Adjustments to Prices for Technological Improvements and Quality Changes in Price Indexes

Annette Barbetti
Superannuated Commonwealth Officers' Association
P.O. Box 107, Mawson, ACT 2607
Email: barbaj@grapevine.net.au

Abstract
This paper addresses several issues related to price adjustments in the price indexes such as the CPI and the PPI:

- The need for the measurement of quality inflation, defined as that part of the increase in shelf prices that can be attributed to a perceived increase in quality or utility:
- The need to provide information to the public about the extent of the adjustments for quality inflation associated with the compilation of the CPI and the PPI and the methods of measuring quality inflation and making adjustments for it;
- The need for a published cost of living index that is not discounted for quality inflation, to promote better public understanding;
- Difficulties in measuring increase in quality or utility; and
- Selective provision of information about technological change by manufacturers and the possibility of bias.

This paper recommends a new measure of inflation defined as follows:

CPI (Shopping) = CPI (Pure Price Inflation) + Quality Inflation

The CPI (Pure Price Inflation) is, of course, the CPI that is published quarterly by the ABS. The Quality Inflation term should be published as well as CPI (Shopping), because it would help to improve public understanding. The CPI (Shopping) index would be particularly useful for retirement planning.

1. INTRODUCTION

The international standard for the compilation of the CPI (Resolution II of the ILO, 2003) says:

"1. The CPI is a current social and economic indicator that is constructed to measure changes over time in the general level of prices of consumer goods and services that households acquire, use or pay for consumption.

2. The index aims to measure the change in consumer prices over time. This may be done by measuring the cost of purchasing a fixed basket of consumer goods and services of constant quality, and similar characteristics, with the products in the basket being selected to be representative of households' expenditure during a year or other specified period. Such an index is called a fixed-basket price index.

3. The index may also aim to measure the effects of price changes on the cost of achieving a constant standard of living (i.e. level of utility or welfare). This concept is called a cost-of-living index."

2. QUALITY INFLATION

The CPI, as defined by the ILO, is generally considered to be appropriate for some macroeconomic purposes (although the implicit price deflator, which takes substitution into account (unlike the CPI), is used in estimating Gross Domestic Product at constant prices, that is, chain volume measures). When rapid technological and regulatory changes are taking place, it is often difficult to measure change in quality, and even more difficult to measure change in utility or welfare. What seems to be measured is the vendor's idea of what the customer will consider to be an improvement in quality and/or utility at the moment of purchase. Lemons are not discovered until afterwards, so actual durability is not really taken into account.

Hedonic price indexes are often used to measure the relationship between quality changes (as described by the manufacturers and which the statistical agency has decided to treat as such) and observed price changes, but the regression models used to produce hedonic price indexes are very resource and data intensive, require frequent updating and often produce questionable results, particularly when many of the items in the base period reference basket are no longer available.

One way to measure the quality inflation would be to compare the prices of only those goods in the reference basket that have not changed in any way and were available for purchase at both of the time periods being considered, to obtain a measure of the pure price inflation for each commodity. An estimate of the contribution of quality or utility inflation to the observed increase in prices, that is, the Quality Inflation, can then be calculated by subtracting the corresponding contribution to the CPI (Pure Price Inflation), obtained using current methods. That procedure might not always be feasible, in which case a more complicated procedure would be necessary.

It would be useful, for many purposes, to know how much of the increase in prices in a given period is due to improvements in quality and utility, and how much was due to a combination of other factors, such as movements in exchange rates, temporary shortages due to natural disasters, etc.

Similarly, it would be useful to have similar information for the Producer Price Indexes. For example, such information could be of considerable use in analysing how quality and technological improvements are elements of increases in labour productivity.

3. INFORMATION ABOUT ADJUSTMENTS FOR TECHNOLOGICAL CHANGE

Information about the total effect of quality adjustments to the prices used in the compilation of the CPI and the PPI should be made available to the public. Many otherwise well-informed members of the public do not understand that the CPI does NOT reflect what is happening to prices in the shops.

The ABS says very little about quality adjustments and their affect on the CPI in its official publications. I have asked the ABS for more information about the overall effect of all the adjustments for quality improvement in the CPI, but they have informed me that this information is not available. The New Zealand Department of Statistics has, however, published data on the extent of quality adjustments for some items in the New Zealand CPI.

4. RETIREMENT PLANNING

The ABS does say in its publications that the CPI is a measure of price inflation, not a cost of living index, but most members of the public do not understand what that means. Most members of the public erroneously believe that CPI indexation does preserve purchasing power, without realising that it does not allow for unavoidable increases in living standards. As a result, most people are making very inadequate provision for their retirement. For example, suppose that a person aims to have a retirement income equivalent to $40,000 a year at today's prices. They might think that they can do that by saving $500,000 in their super fund, which will get a long-term return of 8%. Allowing for fees, taxation, and CPI increases of 3% a year, the return would be 4% per annum. However, supposing that the real rate of inflation (including quality inflation) would be 4%, their return would be only 3% per annum and they would need to save an additional $125,000 to be able to maintain their purchasing power.

It might be argued that people should just try to maintain the standard of living that they had when they retired and do without the new and improved goods and services. That might be possible for three or four years at most, but it is not possible in the longer term. When modern goods develop problems, it is often impossible to repair them, so one has to buy new improved ones. Life expectancy has been increasing for the past century. If a couple are both aged 65, there is a 50/50 chance that one of them will live to 94, according to research published in the June 2010 issue of *Choice* magazine. They will have had to buy many new improved items during that period.

In the real world, living standards have been improving due to technological change and other factors, such as government regulations mandating higher minimum standards for goods and services, and they will continue to improve. Consumers are often forced to purchase better quality goods and services because there is no alternative. Similarly, some goods and services disappear from the marketplace, to be replaced by better goods and services, because of decisions made by manufacturers and/or distributors.

When goods and services become unavailable, they have to buy the replacement items at the full shelf price, rather the notional price after discounting for quality improvement. Examples are cars without front airbags (no longer available due to government regulations) and some older models of mobile phones (unable to work on the new 3G network). The increasing use of the Internet to provide otherwise unobtainable information is forcing people to keep purchasing new computers and related equipment at shelf prices which are much higher than the prices, heavily discounted for quality improvement, that are used in the calculation of the CPI.

5. DIFFICULTIES IN MEASURING INCREASES IN QUALITY

Statisticians must decide whether a change in size equates to a change in quality or simply a change in quantity. For example, if the size of a standard chocolate bar is reduced, there is clearly a change in the quantity of chocolate, but there is no change in the quality or utility of the chocolate. Suppose, however, that the only change in the new model of a computer is that it has more memory than the previous model. The purchaser will be buying a better computer, but how does one measure how much better? It would not be realistic to suppose that if it has twice as much memory it would be twice as useful. Some of the extra memory would be required immediately for the software upgrades since the last model, and more would be required for future upgrades. In theory, the additional memory would prolong the useful life of the computer, but in practice most domestic users find that some other vital component of their computer fails long before they have exhausted their computer's memory. In that case, how can one measure the change in utility? For some goods, the change in utility is estimated by using hedonic models. See, for example, the ABS research paper "Reviewing the ABS' Hedonic Regression Model for Desktop Computers".

However, as all computer users know, there are frequent upgrades to all kinds of computer software. In general, most new versions of software are designed to be backwards compatible. In practice, that means that every new version of a particular software program uses more memory than the previous one. Computer users are well aware of that and tend to buy computers with more capacity than they really need in anticipation of more upgrades, with the result that the actual improvement in performance would be less than that predicted by conventional hedonic methods (see the paper by Feenstra and Knittel).

6. PROVISION OF INFORMATION ABOUT TECHNOLOGICAL CHANGE

Technological improvements may result in lower manufacturing costs, more durable products, increased functionality, more appealing products, environmentally superior products, products that perform more efficiently, cause fewer problems, etc. It is customary for statisticians to rely on manufacturers' claims about improvements. It would not be realistic to expect statistical agencies to try to verify the truth of those claims.

One would expect manufacturers to be more thorough when describing improvements than when revealing design features that may detract from the

utility of their products. Sometimes the manufacturers have not yet detected the problems (e.g. bugs in computer hardware and software, potential security risks in control systems for modern cars) or they have gone to elaborate lengths to conceal them (e.g. health problems linked to cigarette consumption). This is an issue for both the PPI and the CPI.

An innovation that reduces manufacturing costs may render the product less durable. For example, during recent years many manufacturers have replaced durable metal parts with cheaper, flimsier, less durable plastic parts. Manufacturers would probably fail to inform statistical agencies of such minor changes in manufacturing processes (which can significantly affect durability), and, even if they did, statisticians may well consider them to be insignificant, with the result that the statisticians would not adjust the new shelf price to take into account the corresponding decrease in utility.

Sometimes changes to less durable products occur as a result of government regulations banning certain products. Consumers have no choice but to buy the products approved by the government. For example, some years ago, the European Union mandated a new standard for brake linings for cars, which was intended to improve a car's handling ability on smooth, icy surfaces. An unintended side effect was a significant reduction in the expected life of the brake linings for certain models of cars. Buyers of new vehicles had no choice in the matter – they were forced by manufacturers to buy vehicles conforming to the new standard, even in countries outside the European Union (it was apparently cheaper for car manufacturers to adopt the new standard for all their brake linings).

In such cases, a statistician may take into account at least four factors: the change, if any, in the cost of producing the new brake linings; the improvement in handling of the vehicles; the reduced durability of the brake linings; and the lack of choice for the purchaser. If one considers the change in utility purely from the viewpoint of the consumer, then the utility would vary according to the climatic conditions of the country compiling the CPI. A Canadian consumer might well think that the new brake linings had increased the utility of the vehicle, whereas an Australian consumer who never drives on icy roads would think that they had decreased the utility of the car when he found out that he had to replace his car's brake linings twice as often as before.

7. SUMMARY

I believe that the introduction of the proposed CPI (Shopping) is long overdue. Many people are questioning the present CPI, because they do not understand that it is a measure of pure price inflation after adjustment of prices for technological change. The provision of a second measure, as suggested in this paper, would be a positive step towards restoring the public's faith in the CPI and would also help prospective retirees to make a better estimate of the price increases that they must expect to experience during their retirement. It should be possible to compile the additional estimates without greatly increasing the cost of CPI compilation.

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