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Dear Sir Michael

### FORMULA EFFECT AND THE VALIDITY OF THE CPI

1. Thank you for your letter of 8<sup>th</sup> Aug. 2011 (inc. the reply from the National Statistician, Jil Matheson) in reply to my letter of 5<sup>th</sup> July 2011 and my enclosed mathematical note on the formula effect in the CPI/RPI. I am further replying formally via yourself as head of the UK Statistics Authority, though you will no doubt wish to refer this on to the National Statistician.
2. On the question of utility, I would first note that the CPI makes no use of this concept in its formulae. The only way in which utility enters into either the CPI or the RPI is via quality adjustment of the prices of a limited number of items in the price basket (e.g. computers). This has a small downward effect on both indices and has nothing to do with the issue of brand substitution. Utility is a subjective measure of value which depends on many things of which price is but one. For example, things like colour, style, portability and even packaging can affect subjective utility and it is by no means always true that a more expensive product will have a higher utility than a cheaper one. Utility is not directly measurable and can only be inferred from behaviour and decisions made by individuals or collectively.
3. In any case, my main point is that under the GM formula, the degree and direction of brand substitution depend only on the percentage price changes of different brands and that price levels (and utility) are not relevant. As I stated before this is inherently implausible. In Jil Matheson's example, you could replace 60p by £60 and the degree of substitution would be unchanged. Also you could reverse the direction of the price level differential of the two brands in the example without changing either the direction or magnitude of substitution. The notion that price levels or even relative price levels of different brands do not affect substitution behaviour is really beyond reasonable belief. In many cases people do not have information on recent percentage price changes and are basing their decisions on price levels.
4. The substitution formulae in my note also help to understand why the GM formula always produces a lower result than the arithmetic mean (AR) formula. The GM formula is constantly moving index weight from brands with high percentage price rises to those with lower percentage price increases. It is, of course, well known mathematically that the GM formula will produce a lower result than the AR one and a good article on this subject can be found in Wikipedia under the title "inequality of

the arithmetic and geometric means”.

5. If brand weights (implied or otherwise) are to be changed monthly (which is itself a controversial issue since higher level weights are only changed annually), it should be on the basis of the expenditures on those brands not their percentage changes in price. There is at present no data collected to do this but it is quite feasible to produce a price index in this way if such data were collected and I would suggest that this is a matter of such importance that a data collection of this type should be undertaken. There is an enormous gap in statistical knowledge of the real pattern of consumer behaviour, especially in relation to brand substitution. Even if such a data collection were to be temporary (to limit cost) it would at least inform the choice of formulae used in the price indices.

6. At the moment, the generally held view (though again lacking in empirical evidence) is that people tend to switch from more expensive to cheaper brands, especially in times of economic difficulty. This would be expected to lead to a competitive downward price pressure on the more expensive brands and an upward price pressure on the cheaper ones. The result would be to move index weight from brands with low percentage price increase to those with higher percentage price rises - this is quite the opposite of what is implied by the GM formula. So an index constructed in this way would be expected to give rise to higher inflation estimates than the RPI, whereas the CPI almost always gives rise to lower inflation estimates than the RPI (by a large margin).

7. Having studied this matter for a while, it is now clear to me that those countries which have used the GM formula in their price indices have made a serious error, and although the UK is obliged to supply CPI data to the EU under the HICP regulation, there is no reason to publish these figures in the UK, let alone to promote them as the leading measure of UK inflation.

8. Moreover, I believe that customers (inc. the media) of ONS/UKSA price indices should be alerted to this error and that measures should be taken to rectify the situation as quickly as possible. The EU should also be informed so that the HICP regulation can be amended.

9. Having said that, the HICP regulation does also allow use of the RA formula and/or use of expenditure weights at brand level, so nobody has to use the GM formula under this regulation, and 9 countries (inc. Germany) do not do so. Also, outside the EU, Japan, Switzerland and New Zealand, to name just those I am aware of, do not use the GM formula. It is therefore quite wrong to say that the UK is in any way following an international consensus on the use of the GM formula to represent brand level substitution.

10. I hope, in the light of the further points made above, that you will now reverse your decision regarding suspension of CPI publication in the UK, and that you will disseminate information on the problems I have raised as widely as possible.

Yours sincerely

DR D G JONES

Copy to: Jill Leyland, Vice President of the Royal Statistical Society.