

Meeting of the Ottawa Group 2 – 6 April 2001, Canberra, Australia

Welcoming Address by Dennis Trewin, Australian Statistician

I would like to welcome you to the sixth meeting of the international working group on price indices — the so called Ottawa Group. I am pleased Australia is hosting. Australia is an original participant in the Ottawa Group and has attended each meeting.

In particular, I would like to welcome the representatives from various Asian countries particularly those who are attending for the first time. ABS is keen to continue to work closely with our near neighbours on statistical matters to improve the development of statistics in our region. It's an important aspect of our recently revised Corporate Plan.

There is a valuable role for the Ottawa Group to play in the field of price indexes - as forces of globalisation bring economies closer together, there is greater demand for statistical agencies to produce data of a high quality that is consistent between countries. There is also a continuing need to share research and development experiences. There are a number of particularly challenging areas in the field of price statistics. Many of these are in rapidly growing areas of services and we are pleased that there will be particular focus on financial services and telecommunication services during the meeting.

Producing statistics such as the CPI to a high quality is no simple task. There are issues to do with pricing to constant quality as well as challenges in dealing with new goods and goods that disappear. There are also possibilities for improving the CPI through the use of scanner data — particularly in undertaking research directed towards establishing better methodologies. I am glad to see the Ottawa group paying continuing attention to these issues.

There is a good agenda for this meeting. The three main topics of scanner data, and pricing of financial services and telecommunication services are extremely important for Australia and no doubt many other countries. The activities of the Ottawa Group are important but they are also expensive. It is up to the Group to ensure good value for money is obtained on the important topic of price statistics. I believe that the Ottawa Group meetings would become more useful if:

- they do not become talkfests — they lead to real improvements in price statistics;
- they are not pitched at too esoteric a level, whilst recognising this may be necessary for parts of the discussion;
- the Ottawa Group draws some conclusions from its discussions, particularly on implications for CPI practices. Sometimes the conclusions may be of the form "more work needs to be done" but hopefully the conclusions are more informative for most discussion items; and
- the papers and conclusions from the meetings are shared beyond the meeting participants.

I would also like to inform you of Australia's involvement in recent key international price index developments which I thought might be of general interest.

- We have participated in each round of the OECD Purchasing Power Parity Program since 1985, with the results feeding into the broader International Comparisons Program (ICP) coordinated by the World Bank. We have in the past criticised the reliability of PPP results,

but now believe that initiatives taken by the OECD and Eurostat have led to a significant improvement and we will be a contributor to future rounds.

- We were also a strong critic of the revised ICP program put forward by the World Bank at the 2000 UN Statistical Commission meeting. We did not believe it gave sufficient consideration to documented quality concerns or leave sufficient time to organise a well thought through development program. The UNSC appointed a Friends of the Chair to assist the World Bank to prepare a revised development program which has now been prepared. In the light of discussion at the recent UNSC meeting, the ABS has offered to undertake a coordinating role among Asian countries in relation to their contribution to the ICP.
- We support the development of international manuals in the area of price statistics. These should be aimed at improving compilation practices — particularly in developing countries who are the countries most likely to use them in detail — and thus the accuracy and comparability of price indexes. We feel that the manuals should provide basic concepts and objectives, guidelines to best practices and procedures - recognise real world situations and provide options that can work in practice. The manuals should be clear with many illustrative examples. We are concerned that existing drafts of the CPI Manual have not targeted the right audience and are pitched at too technical a level — we will be interested in Ottawa group members' views on this when we come to the discussion on this topic later in the week.
- Bill McLennan has undertaken a consultancy for the ILO to redraft the resolution on consumer price indexes. I think he has done a splendid job and the ABS supports the document he has prepared. The draft resolution will be discussed at an ILO meeting later this year.

There are also a few recent developments in the Australian price indexes I thought might be of interest.

- There was a change in the principal purpose of the CPI with the introduction of 13th series in September 1998; away from a household living cost approach to a measure of household inflation. The ABS has committed to produce analytical living cost indexes for selected population subgroups; we intend to release indexes for employee households, age pensioner households, other government transfer recipient households and self-funded retiree households in the next month or two. These fundamental changes to the Australian CPI were very well received in part because there was extensive consultation beforehand.
- We are pursuing two major initiatives in regard to the CPI — financial and telecommunication services. In 1998 we announced our intention of including a range of financial services in the CPI, especially an aggregate measure picking up both the direct and indirect charges associated with deposit and loan facilities. We are now receiving most of the information we require from the major financial institutions to construct these measures. We are still not certain, though, when we will be able to incorporate these measures into the CPI. In recognition of the failure of traditional index number techniques to cope with the rapidly changing telecommunications sector, the ABS is moving towards adoption of a so called sample of bills approach.
- In 1997 we released an information paper proposing a family of price indexes for the whole economy. An information paper discussing in more detail the proposed construction of the domestic final purchases index (one of the key indexes in the "family") and providing experimental estimates will be released shortly.
- Stage of production indexes have been released for over 12 months and we have received excellent feedback on their usefulness in increasing understanding of inflationary pressures.
- We are improving the efficiency of producing price indexes. We have participated in benchmarking exercises, both internally and externally with the UK. We will shortly be

undertaking a review of our prices program, looking at practices such as changed methods for price collection and greater sharing of resources and systems across all price indexes.

- We will also be looking at expanding the scope of the CPI to non-metropolitan areas, as well as the possibility of constructing spatial indexes.

Finally, I would like to repeat the welcome and encourage participants to have a good time. The opportunity is here for the Ottawa Group to closely examine important CPI issues and present options, so that there is a clearer vision of the best approaches to addressing these issues for the benefit of all statistical agencies

Introduction

This volume contains revised and lightly edited versions of papers presented at the Sixth Meeting of the International Working Group on Price Indices (the Ottawa Group). The meeting was hosted by the Australian Bureau of Statistics in Canberra from 2 through 6 April 2001.

Terms of reference of the Ottawa Group

The Ottawa Group provides a forum for specialists and practitioners who work for, or are advisors to, national statistical agencies or international organisations to exchange their experiences and thoughts on crucial problems of measuring price change. The Group's strength is based on its professional authority, independence, and usefulness to national and international agencies.

Without avoiding theoretical issues, the focus of the Group is on applied research, particularly though not exclusively, in the area of consumer price indices. The Group examines advantages and disadvantages of various concepts, methods and procedures in the context of realistic operational environments, supported by concrete examples whenever possible.

Only specialists actively involved in the application of the principles relating to the topics under discussion are invited to the Group's meetings as active participants. The proceedings from the sessions are edited and diffused. They contain the presented papers and the most important elements of discussions. They also include the Group's recommendations when a preponderant opinion clearly emerges from the discussions, or, if this is not the case, a summary of the discordant opinions with balanced commentary.

The Group may also assemble and publish compendia of materials related to specific topics of price statistics, composed of papers and of summaries of discussions from several meetings. Each of these publications could constitute chapters of a Handbook describing best practices in the given area of price statistics.

Organisation of the Group

The Group has a Steering Committee, which ensures both the continuity and evolution of the Group's activities. The Committee comprises representatives of the agencies that host the Group's recent or upcoming meetings together with others agreed to by the membership from time to time. The representative of Statistics Canada is a permanent

member, serving as executive Secretary.

The Committee outlines long-term activity plans for the Group and proposes topics for the meetings. Meetings are organised in principle once a year, with topics established in advance for at least the next two meetings. The Committee extends calls to the member agencies for the submission of papers on the agreed topics and it is responsible for the selection of papers to be presented. Their authors are invited to the meeting, possibly with other specialists whose contribution to the discussion on a specific topic is considered useful. The number of active participants is kept limited for the sake of efficient discussion, however the host agency may additionally invite a reasonable number of observers.

Although the meetings may be divided into sessions, these are not organised in a parallel manner. Each session is devoted to one, clearly defined topic with a designated moderator. Furthermore, each topic has a designated person responsible for producing a summary of the discussions and recording any recommendations.

The host agency provides facilities for the meeting and arranges for the hard-copy publication of proceedings. The participants bear the cost of travel, accommodation and subsistence during the sessions.

The copies of proceedings and information about the Group are also available on the Internet. Prices Division, Statistics Canada, is responsible for maintaining a web-site open to the public. The Steering Committee may also decide to edit and periodically release compendia on selected topics, whenever it is warranted by the status of available materials.

Previous meetings of the Group

<u>Meeting</u>	<u>Date</u>	<u>Hosting Agency</u>	<u>Location</u>
First	November 1994	Statistics Canada	Ottawa
Second	November 1995	Statistics Sweden	Stockholm
Third	April 1997	Statistics Netherlands	Voorburg
Fourth	April 1998	US BLS	Washington DC
Fifth	August 1999	Statistics Iceland	Reykjavik

The sixth meeting

The papers were grouped into five broad categories for purposes of discussion. The sessions and moderators are shown in chronological order below.

<u>Session</u>	<u>Moderator</u>
Quality adjustment and scanner data	Bert Balk
New and disappearing goods	Keith Woolford
Financial services	Mick Silver
Miscellaneous areas of new or ongoing research	John Greenlees
Telecommunication services	Erwin Diewert

In total, some 28 papers were presented for discussion with a further 3 papers submitted as room documents. Several papers had been published previously, but were included for discussion as they were relevant to the topics. All papers are included in this volume grouped according to topic and in order of presentation

In addition, Walter Lane moderated a session devoted to the discussion of problems currently being experienced by compilers of CPI's. Meeting participants submitted, in advance, questions or details of problems. A number of issues were forthcoming and discussed.

Moderators were charged with the task of summarising discussions for each session and these summaries precede the papers. Where appropriate, they also include the Group's recommendations for statistical agencies.

At the invitation of the Technical Expert Group – Consumer Price Index (TEG–CPI), a session was devoted to a discussion of the new manual on consumer price indices being prepared for the International Labour Organisation (ILO). The major concern of Ottawa Group participants was that the manual lacked a clear focus. They felt the principal objective of the manual should be to provide guidelines to statisticians in national agencies responsible for compiling consumer price indexes. The consensus views of meeting participants were conveyed in a communiqué to the TEG–CPI, a copy of which is reproduced in Appendix 1.

With the concurrence of the ILO, a draft revised Resolution concerning consumer price indices was circulated to participants. The draft was prepared by former Australian Statistician, Mr W. McLennan as a consultant to the ILO. The ILO recognised the expertise of Ottawa Group participants and welcomed any comments they had on the draft resolution. A copy of the draft resolution is reproduced in Appendix 2.

The next meeting of the Group will be hosted by the Institut National de la Statistique et des Études Économiques (INSEE) and held in Paris in November 2002. Mr Thierry Lacroix outlined initial proposals for the meeting. He suggested that the meeting be held over three days with a maximum of 20 papers for presentation, with papers to be available four months prior to the meeting. The key topics proposed for this meeting are:

- financial services (including insurance);
- health and social services;
- e-commerce; and
- coping with changes to complex pricing schemes.

Some participants were concerned that the meeting should not preclude other topics if major works of substance were to emerge in the meantime. There was also concern that the group maintain a format and size that permitted in depth discussion of papers submitted. Mr Lacroix would further consider these matters in consultation with steering committee members.

The steering committee has accepted the offer of Statistics Finland to host the meeting after Paris.

The steering committee will report to the United Nations Statistical Commission and send them a copy of these papers and proceedings.

Finally, I would like to extend my thanks to the many people who contributed so much to the success of this meeting:

- my fellow steering committee members – Louis-Marc Ducharme (Statistics Canada), Bert Balk (Statistics Netherlands), John Greenlees (BLS), Thierry Lacroix (INSEE) and Rósmundur Guðnason (Statistics Iceland) – for their assistance in planning for this meeting;

- all participants for the quality of presented papers and their enthusiastic and insightful contributions to discussions; and
- Michelle Moore and Bill Ferris of ABS for their tireless work behind the scenes and for the support they provided to moderators.

Copies of papers and proceedings are also available on CD-ROM from the Australian Bureau of Statistics and the Ottawa Group website maintained by Statistics Canada at www4.statcan.ca/secure/english/ottawagroup.

I hope that this volume contains material that will directly benefit compilers of official price indexes while encouraging further research in this important field of statistics.

Keith Woolford
Canberra

Summary of Sessions

Quality adjustment and scanner data

Moderator: Bert Balk, Statistics Netherlands

The papers considered under this topic covered a range of issues relating to the adjustment of prices for changes in quality and the use of scanner data in CPI compilation.

It is intended that CPI's measure price change of items of constant quality. However, in reality few items remain exactly the same over time. There are many aspects of quality change. Some quality dimensions of products are readily observable (e.g. volume or weight) and adjustments for changes in these are relatively straightforward. Other changes are less visible and hence are difficult to measure and make adjustments for. In addition, quality change issues arise in the treatment of new and disappearing items.

There are various methods of controlling or adjusting for quality change, including the use of matched samples, simple subjective judgement and hedonic techniques. Sellwood provides a discussion of quality adjustment practices and objectives. For example, he notes that sample replacement (or rotation) of itself is not a quality adjustment procedure although it may produce a different index outcome, while use of overlap prices implicitly assumes that all the price difference is due to quality. Sellwood calls for greater clarity in defining quality and in specifying quality adjustment procedures.

The papers of Bode and Van Dalen, Lee and Okamoto and Satou provide examples of estimates of price change using different hedonic approaches for removing quality change. Matched samples, by definition, maintains items of the same quality in the index but it can result in a loss of market coverage as items change or cease to exist. Frequent sample updating can sustain market coverage, but still needs to be accompanied by suitable methods of quality adjustment. Silver and Heravi utilise scanner data on washing machines to explore the effects of different sample updating/imputation practices and hedonic quality adjustment. Their results indicate the desirability of frequent updating (or rotation) of the samples to maintain item coverage, and the use of hedonic and comparable replacement techniques over implicit imputation.

While there is an extensive range of literature on the hedonic technique, there has been no clear resolution of exactly how it should be used in constructing price indexes. For example

there are questions about what functional form should be used or whether regressions should be run over the entire time period (with dummy variables for each time period) or separate regressions for each time period. The papers of Koskimäki and Vartia and Diewert fill an important gap in this area.

Diewert provides an economic formulation for the approach to hedonic quality adjustment starting with an individual consumer and traditional utility theory under a range of assumptions. Koskimäki and Vartia provide a product level presentation. Both papers argue that hedonic regressions should be run separately for each time period using a constant set of quality variables, rather than one regression with time dummies or two period comparisons. Under this formulation the coefficients of the quality variables will change over time reflecting changes in consumers valuations of these attributes. Quality adjusted price changes can then be calculated at the average of the qualities prevailing in each period, rather than the average for the full period covered by the price observations. Both papers argue that the appropriate functional form is one which uses a logarithm of price as the dependent variable, while Koskimäki and Vartia further argue that the independent variables should also be in logs and encouraged the use of other non-linear forms. Regression forms that are linear in the 'raw' prices and attributes are to be avoided.

Diewert also shows that under certain conditions, if models are matched each period, then the hedonic regression approach will give exactly the same answer as a traditional statistical agency approach to the calculation of an elementary index. He supports other researchers claims that the advantage of the hedonic approach over matched samples increases as the degree of matching decreases. Diewert also argues that quantity weights should be used in hedonic regressions if possible, although in discussions Vartia expected weighting to have little impact on the results.

Bode and Van Dalen's paper could be considered as providing the empirical counterpart to these theoretical considerations. Their preferred model appears to be an annual semilog model, using weights at the level of brands.

Meeting discussions raised various issues in relation to hedonic regressions. While recognising the theoretical advantages of the approach, practical problems such as selecting appropriate quality measures and specifying the functional form were raised. The cost of collecting suitable data and estimating the regressions was also of concern.

The potential of scanner data has been apparent to price statisticians for some time. Most studies to date have focussed on the use of scanner data as a source of price information and a means of evaluating the performance of CPI indexes (eg Richardson). Scanner data is a valuable source of data as it often provides almost total coverage of the market for a particular product. However, scanner data is often not sufficiently 'clean' for direct use by price statisticians in that the product codes do not always change when an item's quality changes, prices may be affected by specials on sales after use by dates, and so forth (e.g. Richardson). There are wider applications for scanner data, such as providing weights for hedonic regressions and as a frame for updating CPI price samples. Fenwick, Ball, Morgan and Silver show how scanner data can provide good insights into the adequacy or otherwise of CPI price samples and by implication the practices used in determining how items and outlets are selected for the sample.

Meeting participants raised concerns about the cost of using scanner data. Some participants expressed views that the cost of using scanner data was at least double that of existing CPI price collection practices and suffered from the reliability issues mentioned above. It was not

clear if the potential improvement in the reliability of price indexes warranted the extra cost at this stage.

Recommendations for statistical agencies

1. update price samples as frequently as is possible and reasonable,
 2. use matched samples where it is expected that the proportion of matched items will be large (i.e. where new and disappearing goods are expected to account for only a small proportion of items),
 3. use hedonic models where new and disappearing goods are likely to account for a significant proportion of items,
 4. hedonic regression models should use the logarithm of price as the dependent variable, and preferably also logarithms of the independent variables – regressions that are linear in raw variables are to be avoided,
 5. separate hedonic regressions should be run for each time period if practical,
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6. quantity weights should be used in hedonic regressions if possible,
 7. scanner data looks promising if it covers the universe for items. Scanner data has potential as a method of price collection for various items if improvements are made to the reliability of the data,
 8. scanner data has potential to provide other useful information to price statisticians and these deserve further exploration,
 9. further study of the cost effectiveness of scanner data is required.

New and disappearing goods

Moderator: Keith Woolford, Australian Bureau of Statistics.

In order to minimise bias in the CPI the item samples need to be updated to include new goods and exclude those that disappear.

The traditional fixed weight/Laspeyres type indexes, which are used in the compilation of most consumer price indexes, do not allow for substitutions between commodities and cannot adequately allow for new goods. Similarly, the Paasche index using current period weights cannot handle goods that have disappeared since the base period. Changes to the item coverage of these indexes over time can only be handled by linking (or chaining) which also requires reweighting.

Lane identifies five broad categories of new goods. His concept of new is very broad, including generic equivalents, replacement models and innovative products. Current methods for handling these categories of items within the US CPI are described and improved approaches are identified. Some of the approaches discussed for new goods are specific to the collection and compilation practices used in the US CPI.

Opperdoes presents empirical results of efforts to handle new and disappearing goods by using a constant elasticity of substitution (CES) formula proposed by Balk at the fifth meeting of the Ottawa group. Scanner data is used and a new good is defined by the appearance of a new product code. It appears that for a number of products the computed elasticities of substitution are not particularly stable through time and this would be of concern to index compilers.

Since the traditional Fisher index is the geometric mean of Laspeyres and Paasche indexes it

also cannot handle new and disappearing goods. De Haan extends the Fisher formula to include new and disappearing goods although it requires the use of imputed prices for these items. To avoid imputing prices an approximation is made with the help of Balk's CES based price index and this is compared with the Fisher index compiled on a matched sample basis using the same data and results from Opperdoes to measure the bias. The results show considerable differences in the estimates of bias across 9 commodity groups.

Recommendations for statistical agencies

The discussion in Lane is a useful overview of the new goods problem from a practical perspective.

The research of Opperdoes and de Haan points the way to a promising alternative approach for tackling the problem of new and disappearing goods but requires further study before it could be implemented in practice.

Financial services

Moderator: Mick Silver, Cardiff University.

Financial services other than insurance have typically been ignored or badly covered in consumer price indexes. This reflects the lack of a conceptual framework for their measurement and the difficulty of obtaining reliable data.

Fixler and Zieschang outlined the national accounts concept of the value of financial intermediation services to households (CPI) and by financial firms (PPI) which comprises an implicit measure of services (essentially interest margins) and explicit fees and charges. They then discussed the data required and presented three approaches for measuring the reference rate required for the implicit service charge.

Woolford addressed the question of which financial services fall within the domain or scope of the consumer price index. He argued that the answer depended on the principal purpose of the index, i.e. whether it is to measure changes in living standards, to assess changes in money incomes or is a measure of price inflation for households. Assuming the principal purpose is to measure price inflation, he considered the measurement of three types of financial service: currency exchange, stockbroking services and deposit and loan facilities. Particular attention was directed to areas where the 'quantum' was more difficult to grasp (e.g. maintaining a current account with a bank) and the price less explicit. While the measurement of deposit and loan facilities was similar to that outlined in Fixler and Zieschang, it was argued that measures of margins cannot be constructed independently from direct fees and charges (i.e. a total cost must be calculated at the individual product level).

In a useful paper, Frost elaborated on the approach taken by the ABS to construct price indexes for deposit and loan facilities along the lines outlined by Woolford. The approach involves collection of detailed data from major relevant institutions at the individual product level to measure price change in interest margins, establishment fees, other fees and charges, and indirect taxes. A sample of accounts is used to measure the latter two elements. The transactions in these accounts are revalued each period and current period fees, charges and taxes applied.

Interest engendered by the last two papers led to a presentation by Obst and a discussion of

the 'Australian solution' to the setting of a reference rate for estimating the implicit component. The advantage of this approach is that it avoids the possibility of negative interest margins that is inherent in using an indicator rate as the reference rate.

John Greenlees presented a U.S Bureau of Labor Statistics paper on the direct pricing of health insurance. For health insurance the U.S. currently prices medical care inputs, such as physicians and hospital services, and assumes that the price of health insurance moves roughly in proportion to these prices. He outlined an alternative approach of directly pricing health insurance that is currently being investigated. The change would remove many obstacles to accurate quality adjustment in the current practice. It would, however, also introduce some new issues such as the appropriate handling of risk changes when, for example, the onset of a new disease leads to increases in premiums. A related question is whether employer funded insurance should be included (expenditure made on behalf of the household) or excluded (cost to business).

Participants were supportive of the approach to pricing deposit and loan facilities as outlined by Woolford and Frost. It provided a sound theoretical base for capturing all the prices associated with these services.

In discussions the use of customer (or hypothetical) profiles, rather than a sample of accounts, was considered as a simpler way of measuring explicit costs on deposit and loan transactions. From a practical perspective customer profiles are less data demanding than samples of accounts but still require a substantial resource input. However, the complex and multiple nature of financial charges might not be adequately captured in hypothetical accounts. With either approach it is still possible that account statements might not contain all the necessary information to capture the effects of a change in charging regimes.

There was discussion of the revaluation of the base period quantities of financial services, in particular the Woolford example of revaluing foreign currency purchases by use of the inflation rate of appropriate overseas countries. It was concluded that this was the correct approach.

Participants expressed various views and arguments for the treatment of health insurance and employer contributions. It was suggested that the principal purpose of the CPI should guide the measurement of insurance. Thus employer (and government) contributions to health care might be included in a cost of living index but excluded if the index was to measure changes in money incomes. In an inflation index the aim should be to represent the service provided by the industry. Another line of argument was that it depended on whether employees have any say in the selection of the insurance fund; if they did then employer contributions should be included. Participants also pointed out that whatever treatment is adopted for employer funded insurance, it may need to be also applied to other employer-provided benefits, such as the provision of motor vehicles.

Recommendations for statistical agencies

The method of defining and measuring financial services for inclusion in the consumer price index requires further investigation leading to a universally accepted position. The papers in this session provide real insights into conceptual and practical issues.

Care needs to be paid to the dynamic changes within this sector as the emphasis given to explicit and implicit components change and interact and the quality of the service provided

changes.

There is merit in the Australian approach to measuring financial services and their progress should be observed. However, the data demands are extensive and may not be realisable in many countries.

Problem areas

Moderator: Walter Lane, Bureau of Labor Statistics

Participants were invited to submit problems they were confronted for consideration of the meeting. The following are problems or issues of general interest in respect of CPI construction discussed in this session.

Problem 1 – Editing of outliers.

The issue was how price ‘outliers’ identified by the editing system should be treated when the reported prices were correct. In this context the issue was whether the outliers were ‘representative’. The possibilities being considered included rejecting such outliers, applying some statistical procedures to reduce/replace the outlier value with a value which meets some predefined criterion (based, say, on inter-quartile range).

It was pointed out that it was important to look at reasons for price changes. In a number of areas it was common for firms to adjust prices infrequently so that when prices were adjusted they could be by relatively large amounts (compared to the movements in other comparable prices in that period). If such changes were treated as outliers and excluded or adjusted then legitimate long-term price movement would be missed and the index biased.

A number of delegates stressed the need to have as much input editing as possible undertaken in the field by price collectors. With the use of available collection devices (hand helds) it was possible to program in various editing checks. Such checks should be relevant and readily understood by price collectors. Using this approach editing in the office can focus on other aspects. Focus of editing should be on high risk areas - items with large weights and where few prices were collected. If large movements were to be edited it was important not to have a procedure (or algorithm) which introduced a bias - there was a need to ensure price rises and falls were treated in an even handed manner and symmetry was achieved over time.

The need for caution with automatic editing systems was emphasised. Automatic editing systems could tend to cut out large increases and lead to a likely long-term downward bias (as there would generally be more cases of large price increases than large price falls).

The guideline used for the HICP was put forward as a good guide – ‘accept unless proved wrong’.

It was pointed out that in undertaking editing at the macro level there was a need to apply judgement and a useful approach was to require compilers to assess outcomes against expectations. It was important to bear in mind that samples were generally small relative to the universe. Thus the issue was not one of the price collected being right or wrong but rather its representativeness.

Problem 2 - Does the geographic coverage of the CPI need to include the whole country and the demographic coverage include all households?

Currently the geographic coverage of the CPI in some countries covers price changes only in the major cities and/or the demographic coverage is restricted to say lower to middle income households. There was pressure to expand the geographic coverage to the whole country and demographic coverage to all households but this would be costly and raise many practical difficulties.

Participants presented a range of views. Some claimed that prices rose more rapidly in the big cities. Consumption patterns were also expected to differ between metropolitan and rural areas. The EU rule was to not leave out any areas that accounted for more than 1% of the population.

On the other hand the evidence from France indicated that there was no big difference in price change between big cities and rural areas, although short-term movements could differ reflecting differences in outlets and products. Data on food prices in Australia, collected some year ago, also supported this case. However, it was likely that regional differences could arise in prices of items that are most difficult to collect, such as services. It was important not to confuse the issue of differences in rates of price change (which is what the CPI is intended to measure) with differences in price levels.

In general, it would be reasonable to expect the variation in behaviour between metropolitan and rural CPI's (within a country) to be related to differences in infrastructure and household incomes. In the more developed countries, with good infrastructure and relatively small differences in household incomes across regions, the CPI's are likely to show similar behaviour over the longer term. In the less developed countries, income disparities are likely to be greater, increasing the likelihood that expenditure patterns will also differ. The absence of good transport systems will also serve to make access to rural areas more difficult and minimise opportunities to arbitrage. These factors could result in differences in CPI behaviour.

An important additional consideration would be whether the index was intended to measure changes in prices experienced by residents of a region, or changes in prices charged for items sold within a region. This has implications for weights and pricing practices and tends to be more important for non-metropolitan areas as households in these areas are more likely to purchase goods from outside the region in which they are resident (e.g. from metropolitan areas). To the extent that this occurs it may also reduce the number of prices that need to be collected in non-metropolitan areas. Point of purchase data would be required to adequately address these issues.

There were also practical issues such the level of training and expertise required for local price collectors if extending beyond the major cities to ensure prices are accurately collected.

It was also mentioned that in making a decision on the coverage of a CPI, non-statistical issues may take precedence over statistical considerations. For example, to maintain public confidence in the index it may be deemed important to cover rural areas even though this may have little impact on the actual movements shown by the index.

Problem 3 - Items purchased on the Internet

A number of issues were raised in respect of purchases over the internet. First, if the items were purchased from outside the country should they be included in the boundary of the index? If they were included how could they be priced (i.e. how could samples of outlets and items be selected)?

Delegates recognized that this was a significant emerging issue and should be flagged for detailed consideration at the next meeting in Paris.

If the item domain was the purchase of all goods and services by residents of the country, then there was general agreement that purchases over the internet should be included.

One practical problem raised was the identification and quantification of the significance of these purchases. One approach suggested was to make use of data available from market research firms and/or credit card companies on such purchases.

In pricing such items the issue arose of exactly what was being purchased - are there extra services being purchased over and above the purchase of the goods (such as delivery costs)? If so, how to measure these to constant quality? It may be necessary to separate such costs and to put them into another component of the CPI such as delivery charges. Also, these prices were not always of a flat or per unit nature and this complicated their measurement.

A practical problem was the number of firms entering this market only to disappear in a short space of time. The ease with which firms may enter and leave the virtual marketplace and the ease with which consumers may substitute providers, may pose different sampling problems compared with the sampling of conventional outlets.

Another issue raised was whether in fact prices for goods purchased over the internet moved differently to those in conventional outlets. If the movements were similar, then it was not imperative that purchases over the internet be priced (although such expenditures would need to be included in the weights). It was noted that some years ago the use of mail order was expected to become very significant but had not and the question was raised as to whether a similar outcome might occur with internet purchases.

Problem 4 - Use of the average of price relatives versus geometric means in the calculation of indexes for elementary aggregates.

Elementary aggregates are the lowest level of the index and the only level for which indexes are calculated directly from a set of price observations. Indexes for these price samples can be calculated using various formulae, the main ones being the arithmetic mean of price relatives (APR), the ratio of arithmetic mean prices (RAP) or the geometric mean (GM). The issue arose as to which average was the more appropriate.

It was pointed out that this issue is covered in the new manual. The established position of the Ottawa Group is that the geometric mean is the preferred formula in most circumstances except those where zero prices are possible. In these situations, the ratio of arithmetic mean prices is the preferred approach. The arithmetic average of price relatives is generally discouraged as it is biased in price bouncing/linking situations.

Problem 5 - Frequency of weighting updates and sample rotation.

In introducing this issue, it was pointed out that there was a general move by countries to more frequent updating of weights (with a number of countries having annual updates).

A general issue raised was the availability of the data to implement this. It was costly to obtain such data and it was not clear that the benefit justified the cost.

A potential 'bouncing' problem was identified due to the weights being introduced relating to the previous year. This could lead to a linking problem where items were subject to fluctuations in price and quantities. To overcome this problem consideration should be given to using a moving average (a practice that has been adopted in some countries).

Where weights are derived from a HES the issue of whether the sample sizes supported annual weight changes was seen as an issue. This further supported the concept of basing the weights on a moving average.

A number of delegates raised the concept of reweighting at different frequencies at different levels of the index with more frequent updating at the lower levels (as this is where substitution primarily occurs).

Regardless of the frequency of updating, it was pointed out that the procedures to be followed should be publicly known and transparent in order to maintain public confidence in the index.

Problem 6 - Expenditure abroad - students attending foreign universities

A case was put forward where the expenditure by households on education of their children at foreign universities was almost as high as expenditure on education at local universities. The issue was whether such expenditure should be included in the weights and, if so, how to price.

The discussion concluded that the key considerations were whether the expenditures were best regarded as expenditures of resident households or not, and the stated objective or definition of the (individual) CPI.

The System of National Accounts 1993 advises that "Students should be treated as residents of their country of origin however long they study abroad, provided they continue to form part of a household in that country." (paragraph 14.20.) Therefore, it would be reasonable to conclude that most, if not all, expenditures on education abroad can be regarded as expenditures by resident households. (The alternative might be an unrequited transfer from a resident to a non-resident household, with the latter then purchasing the education service.)

Therefore, if the CPI is intended to measure changes in prices experienced by resident households, expenditure on education abroad would be in-scope.

These transactions would not be in-scope for those CPI's defined as measuring changes in the prices charged for items sold within a country's (or region's) economic territory.

Direct pricing of these services may be problematic, as the national statistical office would have no legal powers to enforce provision of data by non-resident entities – although voluntary co-operation may be forthcoming. If explicit price data is unavailable, an acceptable alternative may be to use a component series of the CPI for the country in which the educational

institution is located, adjusted for exchange rate movements. The viability of this option would depend on whether the institution has a uniform charging schedule (i.e. does not adopt price discrimination), and whether a conceptually equivalent index is available.

Miscellaneous areas of new or ongoing research

Moderator: John Greenlees, Bureau of Labor Statistics

The papers presented in this session covered various issues that did not belong in the specific topic sessions.

Dalén draws a distinction between what index numbers should ideally measure and what is actually achieved in practice. In many respects the difference between the two arises because the universe for price indexes (goods and outlets) is dynamic and not static. He discusses what should be the appropriate statistical target or methodology to handle the dynamic universe. He concludes that the most promising general target formulation involves short index links at the upper level of the index and a unit value index at the lowest level. A special case of this is the monthly chaining and resampling matching method using a superlative type index. Dalén saw this approach as preferable to hedonics.

Participant comments on Dalén mostly focussed on his downplay of the hedonic method. They did not necessarily see it as hedonics versus matched samples. Hedonics was seen as useful in handling quality changes when resampling and in handling the introduction of new goods when there were quality changes. When there was little change in samples and the quality of the items being sampled, the hedonic method and matched samples are expected to produce similar results. It was noted that Dalén had correctly drawn a distinction between new and disappearing goods and quality adjustment. In addition the unit value approach for elementary aggregates was equivalent to the ratio of arithmetic mean prices, the next preferred method for calculating average prices (after geometric means).

In general terms, the most preferred or superlative type indexes use weights from the current and base periods (or current and previous period in the case of chained indexes). Okamoto investigates the performance of indexes compiled with weights estimated for the mid point year in a conventional fixed weight index and in a CES type index. For the main part he finds that the mid point year indexes produce results very close to the preferred indexes and perform much better than the laspeyres and chained laspeyres indexes. The advantage of mid point year is that it offers the potential to overcome the bias of the traditional Laspeyres index without needing weights for the current period.

The typical approach to incorporating items into the CPI is to identify expenditures on individual commodities and to price them separately (the fixed basket approach) even if expenditure on one item might be closely related to expenditure on another. Schultz follows an alternative approach of defining products more broadly in terms of the utility households derive, using as an example private transportation, and casts this in a user cost framework. Data are obtained on the total costs of running each of a sample of motor cars compiled by a private company and compared with published CPI data. Similar results are obtained in one city while there are substantial unexplained differences in another city. Further examination of the data from both the private sector company and the CPI was needed. At this stage there was no intention of introducing the methodology into the Canadian CPI.

Participants saw merit in the overall ideal. In some ways the use of utility could help in

defining what are new products. An example given was recorded sound (music), where a utility classification would classify all equipment used to play recorded sound in the one category. Diewert argued that the opportunity cost of capital (to measure the cost of purchasing the vehicle) should be adjusted for changes in the asset price (i.e. as real cost) and not simply be the nominal rate as used by Schultz. Participants also raised questions as to how quality change in vehicles would be handled and there was discussion as to what constituted quality change. Caution was urged in determining what is treated as quality change. It made little sense and could produce unsustainable results to, for example, treat every style or colour change as quality change. The approach adopted by Schultz handled changes in fuel economy by estimating fuel consumption and applying an average number of miles travelled. This contrasted with the approach used in for example, the Australian CPI where changes in fuel consumption are 'built in' to the purchase price of the vehicle. The user cost approach also raised issues such as the inclusion of interest costs and the principle purpose of the CPI.

As the Austrian market becomes more liberalised (less regulated), new suppliers and goods have entered the domestic market. Haschka outlines some of these recent and pending developments and the procedures used to update the CPI. For goods and services that are homogeneous or essentially of equivalent quality, average prices are/will be obtained by updating weights as frequently as possible to reflect changes in market shares. The electricity, gas and telecommunication industries have undergone liberalisation, although there has as yet been little impact on consumers.

It was suggested that the bill method would be an effective way of capturing price changes associated with market liberalisation. Haschka saw the bill method involving a lot of work and expected it to produce similar results to the approach being taken.

Recommendations for statistical agencies

The papers and discussion tended to enforce general observations along the following lines:

- 1) The universe of goods and services for the CPI is dynamic and compilation techniques and procedures need to be appropriate.
- 2) The concept of CPI commodity structures based more heavily on the utility concept is worth pursuing as it better handles complementary goods and may help provide a basis for determining new goods.
- 3) Changes in regulations regarding market entry of new suppliers and price determination poses substantial challenges and resource demands for CPI compilers if they are to 'get it right'.

Telecommunication services

Moderator: Erwin Diewert, University of British Columbia.

The papers presented in this session highlight the challenges that rapid change in technology, the rapid uptake by consumers of telecommunications technology, changes in regulatory environments, the intense market competition and wide range of pricing regimes applying to telecommunication services have created for price statisticians in most countries. In a sense all the practical problems that can occur in price index construction are inherent in these commodities: new and disappearing goods; new and disappearing respondents; quality change, and measuring the quantum of services consumed (it is not only the number of households using the service, but also their intensity of use).

In some countries the market has changed from one which was tightly regulated, often with only one or a minimal number of suppliers with price controls, to a market that is more open to new competitors and minimal price controls. There are at least three special features of the pricing regimes that raise problems for price measurement. First, many telecommunication services are sold jointly with the goods – buy a plan and get the mobile phone at a nominal price. Second, plans or service charges are often sold with a specified life so that it is possible to have consumers on both old plans (no longer available) and current plans. Third, many of the charges are of a flat rate kind up to a specified level of usage – the effective price thus falls as usage approaches the specified level. In order to construct appropriate prices and to get up to date information to compile weights requires extensive information from service providers (or regulators in some cases). This is not always forthcoming (even with legal enforcement). The main problems with telecommunications pricing that the papers identified are summarized below.

(i) Traditional sampling techniques break down

Telecommunications providers typically offer monthly plans that last one to two years. Using traditional sampling techniques, the statistical agency samples these plans and follows them until they expire. However, typically a plan has a fixed price for its life so no price change is shown in the sample of prices. When a plan dies, it is replaced by a new plan, which is linked in to show no price change in the index. In the papers presented, there were several examples of telecommunications price indexes which were essentially flat over the past 5 years when in most countries, fixed line telecommunications prices per minute of use were falling around 3 to 5 percent per year and mobile telephone prices per minute of use were falling at 5 to 15 percent per year. Thus the traditional sampling techniques lead to a serious upward bias. Telecommunications services are typically 2 to 4 percent of household budgetary expenditures. Assuming an expenditure share of 3 percent and assuming that the price of telecommunications services is dropping by 7 percent per year leads to an overall bias in the consumer price index of about .2 percentage points per year if traditional sampling techniques are used. This is a big enough bias to concern central bankers.

(ii) Quantity weights that are fixed for 5 or more years are unsatisfactory

Many statistical agencies have used a fixed consumption basket or Laspeyres type index where the basket is left unchanged for 5 or more years. This creates a severe problem if the weights for individual telecommunications elementary aggregates are also held fixed for this period. For example in the case of mobile telephone services over the last 5 years, the household expenditure share has grown from perhaps 5 percent of telephone expenditures to about 50 percent. Given the fact that the price of mobile telephone services has been dropping at a much faster rate than the price for fixed line services, this means that a price index based on a more recent basket will show a much greater rate of price decline than the index based on a five year old basket. (A similar problem arises with consumer products that make heavy use of computer chips such as laptop computers, video cameras, etc.). Solutions to this problem are:

- More rapid updates of expenditure baskets (preferably annually or every two years).
- The use of midyear formulae; see the paper presented by Okamoto (2001) at this conference and the paper by Schultz¹
- The use of the Lloyd-Moulton formula²

(iii) The problem of quality change is often neglected

The quality change problem in telecommunications has several dimensions:

- Mobile phone services are improving from a technical point of view but it is difficult to quantify these quality improvements.
- The paper by Fixler, Greenlees and Lane highlighted the problem of quality adjusting for network effects; i.e., as more people have access to the internet, internet services such as email become more valuable.
- Related to the above point is the problem of quantifying the substitution of email for traditional letters delivered by postal services. It is clear that households are substituting emails for the more expensive traditional letters and the average cost per message delivered has dramatically dropped. However, this drop in communication services will not be picked up anywhere in the system of price statistics. The problem is similar to the price of light problem studied by Nordhaus³ (1997): over time, new methods of delivering lumens were developed that had the effect of dramatically decreasing the price per lumen. However, because the means of light delivery changed over time, each new method of delivery was linked into the consumer price index to show no change in the relevant CPI component. Similar substitution problems arise with the delivery of music, newspapers and other entertainment services over the internet.
- A final quality change problem arises due to the fact that the various telecommunication 'plans' are constantly changing in their characteristics. Thus it is difficult to compare a new plan with an older one. A specific problem is the fact that some mobile phone service plans offer 'free' equipment.

Three main approaches to pricing telecommunication services:

(i) The use of hedonic techniques

Perhaps the least demanding approach is to take a sample of prices of representative goods and services and then use hedonic techniques to adjust for quality change (e.g. Yu). It may be best to run separate hedonic regressions for prepaid cards and for monthly plans since it is difficult to make these two types of service comparable.

(ii) The use of detailed unit values

Another approach is to compile consumer profiles representing a variety of users (low intensity to high intensity) of the various telecommunication services and to apply appropriate pricing plans to each profile. This is essentially a stratified unit value approach. Lacroix and Magnien propose this method in France, with the use of transition probabilities to capture households switching between plans and companies.

(iii) Use of the bill method

A third method is to model the prices charged based on sets of bills, whether these are a sample of actual bills or hypothetical accounts constructed to represent typical types of customers. The appropriate plan could again be the one that produces the lowest cost, one that is comparable to the plan the household was on when sampled; see the paper by Beuerlein.

Many issues were raised in discussions. At the aggregate level it was appropriate that all types of communications, at least telecommunications, should be in a commodity group which would then break down into the various subcomponents. It was important that weights, especially at the lower level of the index (like within total communications) be updated frequently to keep pace with consumption patterns. In the case of the modified Laspeyres index, weights should also represent what might be expected into the future.

The bill method (the third method above) was generally accepted as the preferred way to go, and offered some improvements over unit value based indexes. However, there were some issues associated with the bill method that needed to be addressed. For example for phone calls, how many households were on the most cost efficient plan for their usage and the households were locked into plans for a year or more and might need to be priced even when no longer available to new customers. The Australian experience was that when new phone plans were introduced they were aimed at increasing consumption of telephone services and companies often approached customers offering the new plans so that old plans soon died out.

The depth of data required for the profiles and bills approaches and the resources to handle the data was substantial. It was noted that in Germany, where consumer profiles were used, one person was required full time to collect the necessary data requirements. The complicated nature of pricing required information on the time calls are made, the length of time of the call, the destination of the call, discounts that applied on the total bill, etc. In addition, information is required on market shares of the companies. Profiles (and bills) would need to be updated, preferably annually.

It was noted that use of matched samples would not be an appropriate method for incorporating new plans. The prices of plans generally would not change for the life of the plan. Thus matching plans would typically result in an index showing no price change. Rather quality adjustments would need to be made to new plans (essentially a replacement with overlap). In the case of goods, such as computers, the prices of old models tend to fall as or before they are replaced by new models and in these cases the difference between the price of the old and new model may approximate the quality difference.

In concept the unit value approach had some appeal as a way of adjusting for quality change. However, in the case of internet charges there was then a problem of pricing 'unlimited' time plans.

Recommendations for statistical agencies

The accurate measurement of price change for telecommunication services is complicated. There are difficulties in defining the quantum that are consumed, in determining appropriate prices for those quantum and in adjusting for quality change. The current thinking of price statisticians is that use of profiles and samples of accounts are the best methods. However, the data requirements and resources needed to establish and maintain these approaches are substantial and co-operation of the service providers is essential. What is certain is that traditional sampling methods are not appropriate in this sector.