please contact:

Lyn Hawkins, Consultations Coordinator
Room 1.101
Government Buildings
Cardiff Road
Newport
NP10 8XG
Email: lyn.hawkins@ons.gov.uk

1. Part one: Background

20. Everything that consumers buy has a price, which may change over time. The RPI and CPI are designed to measure such changes. A convenient way to understand the nature of these indices is to envisage a very large shopping basket comprising all the different kinds of goods and services bought by a typical household. As the prices of individual items in this basket change, the total cost of the basket will also change - consumer price indices measure the change from month to month in this total cost. However, no two households spend their money in exactly the same way. Each household's or person's experience of inflation will be different. The CPI and RPI are measures of average inflation, based on average household expenditure on the items in the shopping basket. As such, they do not measure the cost of living, rather, changes in the prices of goods and services consumed by households.

2. Uses of RPI

21. The RPI was introduced in 1947 and was made an official inflation measure in 1956. The CPI has a much shorter history than the RPI, being introduced in 1996 as the Harmonised Index of Consumer Prices (HICP) in response to the EU's HICP regulation[2]. In 2003 the Chancellor of the Exchequer announced in his Pre-Budget Report that the UK inflation target would in future be based on the CPI (or as known then, the UK HICP), replacing the RPI excluding mortgage interest payments (RPIX). The reasons for the change were set out by HM Treasury in the Pre-Budget Report 2003[3] for the Bank of England's Monetary Policy Committee. At the time, the Chancellor confirmed that pensions, benefits, and index-linked gilts would continue to be calculated on the same basis as previously, that is, with reference to the all items RPI or its derivatives.
22. Since the Pre-Budget Report in 2003 many users of the RPI have switched to using the CPI. In April 2011, the government switched from using the RPI to the CPI for the indexation of benefits, tax credits and public sector pensions.
23. The RPI continues to be used for a variety of purposes. Index-linked government bonds continue to be adjusted in line with movements in the RPI as do large numbers of private sector pension schemes. For students in England and Wales the interest rate paid on their student loans depends on the RPI. The RPI is also often used in pay bargaining. Furthermore, the RPI is used for price regulation, notably for certain privatised utilities and

[2] Harmonised Indices of Consumer Prices (HICP): A short guide for users, Eurostat: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-BE-04-001/EN/KS-BE-04-001-EN.PDF
[3] Pre-Budget Report (December 2003), HM Treasury: http://webarchive.nationalarchives.gov.uk/20091222074811/http:/www.hmrc.gov.uk/pbr2003/index.htm

train fares, where prices are constrained to rise by no more than a rate dependent on the RPI. Further details of the users and uses of RPI can be found in Annex A.

3. Differences between the RPI and the CPI

24. The main differences[4] between the RPI and CPI relate to:
    - **population base** – the RPI excludes very high and low income households and hence the CPI has a wider population coverage than the RPI
    - **commodity coverage** - the CPI excludes owner occupiers' housing costs[5] and hence the RPI has wider commodity coverage than the CPI
    - **different formulae used to combine prices at the first stage of construction of the indices** - It is this aspect that is the primary focus of this consultation.
25. The use of different formulae at the first stage of construction of price indices, with what are termed 'elementary aggregates', causes the formula effect. Elementary aggregates are groups of relatively similar (homogeneous) goods and services. They may cover the whole country or regions within the country or may be distinguished for different types of outlets depending on the availability of information. An example of an item within the food category would be apples. Within the elementary aggregate, the apples may be different varieties, organic or not, country of origin etc. As well as being similar products the aim is to have items that are expected to have similar price movements such that the range of price movements within the aggregate is minimised.
26. Each elementary aggregate typically contains a large number of individual goods or services, or items, but in practice only a small number can be selected for pricing. When selecting the items, ONS aims to select products for which price movements are believed to be representative of all the products within the elementary aggregate. The objective is to try to track the price of the same item over time for as long as possible, or as long as the item continues to be representative. Therefore, the items selected are ones that are expected to remain on the market for some time, so that like can be compared with like.
27. There is typically no information available on households' expenditure at the level of the elementary aggregate. Because of this it is necessary to average prices of items together using an unweighted approach. As noted above, the RPI uses arithmetic averages (means) for elementary aggregates whereas the CPI uses a mixture of arithmetic and geometric averages.

[4] Annex B: Remaining differences between elementary aggregate formula
[5] The inclusion of owner occupiers' housing costs in the CPI has been subject to a separate consultation. The outcome will be published towards the end of October 2012.

28. In constructing consumer price indices, most statistical institutes choose between two formulae. These are the Dutot and the Jevons. In the UK the Carli is also used. Dutot and Carli are arithmetic approaches and Jevons is a geometric approach.
29. The RPI uses a combination of Carli and Dutot formulae to calculate elementary aggregate indices, whereas in the CPI (where the use of the Carli is effectively prohibited by a legally binding European regulation[6]) a Jevons is used to calculate the majority of elementary aggregates, with the remainder using the Dutot. Both indices also contain a number of goods and services where suitable expenditure weighting information is available or, due to special circumstances, other elementary aggregate formulae are used. Table 1 below shows the current formulae used in the RPI and CPI, by approximate expenditure weight of the respective indices.

Table 1: Current formulae used in the RPI and CPI, 2012

	RPI	CPI
Carli	27%	0%
Dutot	29%	5%
Jevons	0%	63%
Other/weighted formula	43%	33%

Source: ONS

30. If the Carli, Dutot and Jevons all produced the same result there would be no formula effect gap. However, the different measures produce sometimes large differences in their results.
31. The following table (Table 2) looks at how the Carli, Dutot and Jevons are constructed and presents some of their accepted strengths and weaknesses. These properties can be used to guide the choice of the most appropriate formula for a cost of goods index.

[6] The Carli can only be used if it can be shown to produce comparable results to indices produced using the Jevons and Dutot. See Official Journal of European Communities, Eurostat, Commission Regulation (EC) No 1749/96, annex II: http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/documents/Tab/Tab/02-IMPLEM-EN.pdf

Table 2: Main differences between elementary aggregate formulae (see Annex B for a worked example of each)

Elementary aggregate formula	Carli	Dutot	Jevons
Description	Developed in 1764 by Carli, an Italian economist, this formula is the arithmetic average (mean or average) of the price relative, or ratio, between a period *t* and a base period *0*.	Developed in 1738 by French economist Dutot, this formula uses an index calculated by dividing the average price in period *t* by the average price in period *0*.	Developed in 1863 by English economist Jevons, this formula is the geometric average of the price relative of period *t* and base period *0*.
Current usage	The Carli is used in the RPI where wider variations in price, resulting from broader item descriptions, limit the application of the Dutot. For example, clothing and furniture. It accounts for roughly 27 per cent of first stage aggregation in the RPI.	The Dutot is used in the RPI for tightly defined items, for example food, alcohol and tobacco. It accounts for roughly 29 per cent of first stage aggregation in the RPI.	The Jevons is not used in the RPI but it accounts for around 63 per cent of the first stage of aggregation in the CPI.
Strengths	*Test approach (see section 5)* • Passes most of the usual tests for a price index, including the proportionality test where if all prices are x times the prices in the price reference period, the index should equal x • passes the changes in the units of measurement test where the price index should not change if the quantity units in which the products are measured are changed (for example, if the prices are expressed per litre rather than per pint)	*Test approach (see section 5)* • Passes most of the usual tests for a price index, including the proportionality test where if all prices are x times the prices in the price reference period, the index should equal x • passes the time reversal test where if all the data for the two periods are interchanged, then the resulting price index should equal the reciprocal of the original price index • passes transitivity test. This is where an index that is produced by building a chain from the base month to a	*Test approach (see section 5)* • Passes all of the usual tests for a price index, including the proportionality test where if all prices are x times the prices in the price reference period, the index should equal x • passes the changes in the units of measurement test where the price index should not change if the quantity units in which the products are measured are changed (for example, if the prices are expressed per litre rather than per pint) • passes the time

Elementary aggregate formula	Carli	Dutot	Jevons
		reference month, by using changes between the months in the chain, gives the same result as one that is produced by comparing the base month directly with the reference month	reversal test where if all the data for the two periods are interchanged, then the resulting price index should equal the reciprocal of the original price index • passes transitivity test • is more robust to outliers (high values for item prices)
Weaknesses	*Test approach* • fails the time reversal test where if all the data for the two periods are interchanged, then the resulting price index should equal the reciprocal of the original price index. • fails transitivity tests • susceptible to price bouncing (see illustration in Annex D) • has an upward bias.	*Test approach* • fails the changes in the units of measurement test, where the price index should not change if the quantity units in which the products are measured are changed (for example, if the prices are expressed per litre rather than per pint) *Other aspects* • becomes increasingly arbitrary as the set of products becomes more diverse	*Test approach* • none, as it passes all of the tests *Other aspects* • If any one observation out of a set of observations is zero, their geometric mean is zero, whatever the values of the other observations.

Source: ILO Manual

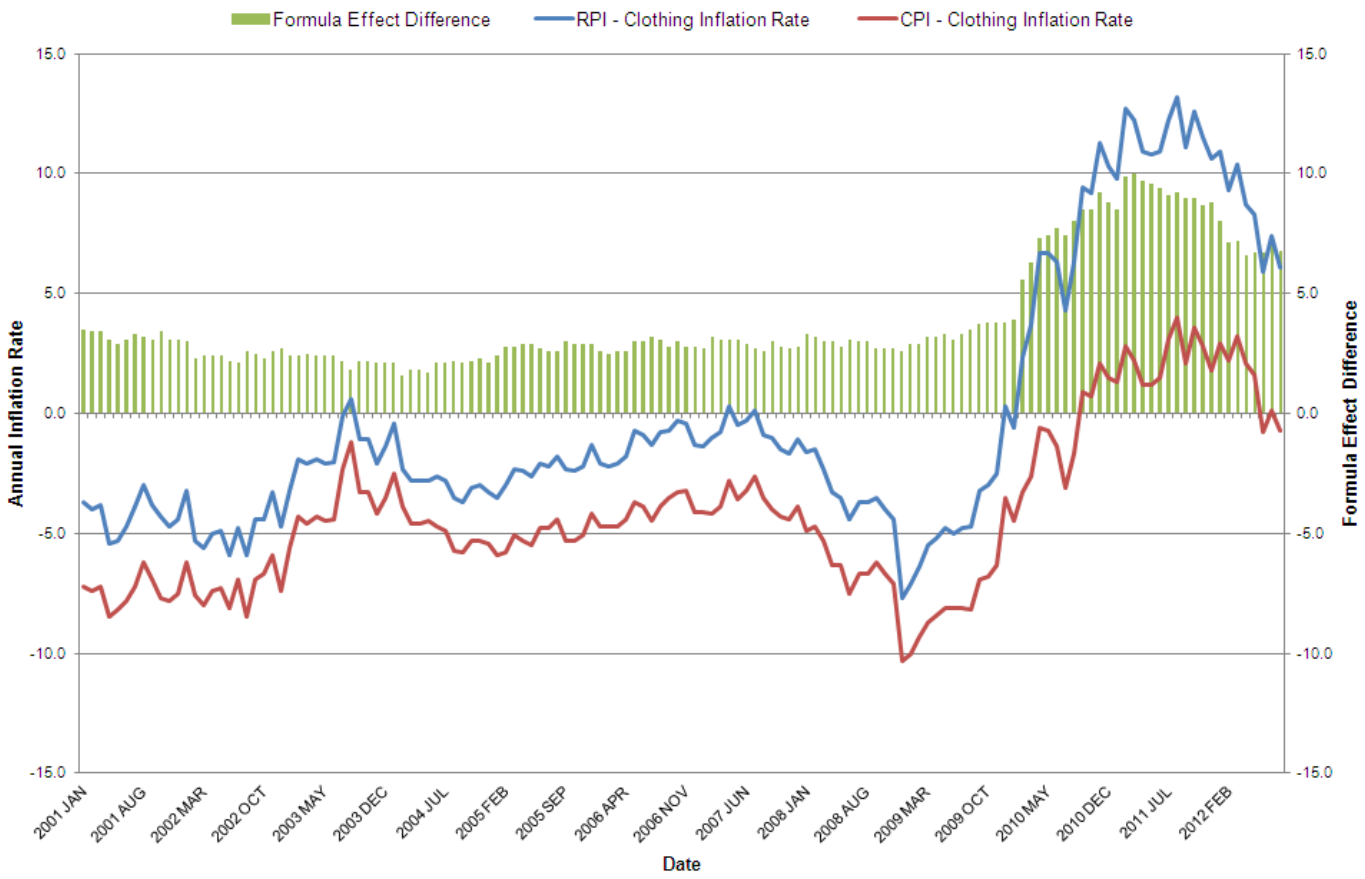
4. The impact of clothing price collection changes

32. The Carli is used to produce the clothing elementary aggregate indices in the RPI and the Jevons is used in the CPI. This difference is the primary cause of the formula effect, which was relatively stable at around 0.5 percentage points on the annual growth rate until changes were introduced to the collection guidelines for clothing in 2010[7]. The changes were

[7] Annex E: ONS price collection guideline changes for clothing prices from 2010

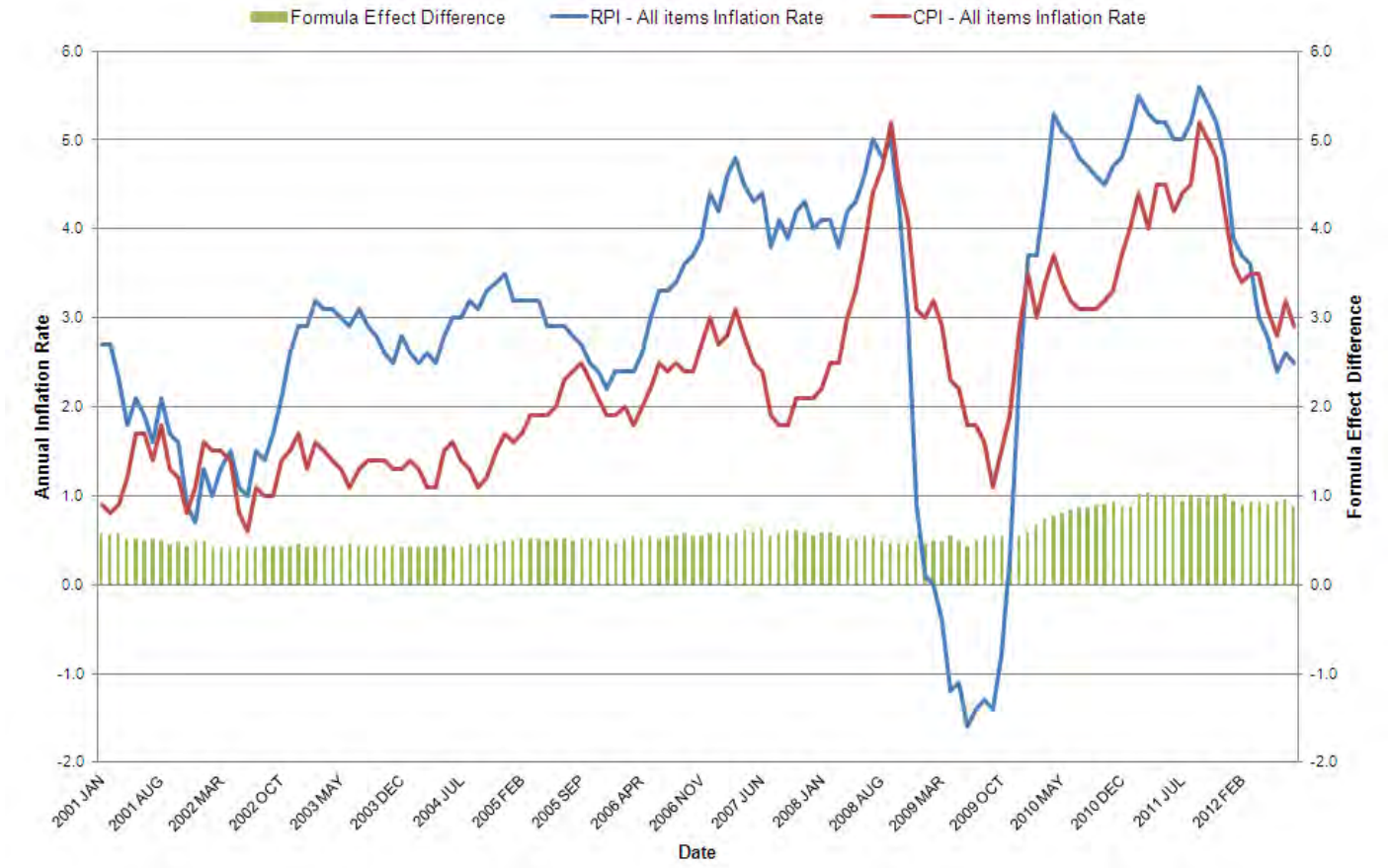
introduced to improve the quality of clothing price collection, but resulted in the formula effect widening to around 1.0 percentage point. This can be seen from the following two charts. The first (Figure 1) shows that, between 2001 and 2009, annual clothing and footwear prices in the CPI fell by 5.3 per cent on average, while in the RPI, they fell by 2.5 per cent on average. In 2011, clothing and footwear prices in the CPI rose by 2.3 per cent a year on average, while in the RPI they rose by 11.5 per cent. As a consequence, the formula effect difference increased from around 2 to 3 percentage points to an average of around 9 percentage points. The second (Figure 2), which shows the formula effect for all items rather than just clothing, illustrates that the gap widened from around 0.5 percentage points to around 1.0 percentage point.

Figure 1: Clothing Inflation Rates in the RPI and CPI: January 2001 - July 2012



Source: ONS

Figure 2: All Item Inflation Rates in the RPI and CPI: January 2001 - July 2012



Source: ONS

33. It should be noted that there are a number of differences between the RPI and CPI (set out in paragraph 24), some of which counteract the impact of the formula effect. Given this, it is not appropriate to expect the bars in figures 1 and 2 to sum to the difference between the lines.
34. In response to the increase in the gap, driven by clothing prices, ONS undertook a number of pieces of research. The work showed that the changes to the clothing price collection guidelines led to an increase in the range of price movements that were being measured; statistically, the variance of the price relatives increased[8]. That is because there were more and wider variations in price changes of an item after the change than were captured before it. The intention of the change was to reduce the number of items where there was no price quote obtainable. Prior to the change, missing items were replaced and the replacement items had their inflation imputed. The standardised approach to imputation meant many price movements were similar and so the variance was low. As a result, the Carli produced higher inflation rates (recall its properties set out in Table 2) than the Jevons.

[8] Annex F: Price variance

35. Initially, ONS looked at whether this variation could be addressed through normal statistical methods, including additional stratification of outlets[9] and further changes in price collection[10] guidelines, but the work does not address the fundamental problem of the Carli, which is its propensity to have an upward bias.
36. In addition to looking at the properties of the price data, ONS's research also looked at the approaches used by national statistical institutes[11] around the world (and only Slovenia could be found to use different formulae in its national and European indices), sought advice from a leading expert in index number theory (Professor Erwin Diewert[12] of the University of British Columbia) and extended its understanding of the economic[13] and statistical arguments in favour of each index. All of this pointed to the use of the Carli in the RPI as the primary driver of the formula effect.
37. Given these findings, ONS revisited the approaches used for choosing formulae at the elementary aggregate level. The two most important approaches are the test (or axiomatic) approach and the economic approach[14].

5. Choosing a formula for the elementary aggregate

38. The **test approach** is one that determines the choice of an index number formula on the basis of its mathematical properties. A list of tests is drawn up[15], each test requiring an index to possess a certain property or satisfy a certain axiom. An index number may then be chosen on the basis of the number of tests satisfied. The Carli index fails the time reversal and transitivity tests[16]. In principle, it should not matter whether we choose to measure price changes forwards or backwards in time. We would expect the same answer, but this is not

[9] 'Managing the formula effect - stratification of outlets', CPAC(12)06, ONS: http://www.ons.gov.uk/ons/guide-method/development-programmes/other-development-work/consumer-prices-advisory-committee/cpac-papers/index.html
[10] 'The formula effect gap between the RPI', CPAC(12)24, ONS: http://www.ons.gov.uk/ons/guide-method/development-programmes/other-development-work/consumer-prices-advisory-committee/cpac-papers/index.html
[11] 'International comparison of the formula effect between the RPI and CPI', ONS: http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/index.html
[12] 'Erwin Diewert on Consumer Price Statistics in the UK', ONS: http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/index.html & Annex G: Explanatory note and summary of Professor Erwin Diewert's report on Consumer Price Statistics in the UK.
[13] Discussion Paper: 'Results of ONS Research into the Application of the Stochastic and Sampling Approaches to the Choice of Elementary Aggregate Formula', ONS: http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/index.html
[14] ILO/IMF/OECD/UNECE/Eurostat/The World Bank (2004). Consumer Price Index Manual: Theory and Practice, Geneva, International Labour Office.
[15] 'Erwin Diewert on Consumer Price Statistics in the UK', ONS: http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/index.html & Annex G: Explanatory note and summary of Professor Erwin Diewert's report on Consumer Price Statistics in the UK.
[16] See Table 2 for details on some of these tests.

the case for the Carli. The Carli index fails the important time reversal test such that a Carli index calculated forwards, between periods 0 and t, exceeds one calculated backwards, between periods t and 0; it is upwards-biased. The Dutot index is meaningful for a set of homogeneous items but becomes increasingly arbitrary as the set of products becomes more diverse. The Dutot index satisfies all of the main tests with the important exception of the commensurability test, that is, if the unit of measurement for items change, then the elementary index remains unchanged. However, for homogeneous items commensurability is not an issue and the Dutot index can then be used.

39. On the other hand, the Jevons index satisfies all the tests and, from an axiomatic point of view, the Jevons index seems to be the index with the best properties and the Carli the weakest.
40. The **economic approach** to index number theory assumes that quantities purchased are functions of the prices, with the observed data being generated as solutions to various economic optimization problems. In the economic approach, the objective is to estimate an economic index – that is, more like a *cost of living* index for the elementary aggregate. Because this differs to the aim of the RPI, it being a *cost of goods* index, the economic approach is less pertinent. However, it is discussed here because it is often referred to by commentators when candidate indices, such as the Carli or Jevons, are compared.
41. There are two special cases of some interest. The first case is when consumers continue to consume the same relative quantities whatever the relative prices. Consumers prefer not to make any substitutions in response to changes in relative prices. The second case occurs when consumers are assumed to vary the quantities they consume in inverse proportion to the changes in relative prices. On the basis of the economic approach, the choice between the Jevons and the Carli rests on which is likely to approximate more closely to the underlying cost of living index: in other words, on whether the (unknown) propensities to substitute are likely to be closer to one or zero, on average. In practice, the propensities could take any value ranging up to plus infinity for an elementary aggregate consisting of a set of strictly homogeneous items, that is, perfect substitutes.
42. But, as noted, this refers to special cases and is relevant for *cost of living* approximations and Professor Diewert's conclusion on this approach is instructive. He finds "*The Consumer Price Index Manual*[17] has a section in it which describes an economic approach to elementary indexes. This section has sometimes been used to justify the use of the Jevons index over the use of the Carli index or vice versa depending on how much substitutability exists

[17] ILO/IMF/OECD/UNECE/Eurostat/The World Bank (2004). Consumer Price Index Manual: Theory and Practice, Geneva, International Labour Office.

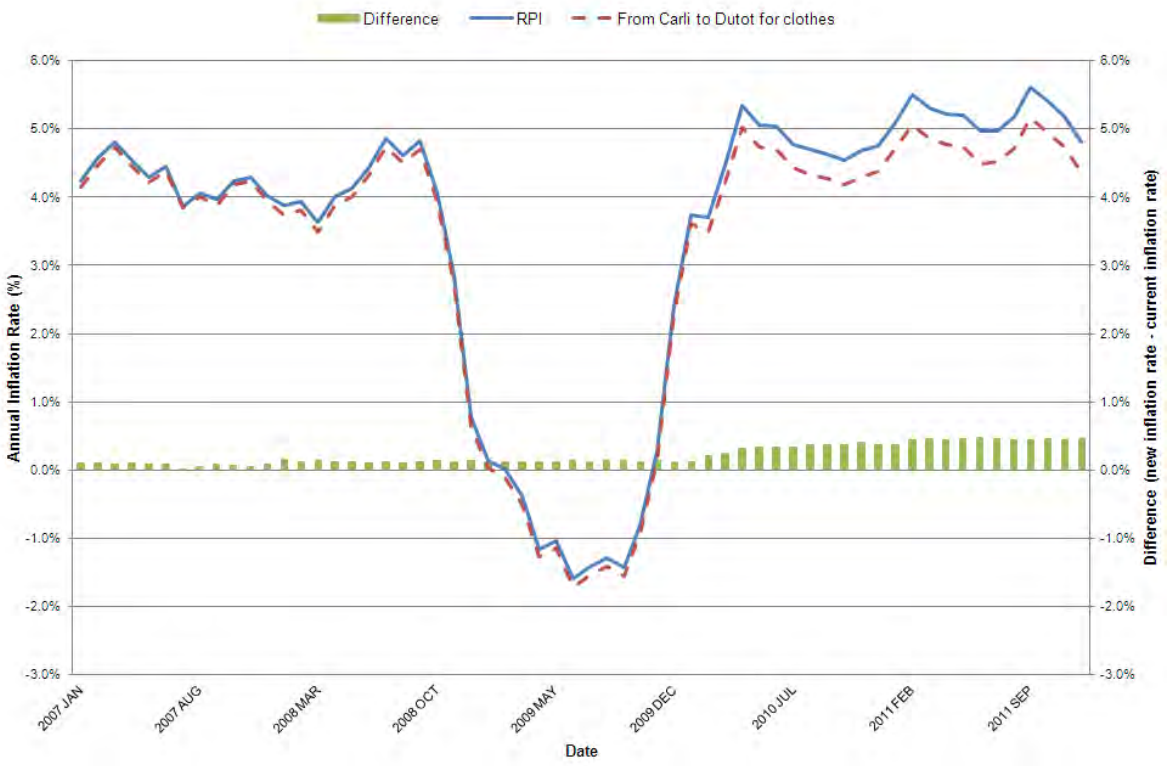
between items within an elementary stratum. If it is thought that there is a great deal of substitutability between items, then it is suggested that the Jevons index is the appropriate index to use. If it is thought that there is very little substitutability between items, then it is suggested that the Carli or the Dutot index is the appropriate index to use. This is a misinterpretation of the analysis that is presented in this section of the Manual…..*The economic approach cannot be applied at the elementary level unless price and quantity information are both available*."

43. Given these findings, ONS has concluded that the choice of appropriate elementary aggregate formulae in the CPI and RPI should be based on statistical considerations and empirical evidence. On that basis, and given the widening of the formula effect gap following the changes to clothing collection guidelines in 2010, the continued use of the Carli in the RPI should be reconsidered. A range of options in respect of that question have subsequently been developed and are set out below, together with a set of questions, which respondents are invited to answer.

6. Options for change

44. The options are:

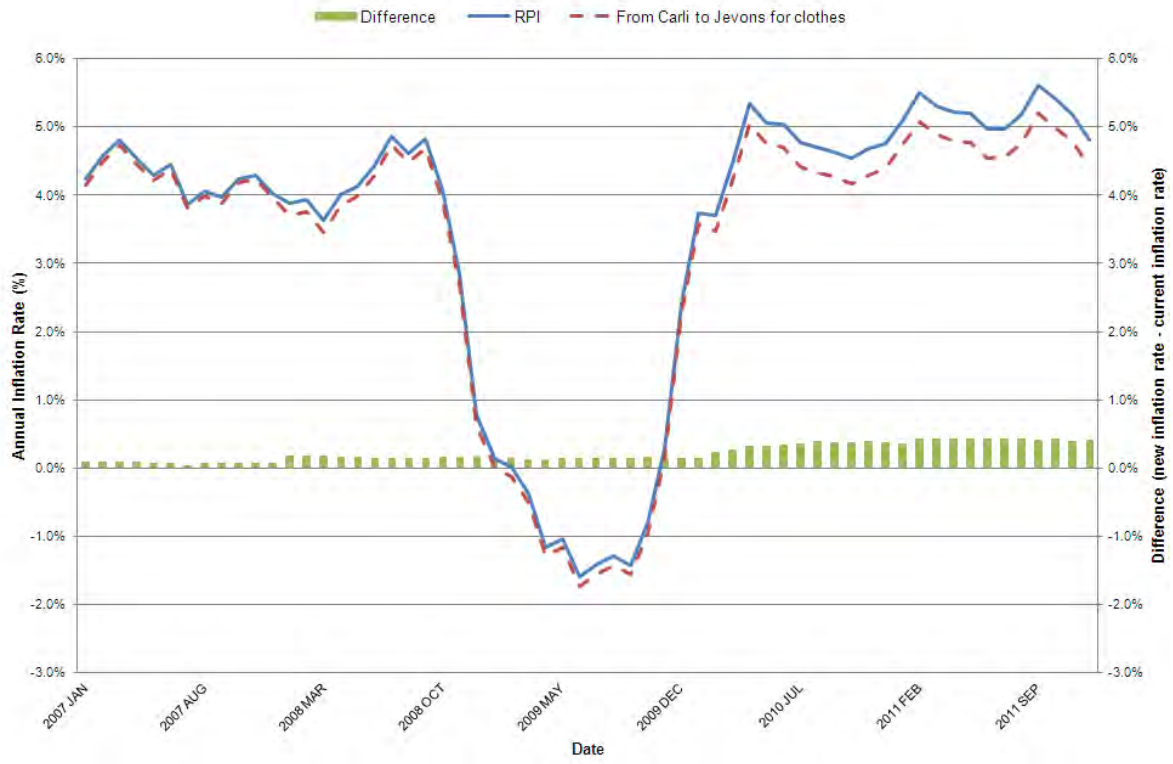
Option 1	No change
Summary	No change. The reasons for the formula effect have been identified, explained and understood.
Description	The analysis included in this document explains how the formulae used in the RPI and CPI differ and why the changes in the price collection guidelines, introduced at the beginning of 2010, led to a widening of the formula effect. This was because the changes led to an increase in the variance of the price relatives for clothing. That is, there were more and wider variations in the price change of an item after the change than were captured before it. The intention of the change was to reduce the number of items where there was no price quote obtainable. Prior to the change, missing items were replaced and the replacement items had their inflation imputed. The standardised approach to imputation meant many price changes were similar and so the variance was low. This changed after the collection guideline changes, and can be seen for a selection of items in the charts at Annex F. Given this knowledge, users may contend that the formula effect difference, of around 1.0 percentage point, is acceptable given the approach to averaging of elementary aggregates in the RPI. However, because of the known limitations of the Carli index, it is difficult to defend based on international practice, and on certain approaches to assessing the performance of index numbers. Given this, the National Statistician has decided that the need to consult on a possible change was very clear, and the advice from CPAC was the same.
Impact	**There is no impact as there is no change. The only impact might be because of the change in the source of private housing rental data (see Part 2 of this document)**
Question	**Do you support the option of no change? If so, please say why using the feedback response form.**

Option 2	Stop using the Carli to estimate price change for clothing
Summary	Stop using the Carli to estimate price change for clothing items[18], with options of the method to be used in its place. This would reduce but not remove the formula effect as some differences between the RPI and CPI formulation would remain.
	The two alternative formulae are the Dutot and the Jevons. In considering alternatives to the Carli, respondents may want to recall the properties for each set out in Table 2, and note that the Dutot is already used in the RPI. Choosing the Jevons or Dutot in place of the Carli would lead to a reduction in the formula effect, but, under current conditions, a gap of around 0.3 percentage points would remain.
Impact[19]	**Figure 3: Changing from the Carli to Dutot for clothing**  *Source: ONS*

[18] The clothing items are outlined in the spreadsheet for 'Elementary aggregate formula within the RPI' in Data for consultation on improving the RPI, ONS: http://www.ons.gov.uk/ons/about-ons/user-engagement/consultations-and-surveys/national-statistician-s-consultation-on-options-for-improving-the-retail-prices-index/index.html

[19] The following charts show the estimated impact that each of the options would have had on the all items RPI annual rate of change. It is important to note that any change would take a full year to have its full effect since there is no proposal to amend retrospectively the formulae used to generate RPI estimates that have already been published. The estimates in the charts have been produced in an analytical system, outside of the main CPI and RPI system. The different specifications of the two systems lead to there being some minor differences between the analytical 'impact estimates' and published RPI statistics. The differences should not impede the interpretation of the impact of any change.

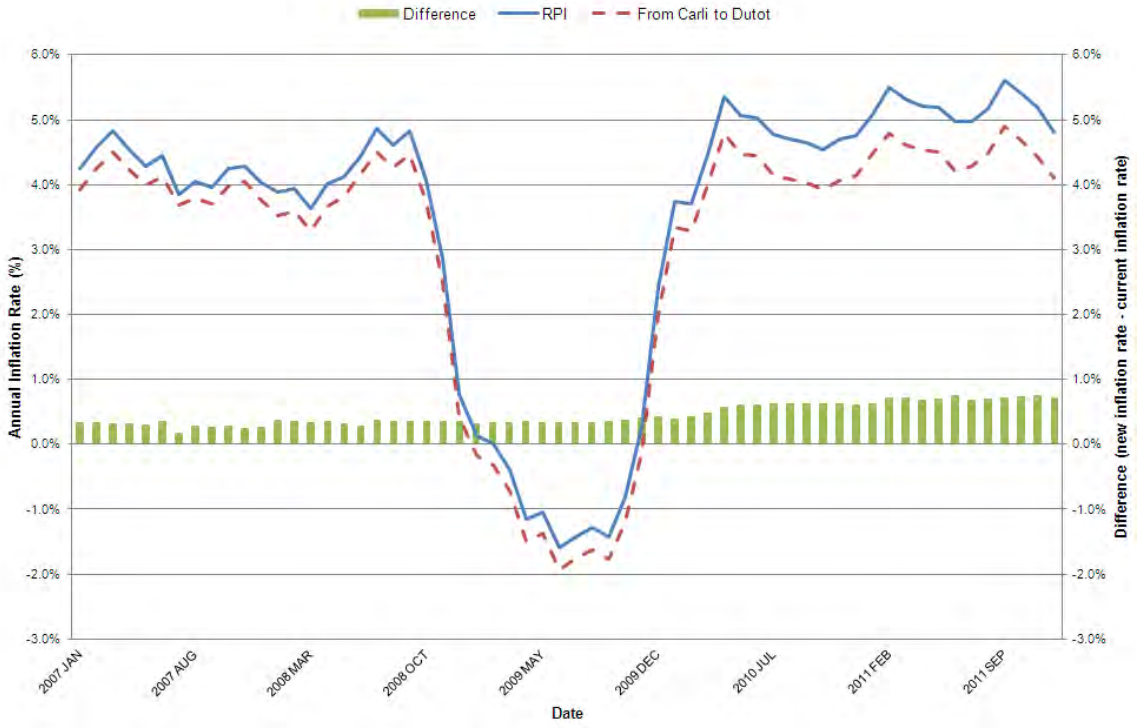
Figure 4: Changing from the Carli to Jevons for clothing



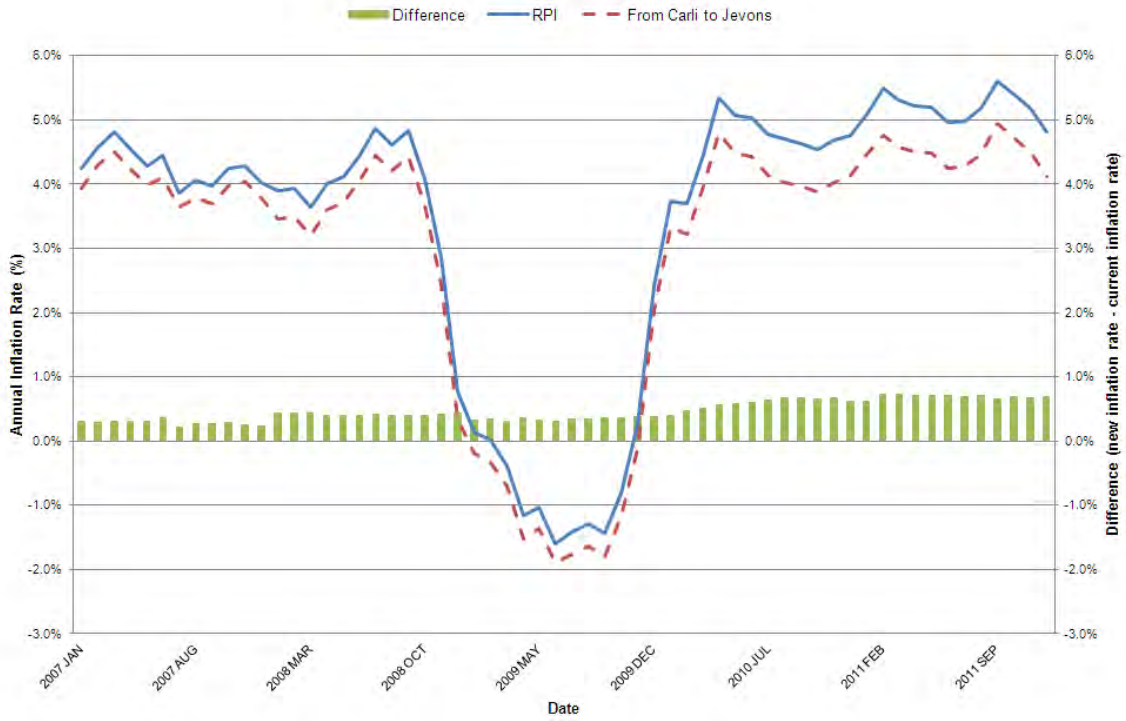
Source: ONS

Question	**Do you support the option of removing the Carli for clothing? If so, please say why using the feedback response form and indicate whether you would prefer to see it replaced with the Dutot or Jevons.**

Option 3	Stop using the Carli for all items in the RPI
Summary	Stop using the Carli for all items in the RPI. Replacing the Carli with either the Dutot or the Jevons would reduce the formula effect to a minimum, although some difference between the RPI and CPI formulation would remain.
	This option is an extension of option 2, extending the replacement of the Carli beyond clothing such that its use in the RPI is stopped altogether. Again, the choice of the replacement is yet to be defined, but similar issues around the Dutot/Jevons properties are relevant.
Impact	**Figure 5: Changing from the Carli to the Dutot for all items**



Source: ONS

	Figure 6: Changing from the Carli to the Jevons for all items  *Source: ONS*
Question	**Do you support the option of removing the Carli for all items? If so, please say why using the feedback response form and indicate whether you would prefer to see it replaced with the Dutot or Jevons.**

Option 4	Change the RPI so that its formulae align fully with those used in the CPI
Summary	Change the RPI so that its formulae align fully with those used in the CPI.
Description	This would remove the formula effect between the RPI and CPI, though there would remain differences in estimates because of the different coverage, weights and scope used in each.
Impact	**Figure 7: Replacing formulae for all items where they are different from the approach used in the CPI**  *Source: ONS*
Question	**Do you support the option of aligning the formulae in the RPI with those used in the CPI? If so, please say why using the feedback response form**

7. Part two: Measuring private housing rental prices in the RPI and CPI

Introduction

40. During 2012, ONS reviewed the method currently used to measure private housing rental prices in the RPI and the CPI.

Recommendations

41. The recommendations are that:
    i. ONS changes the method used to measure private housing rental prices in the RPI and CPI. The proposal is to use private housing rental data from the Valuations Office Agency (VOA) plus comparable data from the Welsh and Scottish Governments instead of the private housing rental data currently collected by ONS.
    ii. the new method should be introduced for the February 2013 RPI and CPI, published in March 2013.

Current method used to measure private rental prices

42. Currently, private housing rental data are collected from letting agents in 141 locations throughout the UK. In each location rental prices for six furnished and six unfurnished properties are collected on a quarterly basis. Different locations are allocated different months in the quarter, so some data are collected each month. Prices are rolled forward during non-collection months.

Drivers for the implementation of an improved measure

43. A review conducted by ONS and work by the HICP Implementation Group on Quality Adjustment and Sampling[20] suggested that there was a need to improve the quality of the private housing rental series used in the RPI and CPI. In addition to this, ONS was required to develop a private housing rental series better suited to calculating one approach to an OOH index, using the rental equivalence approach (OOH(RE))[21].

[20]Destatis, February 2009, CENEX – HICP Quality Adjustment: Rents. Paper prepared for the Second Implementation Group on Quality Adjustment and Sampling, 8 December 2009
[21] 'The rental equivalence approach to measuring owner occupiers' housing costs in the CPI' CPAC(12)13, ONS: http://www.ons.gov.uk/ons/guide-method/development-programmes/other-development-work/consumer-prices-advisory-committee/cpac-papers/index.html

Review approach

44. ONS identified potential sources of private housing rental data and concluded that private housing rental data collected by the VOA together with comparable data from the Welsh Government, Scottish Government and Northern Ireland Executive offered the most promising possibility for improving the measurement of private housing rents.
45. A number of comparison exercises of ONS requirements for a private housing rental series to the current RPI/CPI private housing rental data, and to VOA and the Devolved Administrations' private housing rental data, were undertaken. These demonstrated that private housing rental data from the VOA, Scottish and Welsh Governments better meet the needs of a RPI/CPI private housing rental series than the existing data. Instead of using around 1,200 quotes each month the new sources provide around 800,000 quotes.
46. The Northern Ireland Housing Executive currently receives private housing rental data biannually, covering the Belfast Metropolitan Region only. Given these limitations, ONS has established that these data are not suitable for use in a RPI/CPI private housing rental series at present.

Proposed measurement of private rental prices

47. ONS will continue to use the current RPI/CPI private housing rental data series for Northern Ireland. However, work is currently ongoing to increase the coverage across Northern Ireland, to include more data sources and to increase the frequency with which the Housing Executive receives the data to quarterly. ONS will continue to monitor the suitability of the Northern Ireland private housing rental data for use in a RPI/CPI private housing rental series, with a view to including it in the future.
48. Further details on the change for the RPI and CPI using the improved private rental series can be found in CPAC(12)23[22].

Impact of the improved measurement method on the CPI and RPI

49. In summary, if the new method of measuring private housing rental prices was used, the impact on the RPI would have been to increase the annual rates of growth by up to 0.09 percentage points between January 2008 and December 2011. The annual rate of inflation for the CPI all items index growth rates would have increased but by a less pronounced amount of 0.05 percentage points in all months, between January 2008 and December

[22] 'Improving the measurement of private rental prices in the CPI and RPI' CPAC(12)18, ONS: http://www.ons.gov.uk/ons/guide-method/development-programmes/other-development-work/consumer-prices-advisory-committee/cpac-papers/index.html

2011. The principal reason for this difference between the RPI and CPI is that a larger weight is given to private housing rents in the RPI compared with the CPI.

50. Following standard practice, no revisions would be made to the RPI or CPI should the new methodology be introduced. The 12 month percentage change over the first year in which the improved method is introduced would therefore be based partly on the old and new methods. It is recommended that the improved method of measuring private housing rental prices should be implemented from the February 2013 RPI and CPI, to be published in March 2013.

8. Part three: Next steps

51. This consultation will close on 30 November 2012. CPAC will meet after the consultation has closed and the responses have been compiled, to discuss the options for change. In light of the consultation responses, discussion at the CPAC meeting, and any further expert advice, the National Statistician may put forward a recommendation on the options for change, which the UK Statistics Authority Board would be asked to consider.
52. It is anticipated that any recommendation for change would be announced by the National Statistician in January 2013. Before changes to the RPI could be made, the requirements set out in Section 21(2) and (3) of the Statistics and Registration Service Act 2007 would need to be satisfied. Consequently, the Bank of England would be consulted on whether any proposal would be a fundamental change to the coverage or basic calculation of the RPI and would be materially detrimental to the interests of holders of each relevant index-linked gilt[23]. If the Bank of England considered any proposed change constituted a fundamental change to the coverage or basic calculation of the RPI that was detrimental to the holders of an index-linked gilt, the Authority would seek the agreement of the Chancellor of the Exchequer, whose consent would have to be obtained before any change could be made. Subject to consulting the Bank of England and the subsequent consent of the Chancellor of the

[23] The relevant securities are defined in section 21 as index-linked gilt-edged securities issued before the commencement of section 21 subject to a prospectus containing provision relating to early redemption in the event of a change to the retail prices index. 'Index-linked gilt-edged securities' are defined in section 21 as securities issued under section 12 of the National Loans Act 1968 (c. 13) the amount of the payments under which is determined wholly or partly by reference to the RPI.

Exchequer, ONS would introduce any change with the annual process of updating the RPI/CPI basket of goods when it is published on 19 March 2013.

53. If any change were recommended and agreed, ONS would continue to produce estimates using the existing RPI methodology for a period to aid users during this transition period. These estimates would be produced as a supplementary dataset to the RPI.

Annex A: Main users and uses of RPI

The following table outlines the main users and uses of the RPI.

Table A1: Uses of the RPI

	What	How
GOVERNMENT BORROWING	Index-linked government bonds (gilts)	Issued for the first time on 27th March 1981. The semi-annual coupon payments and principal payments associated with these bonds are adjusted in line with movements in the RPI. (http://www.dmo.gov.uk/index.aspx?page=gilts/indexlinked) (http://www.dmo.gov.uk/documentview.aspx?docname=/giltsmarket/formulae/igcalc.pdf&page=Formulae/Calc).
	National Savings and Investments Index-linked Savings Certificates	The value of savings tied up in these certificates is guaranteed to grow at least in line with the RPI. (http://www.nsandi.com/savings-index-linked-savings-certificates).
REGULATED CHARGES	Regulated rail fares	Setting the maximum allowable annual increase in regulated rail fares by rail operators in the UK. Around 45 per cent of rail fares are currently regulated. Currently, the annual increase of regulated rail fares, which occurs in January, is capped at the RPI from the previous July plus 3 per cent. (www.parliament.uk/briefing-papers/SN01904.pdf).
	Regulation of water and sewerage charges in England and Wales	The Water Services Regulation Authority (OFWAT) sets the maximum allowable annual increase in the overall charge by water companies. Currently, the annual increase of regulated water and sewerage charges, which occurs in April, is capped at the RPI from the previous November plus a constant (called the "K-factor") plus any unused "K-factor" the company has from previous years. The "K-factor" is reviewed every five years and is currently 0.5 per cent. (http://www.ofwat.gov.uk/consumerissues/chargesbills/latestchanges/pricereview).
	Indexation of charges for some of the wholesale services offered by British Telecom (BT)	Indexation of BT's wholesale charges for Local Loop Unbundling (LLU) and Wholesale Line Rental (WLU) services. OFCOM set a maximum annual increase in these charges. OFCOM expects a real terms decrease in these charges, seeing them fall by between RPI-1.2% and RPI-14.6% (depending on the service). BT is currently appealing OFCOM's proposition at the competition commission. (http://media.ofcom.org.uk/2011/03/31/ofcom-proposes-new-wholesale-prices-for-openreach/).
	Corporation Tax on chargeable gains	The RPI is used to calculate the indexation allowance for the effects of inflation when calculating the chargeable gains of companies or organisations. (http://www.hmrc.gov.uk/ct/managing/company-tax-return/returns/chargeable-gain.htm).
	Vehicle excise duty (VED) rates	VED rates increase in line with the RPI. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).

	What	How
	Alcohol Duty Rates	Alcohol Duty Rates are increased by reference to the RPI. The 2012 budget saw duty increase by RPI plus 2 per cent. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).
	Tobacco duty rates	Tobacco duty rates are increased by reference to the RPI. The 2012 budget saw duty increase by RPI plus 5 per cent. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).
	Gambling duty	Gambling duty increases in line with the RPI. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).
	Amusement Machine License Duty (AMLD)	AMLD increases in line with the RPI. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).
	Climate Change Levy (CCL)	CCL increases in line with the RPI. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).
	Fuel duty	Fuel duty increases in line with the RPI. (http://www.hmrc.gov.uk/budget2012/ootlar-rates.pdf).
	Company Car Fuel Benefit Charge	The multiplier used to calculate the cash equivalent of the benefit of free fuel provided to employees increased from £18,800 to £20,200 for the tax year 2012-13. This represents an increase of 2 per cent above RPI. There is a further commitment to increase the multiplier by 2 per cent above RPI for the tax year 2013-14. (http://www.hmrc.gov.uk/budget2012/tiin-2008.pdf). (http://www.hmrc.gov.uk/budget2012/car-van-fuel-charge.htm).
	Company Van Fuel Benefit Charge	The van fuel benefit charge multiplier will be frozen at £550 for tax year 2012-13 and will increase by RPI in 2013-14.
OTHER	Interest payments on student loans	For students in England and Wales who enrolled on courses starting on or after 1st September 2012, the interest rate paid on their student loans is at least RPI. (http://www.studentloanrepayment.co.uk/portal/page?_pageid=93,6678755&_dad=portal&_schema=PORTAL).
	Pay Setting	The RPI is often used in bargaining over pay deals.
	Private sector pension funds	Under the rules of The Pensions Trust, the annual rate of increase in the private sector occupational pensions in payment must be greater than a statutory amount which is set by the government. Since 6th April 2011, this statutory amount has been related to the CPI. Prior to 6th April 2011, this statutory amount was related to the RPI. If the rules of a pension scheme specifically refer to the RPI, however, then that scheme continues to increase private sector occupational pensions in payment by the stipulated figure unless the scheme changes its rules. (http://www.pensionsadvisoryservice.org.uk/media/592194/spot011%20spotlight%20on%20the%20change%20from%20rpi%20to%20cpi.pdf). (http://www.thepensionstrust.org.uk/NR/rdonlyres/A453B372-5E5E-4C66-AB0E-0F4798E374A4/0/TPTPensionsBulletinFactSheet40211FINALVERSION.pdf).
	Private sector business contracts	The RPI is used in some private sector business contracts to inflate and/or deflate monetary values and to set payment amounts.
	Privately issued index-linked bonds	Some companies issue index-linked bonds which return to the investor a rate of interest which exceeds the RPI.

Source: ONS

Annex B: Remaining differences between the RPI and CPI

The following table outlines the remaining differences between the RPI and the CPI.

Table B1: Remaining differences between the RPI and CPI

Issue	CPI	RPI
Population base – the expenditure, as covered by the index, and the source for the expenditure data.	The CPI is constructed based on expenditure by all private and institutional households.	The RPI excludes: (a) Institutional households i.e. those living in prisons, nursing homes, retirement homes and student accommodation. (b) Pensioner households with at least three quarters of their income coming from state pensions and benefits. (c) Households whose household income lies within the top 4% of the income distribution for all households, as measured by the Living Costs and Food Survey (LCF).
Commodity coverage – the actual goods and services included in the indices.	The coverage of the CPI is all purchases of goods and services which are included in the household final monetary consumption expenditure (HFMCE) component of national accounts.	The coverage of the RPI is based largely on data from the Living Costs and Food Survey (LCF). The main differences are: The RPI includes (whereas the CPI excludes)**:** • Council tax • Mortgage interest payments • House depreciation • Buildings insurance • Ground rent • Other house purchasing costs such as estate agents' and conveyancing fees • Road fund licenses The RPI excludes (whereas the CPI includes)**:** • University accommodation fees • Foreign students' tuition fees • Some financial services such as unit trust and stockbroker charges
Geographical coverage	The CPI includes expenditure by foreign visitors to the UK but excludes expenditure by UK households abroad.	The RPI includes expenditure by UK households abroad but excludes expenditure by foreign visitors to the UK.

Issue	CPI	RPI
Treatment of insurance	The amount of expenditure on insurance premiums is distributed amongst other expenditure categories according to the nature of the claim. Only the service charge is allocated to the relevant insurance heading.	All expenditure on insurance is considered to belong to the relevant insurance heading (e.g. housing or motor insurance premiums).
Rounding	The monthly and twelve month rates of change are calculated using unrounded indices.	The monthly and twelve month rates of change are calculated using rounded indices.

Source: ONS

Annex C: Elementary aggregate formulae – worked example

Suppose we want to measure inflation for apples and we collect prices for apples in four supermarkets (A, B, C and D) over a two month period, noting that these are illustrative examples (and do not show what the differences are in practice - this is shown by the empirical evidence presented elsewhere in this document).

Table C1: Price of apples in four supermarkets

Price (£) per kg

Store	Period 0	Period 1
A	1.20	1.20
B	0.85	0.80
C	1.00	0.90
D	0.78	0.85
Total	3.83	3.75

For the Carli formula, we look at the rate of change in each store and then take the average of those changes (also known as the 'average of price relatives'). The Carli is the average rate of change (multiplied by 100 to create an index) calculated as follows:

$$I_{t,0} = \frac{1}{n}\sum_{i=1}^{n}\frac{p_{i,t}}{p_{i,0}}$$

$$= \frac{1}{4}\left(\frac{1.20}{1.20}+\frac{0.80}{0.85}+\frac{0.90}{1.00}+\frac{0.85}{0.78}\right)\times 100$$

$$= \frac{1}{4}\left(1.00+0.94+0.90+1.09\right)\times 100$$

$$= 98.3$$

This gives a decrease in price of 1.7 per cent from Period 0 to Period 1 (where Period 0 is the 'base' month which is set to equal 100.0).

For the Dutot formula we average the prices in each period and then calculate the rate of change. The Dutot is the ratio of average prices (multiplied by 100 to create an index) calculated as follows:

$$I_{t,0} = \frac{\sum_{i=1}^{n} \frac{p_{i,t}}{n}}{\sum_{i=1}^{n} \frac{p_{i,0}}{n}}$$

$$= \frac{\frac{1}{4}(1.20 + 0.80 + 0.90 + 0.85)}{\frac{1}{4}(1.20 + 0.85 + 1.00 + 0.78)} \times 100$$

$$= \frac{\frac{1}{4}(3.75)}{\frac{1}{4}(3.83)} \times 100$$

$$= 97.9$$

This gives a decrease in price of 2.1 per cent from Period 0 to Period 1.

Both the Carli and Dutot formulae use the most common form of averaging called an 'arithmetic mean'. When the context is clear (as in the above examples), the arithmetic mean is often simply called the mean (or average).

The Jevons formula uses a less common form of averaging called a 'geometric mean'. It is obtained by multiplying all the numbers together and then taking the *nth* root of the product. For the Jevons formula we take the geometric mean of the rate of change (also known as the 'geometric mean of price relatives') or the ratio of the geometric mean prices. Both of these calculations produce the same result.

The Jevons therefore can be calculated as:

$$I_{t,0} = \sqrt[n]{\prod_{i=1}^{n} \frac{p_{i,t}}{p_{i,0}}} \qquad I_{t,0} = \frac{\sqrt[n]{\prod_{i=1}^{n} p_{i,t}}}{\sqrt[n]{\prod_{i=1}^{n} p_{i,0}}}$$

$$= \sqrt[4]{\frac{1.20}{1.20} \times \frac{0.80}{0.85} \times \frac{0.90}{1.00} \times \frac{0.85}{0.78}} \times 100$$

$$= \sqrt[4]{0.92} \times 100$$

$$= 98.0$$

Or,

$$= \frac{\sqrt[4]{1.20 \times 0.80 \times 0.90 \times 0.85}}{\sqrt[4]{1.20 \times 0.85 \times 1.00 \times 0.78}} \times 100$$
$$= \frac{\sqrt[4]{0.73}}{\sqrt[4]{0.80}} \times 100$$
$$= 98.0$$

This gives a decrease in price of 2.0 per cent from Period 0 to Period 1.

As you can see in the above example, each formula used gives a slightly different result when measuring the inflation in price for apples.

Annex D: Price bounce – worked example

The three tables below show the hypothetical movements for the prices of apples in four supermarkets (A, B, C and D) over a six month period. Elementary aggregates and elementary aggregate indices have been produced using the current methods used in the RPI and CPI. Note that in period 3 the total price of the apples return to their original total (as in period 0). For this period, the Dutot and Jevons indices return to their values for the base period (100). However, the Carli index does not return to its original value. In other words, the use of the Carli suggests that prices of apples have increased when collectively they have not changed.

Table D1: Price (£)

Store	Period 0	Period 1	Period 2	Period 3	Period 4	Period 5
A	1.20	1.20	1.15	1.00	1.10	1.30
B	0.85	0.80	0.75	0.78	0.80	0.85
C	1.00	0.90	0.80	0.85	0.80	0.90
D	0.78	0.85	0.95	1.20	1.20	1.15
Total	3.83	3.75	3.65	3.83	3.90	4.20

Table D2: Price Relatives (period t/ period 0) (e.g. for product A, 1.2/1.2, 1.15/1.2, 1.0/1.2 etc)

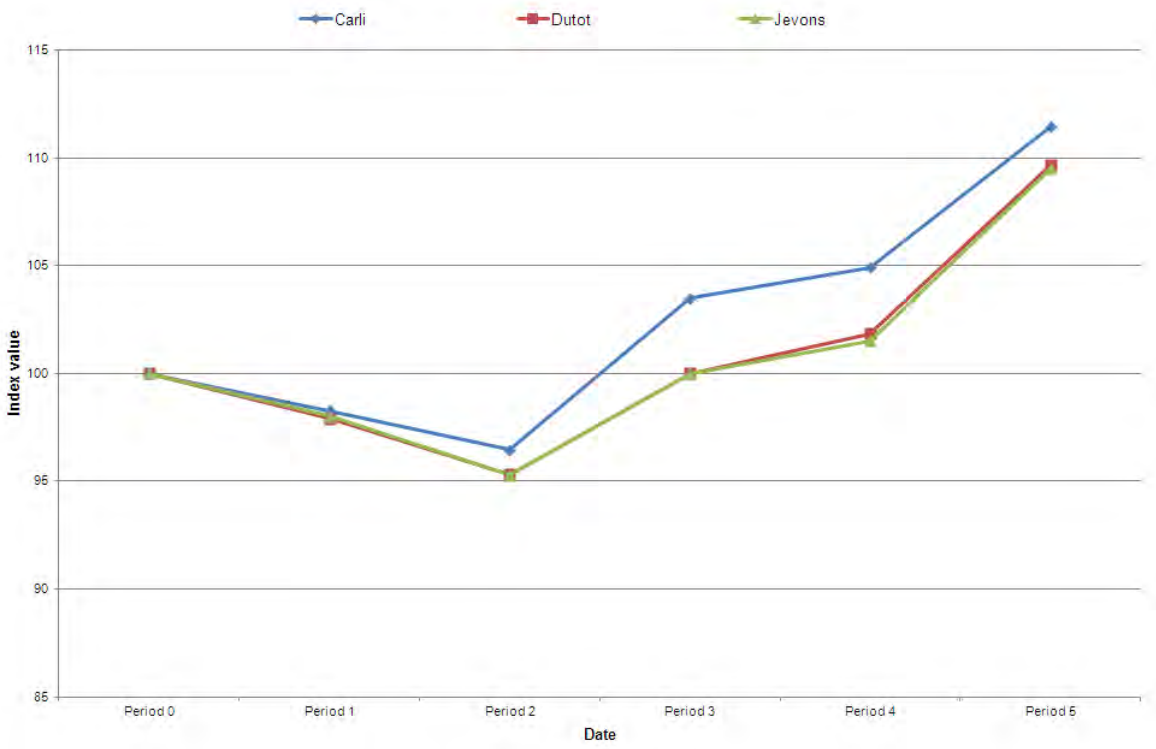
Store	Period 0	Period 1	Period 2	Period 3	Period 4	Period 5
A	1.0	1.00	0.96	0.83	0.92	1.08
B	1.0	0.94	0.88	0.92	0.94	1.00
C	1.0	0.90	0.80	0.85	0.80	0.90
D	1.0	1.09	1.22	1.54	1.54	1.47

Table D3: Index (base = period 0)

Carli	100.0	98.3	96.5	103.5	104.9	111.4
Dutot	100.0	97.9	95.3	100.0	101.8	109.7
Jevons	100.0	98.0	95.3	100.0	101.5	109.5

Figure D1 further illustrates the price bounce in the Carli formulae:

Figure D1: Price bounce example



Annex E: ONS price collection guideline changes for clothing prices from 2010

Since 2010 there has been an increased interest in the formula effect, which widened after changes were implemented by ONS to improve the collection of clothing prices. In summary[24], the changes put in place in 2010 were:

- increased sample size each month: small changes in composition and style were accepted (as such changes are unlikely to be considered by consumers as a change in quality) and the prices of garments that change in this way were included in the index calculation. This improved approach increased the sample size used each month in the construction of the clothing index.
- prices collected in the base period (January) now better reflect consumer spending patterns: clothing products that are in a sale are collected in January, in those locations and for those products where prices are being collected for the first time. The new approach reflects consumer spending patterns better than previously.
- increased number of price quotes used in the calculation of the base period index: prices are collected for all available products in the base period. This approach means that the sample size used in the construction of the base period index has increased.

[24] 'Measurement of Clothing Prices' CPAC(11)10, ONS: http://www.ons.gov.uk/ons/guide-method/development-programmes/other-development-work/consumer-prices-advisory-committee/cpac-papers/index.html

Annex F: Price variance

Following changes to the guidelines for the collection of prices for clothing, which were introduced in 2010, the variance of price relatives increased. The following table shows the average price relative for a range of items, together with the upper and lower quartile value, for the period before and after the collection guideline changes were implemented. The first four items are clothing, and it can be seen that in all cases the average price relatives prior to the changes in 2010 were lower than those seen after. Conversely, for the last two items, which were not affected by the collection guideline changes, the price relatives are relatively unchanged when we compare 2002-2009 with 2010-2011. The increases in the upper quartile show that the increases in the average are driven by a widening of the distribution rather than a general shift in the distribution upwards, since the lower quartile estimates are more or less unchanged.

Men's jeans	Ave PR	lower quartile	upper quartile
average price relative, 2002,2009	1.03	1.00	1.02
average price relative, 2010,2012	1.08	1.00	1.14

Men's casual trousers	Ave PR	lower quartile	upper quartile
average price relative, 2002,2009	1.03	1.00	1.06
average price relative, 2010,2012	1.17	1.00	1.22

Women's dress	Ave PR	lower quartile	upper quartile
average price relative, 2002,2009	1.02	0.88	1.08
average price relative, 2010,2011	1.29	0.89	1.43

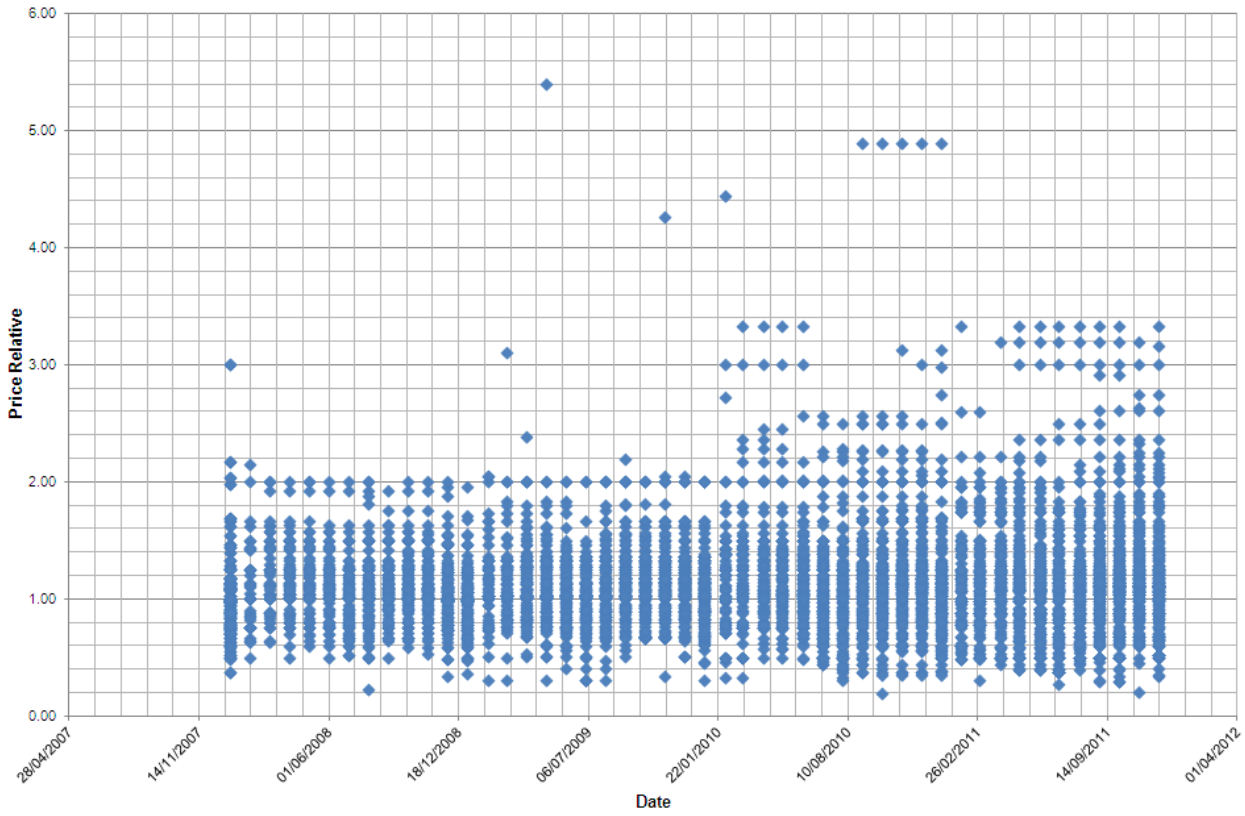
Women's vest	Ave PR	lower quartile	upper quartile
average price relative, 2002,2009	1.04	0.94	1.04
average price relative, 2010,2011	1.17	0.90	1.20

Double wardrobe	Ave PR	lower quartile	upper quartile
average price relative, 2002,2009	1.07	1.00	1.09
average price relative, 2010,2011	1.08	1.00	1.09

Dry cleaning	Ave PR	lower quartile	upper quartile
average price relative, 2002,2009	1.02	1.00	1.03
average price relative, 2010,2011	1.01	1.00	1.00

The following graphs show the price variance analysis[25] for the items included in the table above.

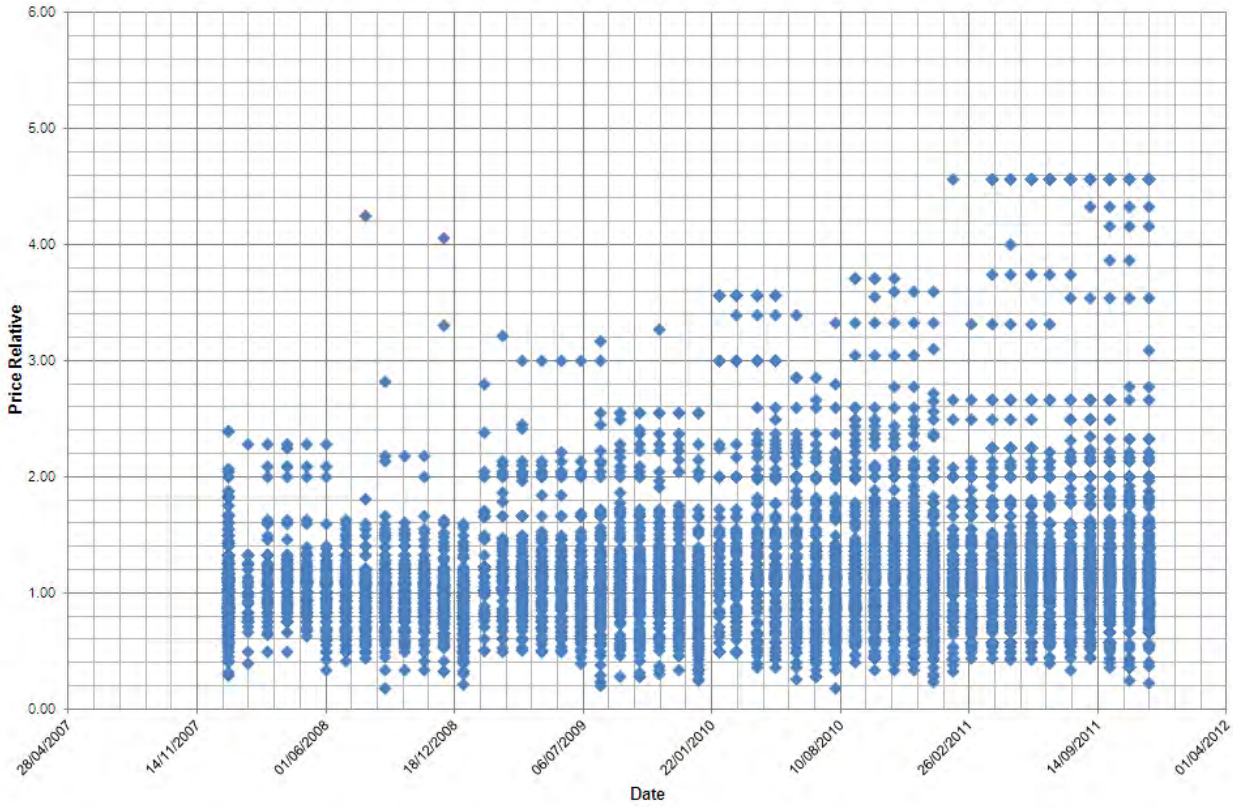
Figure F1: Price relative variance of men's jeans



Source: ONS

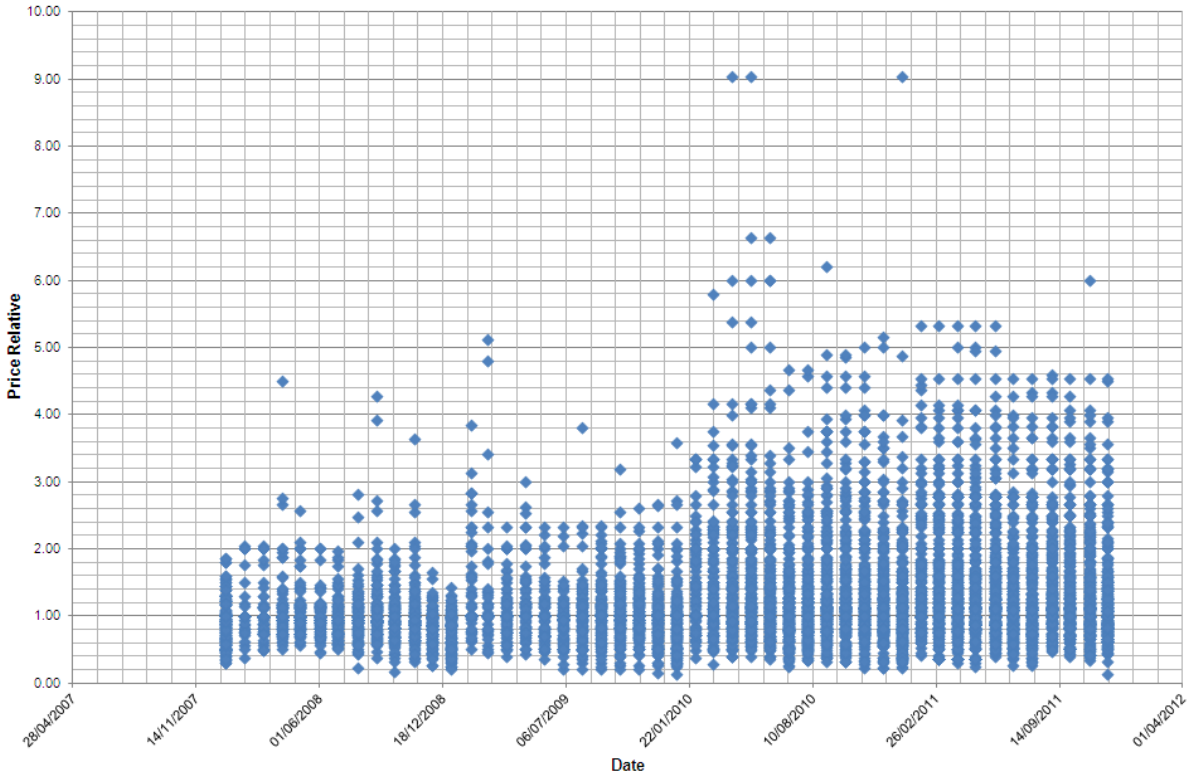
[25] The data presented in each chart are for 2008 to 2011, to illustrate the impact on the distributions more clearly.

Figure F2: Price relative variance of men's casual trousers



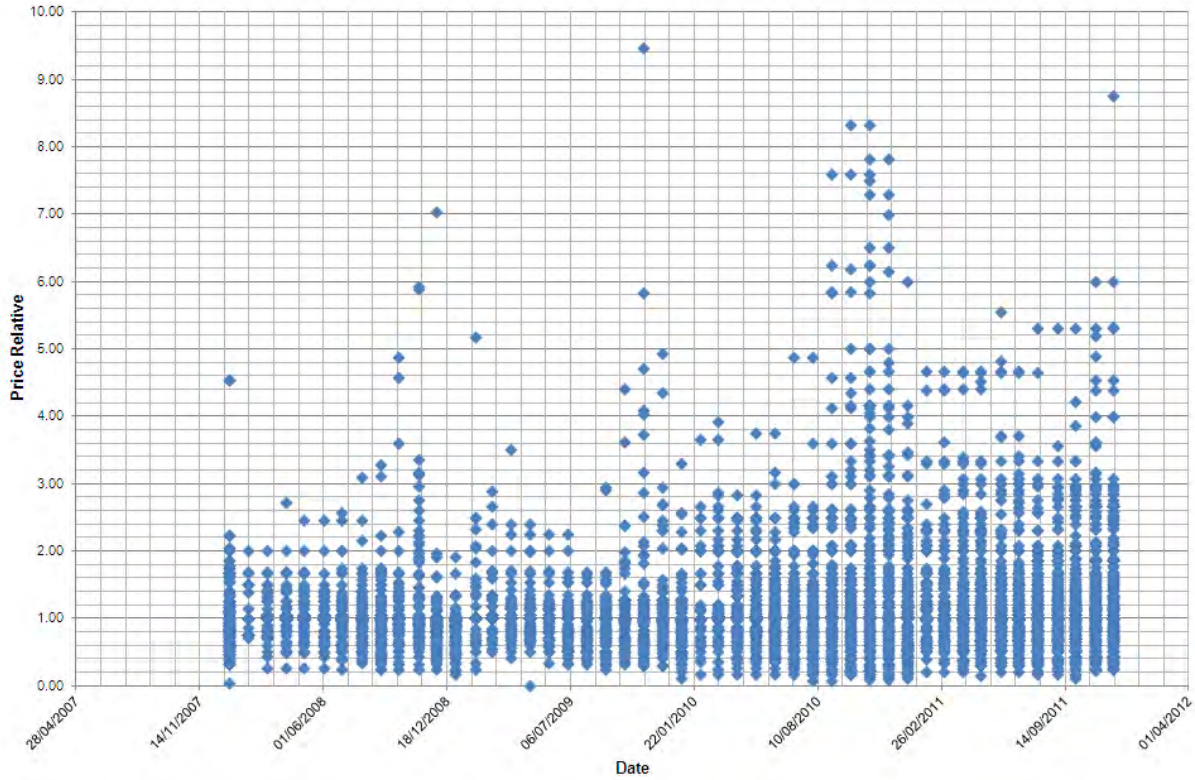
Source: ONS

Figure F3: Price relative variance of women's dress



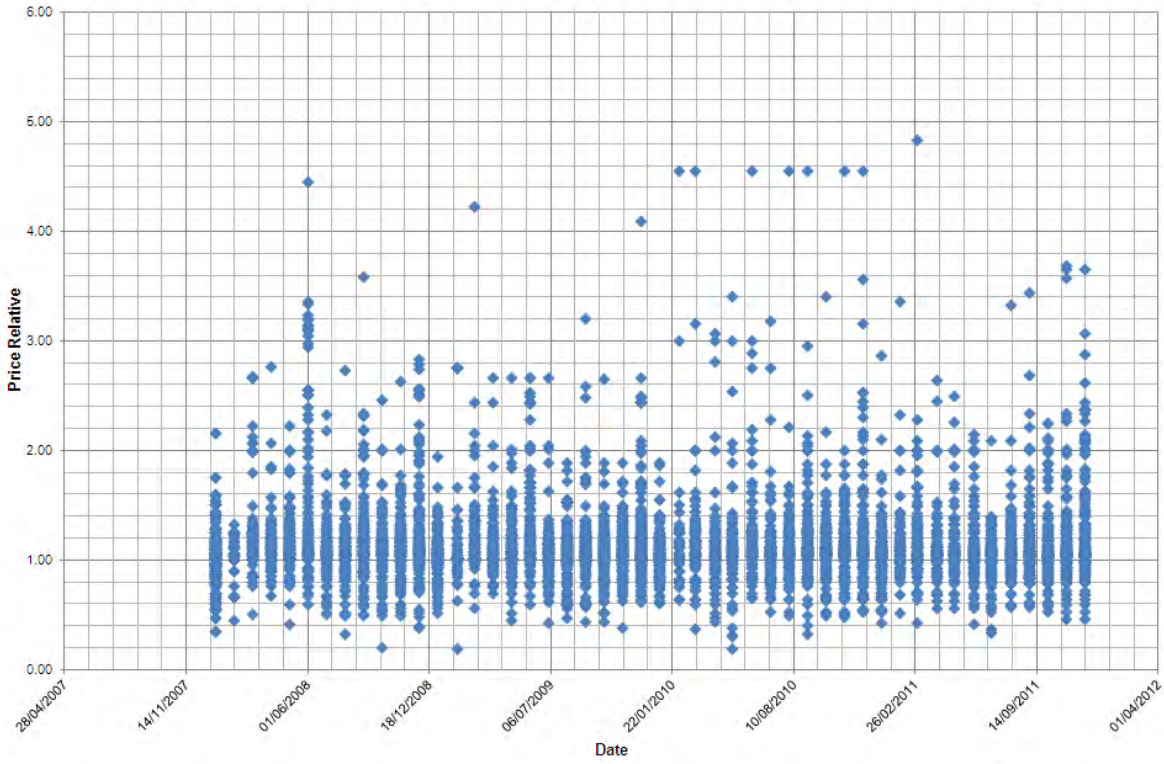
Source: ONS

Figure F4: Price relative variance of women's vest



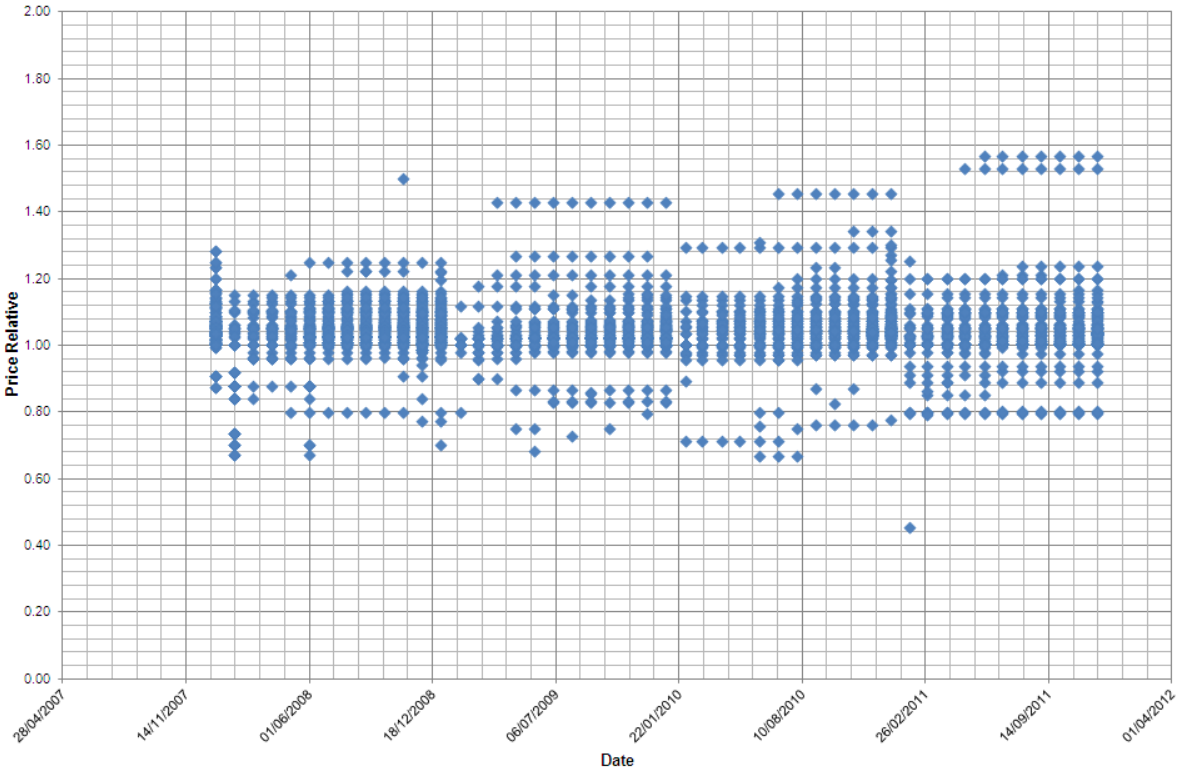
Source: ONS

Figure F5: Price relative variance of a double wardrobe



Source: ONS

Figure F6: Price relative variance of dry cleaning a man's suit



Source: ONS

Annex G: Explanatory note and summary of Professor Erwin Diewert's report on Consumer Price Statistics in the UK

In March 2012 Professor Erwin Diewert, a leading expert in the field of index number theory, visited ONS to provide external expert advice and recommendations to improve the UK's consumer price statistics.

His report[26] updates advice provided in sections of the CPI Manual: Theory and Practice (2004)[27] in light of developments in the past 10 years (the manual was published in 2004 but it was mostly written in 2002) with a particular focus on issues faced by ONS. Many national statistics institutes will find the report useful when reviewing their own consumer prices statistics. Section 10 of Professor Diewert's report lists 11 short and long-term recommendations for ONS to improve the UK's consumer price statistics.

In support of ONS's programme of work Professor Diewert was asked to focus part of his report on the choice of elementary aggregate formulae. His most important recommendation for ONS to improve the UK's consumer price statistics is to drop the use of the Carli index as an elementary aggregate in the RPI. Professor Diewert also made other recommendations that ONS will be considering. ONS will issue a response to the recommendations in due course.

[26] 'Erwin Diewert on Consumer Price Statistics in the UK', ONS: http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/index.html
[27] ILO/IMF/OECD/UNECE/Eurostat/The World Bank (2004). Consumer Price Index Manual: Theory and Practice, Geneva, International Labour Office.

Annex H: Reference of previous papers taken to the Consumer Prices Advisory Committee by subject covered

Full papers and a summary note from each meeting of CPAC can be downloaded from the ONS CPAC papers webpage: http://www.ons.gov.uk/ons/guide-method/development-programmes/other-development-work/consumer-prices-advisory-committee/cpac-papers/index.html

Table I1: Reference to previous papers taken to CPAC by subject covered

	Expert Opinion	International Comparisons	Clothing - Outlet Stratification	Clothing Pilot	Consumer Behaviour	Private Rents	Price Elasticity
CPAC(11)03						X	
CPAC(11)07						X	
CPAC(11)12			X	X	X		
CPAC(11)13						X	
CPAC(11)23							X
CPAC(11)30						X	
CPAC(11)31				X			
CPAC(12)02			X	X	X	X	
CPAC(12)04						X	
CPAC(12)06			X				
CPAC(12)07		X					
CPAC(12)13						X	
CPAC(12)15	X			X	X		
CPAC(12)18						X	
CPAC(12)20				X	X		
CPAC(12)23						X	
CPAC(12)24	X	X		X	X		

Source: ONS