QUALITY ADJUSTMENT IN CPIs – A PERSONAL VIEW

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Introductory Note

This short paper has been written in order to stimulate discussion about what the author believes is a fundamental flaw in CPI theory and practice. Although the paper focuses on the quality change issue, it could equally have discussed the problem in relation to new products. Because, fundamentally, the problem concerns the inter-relationship between products and utility. Is a mobile phone just a different sort of phone, or is it something quite different? And who is supposed to decide this?

Arguments have raged for many years over the quality adjustment problem in consumer price indices (CPIs). The European Union harmonization project, in particular the Regulation concerning quality adjustments, has focussed attention even more strongly on the problem. In the United States, the 1996 Boskin Report[1] highlighted quality change measurement as the largest single cause of what was—in the Commission's view—the overestimation of the CPI. A Bundesbank report[2] has recently reached a similar conclusion in respect of Germany.

Reduced to essentials, there is a conceptual problem and a practical problem. Let us consider first the conceptual problem. This amounts to the question of whether a CPI should be (is) a "pure" price index or a cost-of-living (COL) index. The US Bureau of Labor Statistics (BLS) has recently reiterated its commitment to a COL approach—in theory if not in practice. In its response to the Boskin Report[3], the BLS said:

> "The BLS has for many years used the concept of the COL index as a framework for making decisions about the CPI and accepts the COL index as the measurement objective for the index". The BLS report continues: "The COL index is a theoretical construct, however, not a single or straightforward index formula readily amenable to practical use." A few other countries would line up with this.

A COL-type index is a social statistic, not an economic one. Why? Because its primary aim is concerned with the maintenance of household living standards. This at once brings the COL index into serious conceptual and measurement difficulties. Let's look first at what a COL is trying to measure. It's trying to measure the cost of maintaining an average household's "utility"—a vague concept at best, hence the vast literature surrounding it. The plain fact is that "utility" is a subjective concept which does not lend itself to straightforward quantification, whether at the level of the individual, the household, or the household sector.

What does "utility" mean? It has been defined as "the satisfaction obtained by a consumer from the consumption of goods and services."[4] In a period of changing products and lifestyles, this has no quantifiable meaning. Nobody tries to extract any meaningful knowledge from a comparison of CPIs fifty years apart, just as it is a hopeless task to measure current price-level differences between economies as different as, say, the USA and Bangladesh. This is quite simply because there is insufficient basis of comparison because the lifestyles and markets are so dissimilar.

This leads the author to believe that a CPI, if it is to be meaningful, can only be a short-term indicator.

Does this mean that the COL approach must be abandoned entirely? Not necessarily. The question which is theoretically answered by the COL index is "What is the minimum change in expenditure that would be required in order to leave a consumer indifferent between a reference period set of prices and a comparison period set of prices? " But, to quote again from the BLS Boskin response, "the consumer's wellbeing depends on so many aspects of life other than market goods and services, e.g. environmental quality and amenities (clean air, crime etc), … health status, ... " and so on. Few of these aspects are quantifiable; thus the most that a COL index can do is to behave as a kind of sub-index of this all-encompassing COL concept, excluding many important factors which affect consumer utility.

What, on the other hand, is the purpose of a "pure" price index? (Pure, that is, on a strict Laspeyres principle). This gives precise information on the changing price of a constant basket of products. Such an index is appropriate, say, to the deflation of consumers' expenditure in the national accounts—at least, in between successive rebasings. Although it is perfectly possible to construct such an index over the long term using a chain method of re-weighting and a suitable method of substitution for changing products, the question must be asked also whether this type of index can be used for valid long-term comparisons.
Again, the answer is no.

One or two examples will illustrate this point. Consider the question of the home reproduction of music through commercial recordings. In the 1930s, this was achieved by means of 78 rpm shellac records played on mechanical gramophones using short-life steel or "thorn" styluses ("needles"). A Beethoven symphony might take up six fragile records, weighing 1.7kg, and would require the listener to change or turn over the record five times during the 40-minute playback, as well as wind up the spring mechanism as many times. The quality of sound was not comparable to modern CD standards, and deteriorated rapidly with the age and usage of the records.

By the 1950s, long-playing vinyl records ("LPs") had replaced the 78s, and reproduction was electronic—firstly through valve amplifiers and later through transistors. Loudspeaker design had changed radically, and styluses were now made of relatively durable materials such as sapphire or diamond rather than of wood or steel. Overall, both sound quality and the quality of the "experience" had changed radically. A Beethoven symphony could be accommodated on a single record, involving at most one turnover, and no winding was needed. The listener could thus listen in uninterrupted comfort to perhaps the whole symphony.

Nowadays, a further technical revolution has occurred with the advent of the compact disc (CD) and remote control. Now, it is possible to listen to more than one Beethoven symphony without moving from one's chair, with a sound quality greatly enhanced compared with LPs. The handset gives remote control over many aspects of the playback, including volume, pause, and so on; and the discs themselves have an almost limitless life (or so we are told!).

The question now arises: how would these changes over 60 years have been tracked, typically, by a CPI statistician using modern methods of index construction. And would the results involving a series of quality adjustments, substitutions, and the incorporation of new products, be meaningful? Because if not—even with the advantage of hindsight in this particular example—the process of quality adjustment needs to be challenged.

So, what would have happened? Probably nobody can be sure, but one thing we can be sure of is that different countries—and indeed different price statisticians within a country—would have made widely differing decisions. We can be sure of this because of the discussions we have had in quality adjustment in the context of EU harmonization.

This is a partial list showing some of the quality change/new product events which would have required adjustments to the CPI:

(a) Wind-up mechanical gramophone to electric gramophone
(big technology change; more user convenience)

(b) 78 r.p.m. record to LP
(relatively small technology change; major convenience and quality improvements; durability of record; length of continuous music increased by a factor of 6; much improved sound quality).

(c) Radiogram to hi-fi separates
(split of unified product into several sub-products: amplifier, turntable, speakers; fashion aspect?).

(d) LP to CD
(major technology change; major convenience improvement; big sound quality improvement; major improvement in disc durability. Note that gradually new hi-fi systems began to incorporate a CD player as standard).

Even with hindsight, it would be difficult to deal with most changes of this type. Without hindsight (which is the situation which price statisticians have to face) it is unsurprising that the decision taken would have been very diverse. In particular, most of them would have been subjective. What valuation can possibly be put on the increased durability of a CD compared with an LP?—especially when the durability of a new product can only be guessed at.

The author would argue that the choice of articles which are being priced is to a large extent arbitrary. It normally corresponds to a single product available at a specified price, e.g. a loudspeaker. A loudspeaker has no use unless it is connected up as part of a sound reproduction system. So it makes as much sense to price a loudspeaker as it does to price a particular component (e.g. a transformer) inside an amplifier. The difference is that loudspeakers are often purchased separately by consumers, whereas a transformer is almost always part of an amplifier and is not purchased separately (except possibly for repair). But these technical relationships are always changing over time. In the 1930s, the loudspeaker ("horn") was an integral part of the gramophone, never bought separately. And in the 1990s probably the majority of loudspeakers are incorporated in a hi-fi package system, without a separate price tag.

As another example of technology change in this field, consider the stylus. The function of this component—which had to be purchased and re-purchased separately in the days of 78s and LPs—is to "decode" the encrypted signals on the disc. This is now done, in CDs, by a laser device which is an integral part of the CD player and does not need replacing unless faulty. The point is that the change from an electrical record-player/tone arm/stylus to a CD player is not just the equipment for spinning a disc but also for "reading" it.

These technology changes occur quite arbitrarily. So why not, equally arbitrarily it may be argued, price the total product holistically? This would, perhaps, involve specifying the "product" as: "the replay of a recording of Beethoven's 5th symphony with a system allowing repeated replays." This, after all, is what the consumer is finally seeking. The consumer has to follow the available technology, not vice-versa. The consumer is not interested, per se, in thorn needles, transistors, tracking mechanisms, speaker polarities, lasers and so on, but in the overall quality of the experience of listening to a recording of Beethoven's 5th symphony. This, in fact, is what utility is all about.

But wait a moment. Let's just suppose that we could monitor the price of this holistic "service" over time (it would certainly involve difficult quality adjustments, as well as the spreading over time of the "capital" cost of the equipment). Utility-related it certainly would be, but what would be its economic value? Not as a price deflator. At least, not as long as the present System of National Accounts[5] is constructed in its present way. Consumer expenditure in the national accounts is classified in a traditional way, in which a CD is a CD and not part of a holistic acoustic experience. Of course, the national accounts do not have to be as they are – indeed, the current transition to COICOP (Classification of Individual Consumption by *Purpose* (author's italics)) perhaps show a slight move in a holistic direction. For example, the classification of electronic items such as videos and CDs has changed from an all-embracing "electronic goods" heading to the appropriate functional heading (games, education etc).

In fact, its use could only be as a socio-economic indicator. As pointed out at the start of this paper, nobody tries to extract any quantitative meaning from a CPI comparison over a very long period.

The conclusion to be drawn from this approach is that a CPI can only be relevant for short-period comparisons. There is a close analogy here with PPPs, as mentioned in para.4. It has long been understood that a price comparison at the same time between countries at markedly different stages of economic development (e.g. USA/Bangladesh) is not meaningful. Whilst it is possible to obtain a series of transitive or gradual comparisons by using bridge countries (USA/UK/Germany/Turkey/ India/Bangladesh) it still remains doubtful whether a resulting USA/Bangladesh comparison carries any real meaning. At bottom, one cannot compare apples with pears, no matter how one looks at them. So, if CPIs can only be used for short-term comparisons, (a) how short is "short-term", and (b) what does this tell us about the construction of such a CPI? Does the restriction to short-term use free us from some of the clutter which encumbers a multi-purpose CPI?

The author would propose a definition of "short-term" for this purpose. It is the maximum period of time for which an unchanged set of weights can be reasonably said to approximate to consumer expenditure patterns. This begs the question as to what is meant by "reasonably". We need an operational definition. Some countries re-weight CPIs annually. This is usually regarded as the maximum frequency, but for a monthly index there is no theoretical reason why weights should not be changed monthly. In a society where consumer expenditure patterns were extremely erratic, this might not be thought unreasonable. On the other hand, why might 10 years be regarded as too long? If consumer expenditure patterns were exceptionally stable, 10 years may not be too long at all. In fact, our thinking has been largely conditioned by received wisdom centred on the fact that in the last 30 years at least there have been rapid changes in the consumer market and hence in expenditure patterns. We "know" intuitively that 10 years is too long. But we need something better than intuition. A useful paper by Martini[6] proposes that, in present-day circumstances, the frequency of CPI re-weighting should lie between 1 and 3 years.

The author is not, finally, going to attempt in this paper—which is intended only to stimulate discussion—to define "short-term". But let us assume—purely for argument's sake—that it was 5 years. What then would be the implication for CPI construction?

I leave that to my colleagues in the Ottawa Group to discuss. Hopefully, a later version of this paper might reach some conclusions. But the author believes that price statisticians would do well to consider a remark made by Joel Popkin (formerly Assistant Commissioner for Prices and Living Conditions at the BLS) at an informal seminar in Luxembourg in 1996. He said: **"Statisticians should measure what they can measure and not what they can only speculate about."**

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[1] Boskin, M.J. et al., "Towards a more accurate measure of the cost of living", Dec 1996.
[2] Hoffmann, J., "Probleme der Inflationsmessung in Deutschland", (Discussion paper 1/98, Volkswirtschaftliche Forschungsgruppe, Deutschen Bundesbank), Feb 1998.
[3] Bureau of Labor Statistics, "Measurement issues in the consumer price index", June 1997.
[4] Leftwich R.H., "The price system and resource allocation", 1970.
[5] United Nations, System of National Accounts, 1993.
[6] Martini, M., "The frequency of updating of the base of consumer price index numbers", (mimeo, University of Milan), June 1996.