

### POTENTIAL MEASUREMENT ISSUES IN CONSUMER PRICE INDICES

A number of possible sources of bias in the measurement of consumer price indices have been identified in the literature. Potential upward bias becomes more important during times of low inflation as it may conceal “actual” inflation being in negative territory. This box looks into the main potential sources of measurement bias and assesses the extent to which these biases may be relevant for the HICP. It finds that such bias is mitigated by a number of technical measures included in the methodology used to compile the HICP.

#### Bias owing to substitution behaviour

One well-known source of bias in consumer price indices relates to the typical substitution behaviour of consumers. The index formula typically used weights together price changes for specific product groups on the basis of expenditure shares from a past reference year. However, as relative prices change, consumers tend to adjust their consumption, for example favouring those products which have lower price increases. This leads the weighting structure from past years to become outdated – the products with lower price changes are given too little importance in the index and products with higher price changes are given too much importance. This has been termed a “substitution bias” or “representativity bias”.<sup>1</sup> To reduce this bias, international recommendations<sup>2</sup> suggest that the weights used in constructing consumer price indices be updated regularly.

Since 2012, all EU countries have been required to update their HICP weights on an annual basis.<sup>3</sup> Bias owing to outdated expenditure shares for weighting together product groups, e.g. fruit and vegetables, is therefore likely to be small. At the individual product level (e.g. different types of apples) statistical offices typically have no information on the expenditure shares, and unweighted averages of the price changes are therefore computed according to different formulae. During the development of the HICP, one formula which was known in many cases to lead to bias (the arithmetic average of price relatives) was banned. It is, however, likely that the currently used formulae still lead to measurement errors owing to a lack of weights for individual products. The direction of the error may depend on the sample chosen, and in particular on the position in the economic cycle. For example, at times of low demand, the expected substitution effects may be counteracted by income effects as consumers switch expenditure to products or to outlet types with lower price levels even when their relative prices are increasing.

1 The term “substitution bias” is applied to cases where a price index is intended to serve as a cost-of-living index, which measures the change in expenditure necessary to maintain the same standard of living. The HICP is not a cost-of-living index but rather an inflation index, which measures the change in expenditure necessary to maintain a certain consumption pattern. Nevertheless, the HICP must remain representative of consumer expenditure patterns, which change owing to substitution behaviour or other causes (e.g. changes in income or preferences). In the case of the HICP it is therefore more appropriate to speak of a representativity bias than a substitution bias. See, for example, Hill, R.J., “Inflation Measurement for Central Bankers”, in Kent, C. and Guttman, S. (eds.), *The Future of Inflation Targeting*, Reserve Bank of Australia, 2004 and Diewert, E., “Harmonized indexes of consumer prices: their conceptual foundations”, *Working Paper Series*, No 130, ECB, 2002.

2 See *Consumer Price Index Manual: Theory and Practice*, ILO, IMF, OECD, Eurostat, United Nations, International Bank for Reconstruction and Development and World Bank, August 2004.

3 See the box entitled “New standards for HICP weights”, *Monthly Bulletin*, ECB, April 2012.

### Bias owing to quality changes and new products

Consumer price indices are constructed from price observations which are collected for identical items each month. When sales of certain products become insignificant, statisticians must find a replacement product, which may not be of the same quality. In such cases, an estimate must be made of the value of the difference in quality so that, over time, the “pure” price change can be measured. Some observers have claimed that statistical offices tend to underestimate quality improvements and that this leads to an upward “quality change bias” in measured inflation.<sup>4</sup>

Since the mid-1990s considerable research has been conducted in Europe and beyond on the appropriate methods to adjust for quality changes, most notably a two-year research project involving seven European statistical offices which resulted in some improvements. However, while product-specific recommendations for quality adjustment methods have been made for the HICP, there are no legally binding regulations to enforce a harmonised treatment across countries. The appropriate method to be used depends on nature of the product and the pricing strategies prevalent in the particular market. Therefore the direction and size of any possible quality change bias in the index may differ across items and countries. This implies that an assessment of bias in the euro area HICP would have to take into account current detailed practices in each specific product group in each country. So far, no such research has been conducted.

A second issue relates to the emergence of new products. Some products typically follow a cycle whereby a new product is introduced at a high price, which is then progressively lowered as production efficiencies and sales increase before levelling off and possibly increasing as the product matures. When statistical offices introduce new products with a delay, they tend to under-weight their (downward) price changes, implying a corresponding over-weighting of the (upward) price changes of mature products. To mitigate this new product bias, the HICP regulations require countries to include new products with an expenditure share in excess of 0.1% of household final monetary consumption expenditure within 12 months of the product reaching this threshold. While this is a rather high threshold for an individual product, it may reduce the impact of new product bias.

### Bias owing to new outlets

A further potential source of measurement bias may arise from the trend away from higher-price traditional outlets towards lower-price larger chain stores, discounters and internet retailers. When new outlets are introduced into HICP samples, the price level difference is ignored on the assumption that it reflects consumers’ implicit valuation of the quality of the retail service and has no downward impact on the index. However, the rapid growth in the market share of these lower priced outlets suggests that consumers do not consider the lower price levels to be fully offset by the lower quality of the retail service, i.e. that the new store types offer better value for money than traditional outlets. The treatment of new outlets in the HICP is therefore most likely a source of upward bias. However, conducting an objective assessment of quality differences across outlet types represents a considerable challenge.<sup>5</sup>

4 In the influential Boskin Report on the US CPI (*Toward A More Accurate Measure Of The Cost of Living*, Final Report to the Senate Finance Committee from the Advisory Commission to Study the Consumer Price Index, 1996), the combined impact of quality changes and new product bias was estimated to be 0.6 percentage point. This was the largest of the four identified biases.

5 See Box 2 in “Structural features of distributive trades and their impact on prices in the euro area”, *Structural Issues Report*, ECB, September 2011.

## Conclusions

On the basis of the available evidence, it is not possible to estimate measurement bias in the euro area HICP. Both theory and evidence suggest that such biases would vary over time and depend to some extent on the business cycle. A number of technical measures (such as the annual updating of expenditure weights) to reduce the potential sources of bias were introduced during the development of the HICP following earlier research.