TEG-CPI Meeting on the CPI Manual

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Present: Bert Balk, Carsten Boldsen Hansen, Erwin Diewert, David Fenwick, Peter Hill, Mick Silver.

Conclusions

Chapter 9

Index number realities

The sections of Chapter 9 dealing with the index formulae actually used to calculate CPIs generated an in depth discussion of some index number realities which seem to have been comparatively neglected up to now. Some descriptions and terminology used in the Manual need to be tightened up and made more precise, realistic and rigorous.

The concept of a *fixed basket index* should feature much more prominently in the Manual. Such an index is defined as : $p^t . q^b / p^o . q^b$. It defines a very broad class of indices. It has been proposed to call this index a 'Lowe' index (see below). The term 'pure price index' is also used to describe such an index but, for consistency, it is proposed to not to use this term in the Manual and to use only the term fixed basket index. It may be noted that the concept of a 'pure price change' has a different meaning from 'pure price index' which is a potential source of confusion.

In principle, there is no restriction on the vector of quantities in a fixed basket index. They could refer to any period, but any set of quantities could serve and they need not refer to an actual time period. They could be hypothetical, as in a Walsh index. [1]

Fixed basket indices

- A fixed basket index can be expressed in three other ways. The ratio of two Laspeyres indices from a series of Laspeyres using period b as base is a fixed basket index using period b weights. However, the ratio of two Laspeyres is not a Laspeyres index and should not be described as a 'Laspeyres type' index.

- The ratio can also be written as a weighted average of the price relatives p^t / p^o where the weights are the expenditure shares $p^o q^b / \Sigma p^o q^b$

[1] Although it was not discussed in the meeting, the counterpart to a fixed basket price index is a quantity index that uses a fixed set of prices. In international comparisons, the Geary-Khamis quantity index : between two countries is an example of such an index that uses the average prices (unit values) for the entire group of countries to which they belong.

- More generally, consider a weighted arithmetic average of the price relatives $\Sigma v\,(p^t / p^o)/ \Sigma v$ where the v's could be could be a set of values. It has been proposed to call such an index as 'Young' index. The values do not necessarily have to be the expenditures in some period. However, if the weights are the expenditure shares $p^oq / \Sigma p^oq$, the index is identical with a fixed basket index that uses the q's. A weighted arithmetic average of the price relatives could also be viewed as a weighted Carli.

The properties of fixed basket indices seem to require further investigation and elucidation. Further explanation is needed in the manual. Erwin Diewert agreed to insert some text on this subject in Chapter 15 and subsequent chapters, as required. Bert Balk would referee. Text in Chapters 1 and 9 would also have to be modified.

The expression 'Laspeyres type index' should not be used if the index in question is actually just a fixed basket index but not a genuine Laspeyres index.

The term 'Laspeyres index' should be confined to a particular fixed basket index in which the duration of both time periods compared is the same and where the quantities in the basket are those obtained by decomposing the actual expenditures in the earlier of the two periods into their price and quantity components.

*Fixed basket **versus** fixed weight indices*

Terminology needs to be tightened up and made more precise and informative. The terms *fixed basket* and *fixed weight* mean different things and should not be used interchangeably.

Weights are used to average sets of numbers, such as price relatives. Weights must be additive and sum to unity, but quantities of *different products* are not commensurate and are not additive. In a CPI context, weights are typically applied to price relatives, not prices[2]. They are typically expenditure shares (*value* shares) that sum to unity by definition. When the weights are value shares, pq's, the q's are not weights. The quantities in fixed basket indices should not be described as 'weights' or 'quantity weights'.

A *fixed weight index* is a term applying to *two or more* indices of the same type that use the same weights. In a time series context, the weights remain fixed for a succession of time periods. The difference between the fixed basket and fixed weight indices can be illustrated as follows. Assume the time series have the same price reference base.

[2] Quantities can, however, be used to weight the prices for a homogeneous set of products, as in a unit value index.

- Time series of Laspeyres indices are fixed weight indices, each individual index being also a fixed basket index.

- Time series of Paasche indices are not fixed weight indices, but each individual index is a fixed basket index.

- Time series of superlative indices cannot be fixed weight indices, assuming that the index for each new period introduces information relating to that period that must change the weighting scheme. However, an individual superlative index can be a fixed basket index, e.g., Walsh.

The purpose of the above is to clarify existing usage. As defined above, 'fixed basket' and 'fixed weight' are meant to conform as closely as possible to the way in which the terms are now generally understood and used. To avoid confusion and ambiguity, however, 'fixed basket' and 'fixed weight' must *not* be used interchangeably.

New terminology

Several people have now proposed naming a fixed basket index a 'Lowe' index. When Erwin defines the index, it can therefore be 'officially' named the Lowe index. However, the term 'fixed basket' index cannot simply be dropped, at least for the time being. 'Fixed basket' is self explanatory, clear, well established and in widespread use. The term Lowe index will have to be introduced gradually and it will take time to become familiar and established. In the meantime, there are many contexts in the Manual where it will be necessary to keep referring to it explicitly as a 'fixed basket index' even if it can be periodically described as a 'fixed basket index, or Lowe index' in order to break readers in gradually to the new terminology.

A similar strategy can be used for the weighted arithmetic average of the price relatives, which can be named a 'Young' index. There is no commonly used expression for this index anyway.

Commensurability of time periods

In a CPI context, the prices collected refer to a month or quarter. The duration of the weight reference period defining the expenditure weights, the q's and their associated average prices (unit values), is invariably much longer, typically a year but often two or three years. In reality, the price reference period never coincides with the weight reference period. CPIs are not Laspeyres indices.

The weight reference period may not even exist in the case of symmetric and superlative indices. Walsh is a fixed basket index, but there is no weight reference period for a Walsh when the two periods compared are not consecutive.

Target indices, price updating and modified Laspeyres

The concept of a '*target index'* is needed and needs to be clarified. The target index is not necessarily the ideal index that a statistical office would like to aim at or approximate, such as a COLI, but the index that the office actually intends and sets out to calculate. It is typically a fixed basket index of some kind, but Statistical Offices should specify, and publicise, exactly what is their target index in practice. In addition, it should be clear whether the primary objective is to measure

- the total price change between some price reference period and the most recent period,
- or the annual change between the most recent period and the corresponding period in the previous year,
- or the price change between successive periods of time, which may be what many users are most interested in.

These different objectives could have practical consequences. Consider period to period indices. If the target CPI is a genuine Laspeyres on some fixed base period, the period to period index would be the ratio of two Laspeyres , i.e., a fixed basket index of the form $p^t \,.\, q^b / p^{t-1} \,.\, q^b$. This index can be written as a weighted average of the price relatives p^t / p^{t-1} using as weights the expenditure shares obtained by revaluing the q^b s at the prices of t-1. Such weights are described as 'price updated weights'.

Many countries calculate their indices in this general way as there can be advantages in trying to construct period to period price relatives rather than price relatives that compare the most recent price directly with the price in the base or price reference period. As the universe of products is changing, better comparisons may be obtained between successive periods than comparisons over longer periods. This makes the realities of the index compilation rather different from what might be understood from a mere statement of the target and these realities should be spelled out in the relevant chapters, not only 9 but also 7 and 8 (where these issues are already discussed).

If the index is calculated effectively by cumulating the monthly changes, the resulting index would still be identical with a fixed weight Laspeyres if the universe did not change and there were no breaks in the price series for the individual products. The index comparing with the base period is then the product of the cumulative index up to t-1 and the index between t-1 and t, an index that may be described as a 'modified Laspeyres'. In this case, the period to period index between t-1 and 1 in which many users are mainly interested has to use price updated expenditure weights. Price updating is necessary given the target and given the method of calculation.

However, the group had some concerns that this result could be interpreted as an argument that price updating is always desirable whatever the target. Suppose users think in terms of fixed basket indices. Their preferred index might be one that measures changes between t-1 and t using a basket that is as *representative* as possible of

expenditures in t-1 and t. (This would give virtually the same result as the COLI between t-1 and t.) The preferred index for the users would then be one in which the expenditure shares are as close as possible to the current pattern of expenditure shares. In this case, price updating the weights is likely to yield an index that is further away from the target than an index whose weights are not price updated.

If the elasticity of substitution is unity on average, the expenditure weights remain unchanged, so that any price updating must produce expenditure weights that are less representative. This is simply a reflection of the fact that the quantities are becoming progressively out of date and less representative. The price updated index can also be viewed as linking the two consecutive periods through the weight reference period, a procedure than becomes progressively less attractive and defensible the longer it goes on and the more remote the weight reference period becomes.

Price updating the weights to the price reference period

When the weight reference period(s), b, predates the price reference period, 0, by some years, say through reliance on an expenditure survey conducted several years earlier, it is common to update the expenditure weights to the price reference period. Assuming that there is substitution, it seems unlikely that the price updated expenditure shares will be more representative of period 0 than the original expenditure shares in period b (without price updating). Price updating may not be desirable in these circumstances and the Manual should make this clear.

Revisions to Chapter 9

Before making any changes to chapter 9 to take account of points discussed above, the corresponding changes should be made to the theoretical chapters from 15 onwards. Erwin Diewert will make whatever revisions may be needed.

Other points relating to Chapter 9

Chapter 9 can be divided into three parts: elementary indices, aggregation, and editing. The middle section on aggregation issues will be revised depending on the precise outcome of the issues discussed above.

The section on editing will be converted from a PPI to a CPI context, with some shortening.

The section on elementary indices will be revised to follow the same ordering as in Chapter 20. The discussion of the economic approach to elementary indices should follow a discussion of their mathematical properties and the axiomatic approach. The 'price bouncing' test should be clarified. The presentation of the economic approach should mirror the cautious statements in Chapter 20 and avoid oversimplified generalisations and overstatements, such as 'Jevons assumes constant expenditure shares', which could expose the Manual to unnecessary criticism.

There should also be a clearer separation of sampling issues from economic issues.

The necessary revisions to chapter 9 will be undertaken by Carsten Bolden Hansen. Some of these revision will have to await the revisions to chapter 15 etc.

Chapter 21

The text will be reviewed by Erwin Diewert in consultation with Mick Silver. Three paragraphs summarising the chapter are also needed for Chapter 1

Chapter 22

The existing draft needs to be revised to recognise the fact that statistical offices will not follow the suggestion of dropping all strongly seasonal products from the month to month index as the main index is supposed, even required, to be comprehensive in coverage. It was agreed that more text needs to be added addressing the practical problems that then arise. Some summary additions may be needed to Chapters 1, 2 and 3 referring to seasonality and seasonal products. A clear distinction needs to be made between dealing with seasonal collections and how to seasonally adjust.

Chapter 4

The section on concepts and coverage can probably be dropped since these topics will have just been discussed in detail in the preceding chapter 3. Alternatively, some shifting of text from Chapter 3 to Chapter 4 might be desirable. The remainder of the chapter will need reviewing in the light of the revisions tyo be made to chapter 9, 15 etc. The resulting chapter may be much shorter. Peter Hill will undertake the necessary editing when the other chapters are agreed.

Chapter 6

The text on Price Bargaining in Michel Mouyelo-Katoula's paper on 'Special problems of Price Collection' will be incorporated into the Manual at the end of Chapter 6 on 'Price Collection'. The text would be edited and shortened, as appropriate. David Fenwick will take charge.

The Glossary

There was discussion of some key definitions / descriptions, including COLIs, and some definitions will be tightened or clarified. The revisions will be undertaken by Peter Hill. Some more definitions / descriptions need to be added.

Refereeing and editing

Revisions are still needed to text that has been written or substantially revised during the present year. There are also some consequential revisions for other chapters. The following division of labour was agreed.

Peter Hill will update and revise chapters 1 to 4.
Bert Balk will assure Chapter 5 for style.
Davis Fenwick will revise chapter 6.
Bert Balk will review chapters 7 and 8 and refer back to Mick Silver.
Carsten Boldsen Hansen will revise chapter 9 and Peter Hill will referee.
Peter Hill will review chapter 14 referring to Kim Zieschang as necessary..
Erwin Diewert will revise chapters 15 through 20, and 22 and 23, as needed.
Erwin Diewert will review chapter 21.
Peter Hill will revise and expand the Glossary.

The end of November was set as a target for completing the revisions to ensure delivery of a zero draft before Christmas. Although they could involve a lot of work for some people, the revisions were felt to be essential for producing a high quality Manual.