

# **Consumer Price Index Manual: Theory and Practice**

## ***Report on the 2007 worldwide survey on the usefulness of the CPI Manual<sup>1</sup>***

### **Background**

The Consumer Price Index Manual<sup>2</sup> was published in 2004. It provides economic and statistical background information and offers comprehensive guidelines on constructing a CPI. The Manual is also available in electronic form on Internet (at [www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm](http://www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm)). The electronic version of the Manual is considered a living document, which will be periodically revised and updated, taking into account new developments and reactions from the users.

The manual has been printed in 5000 copies, of which 4000 copies have been sold, and about 570 donated free of charge. Hard copies of the manual have been provided to the heads of national statistical offices of the ILO member States. In addition, copies have been sent to libraries and other depository institutions for reference. Information on the type of purchasers of the manual is available on request from the ILO Publication Department.

To date, with assistance of the International Monetary Fund (IMF) and the Japan Statistical Association, the manual has been translated into Spanish, French and Russian<sup>3</sup>, as well as Japanese. A Chinese version is currently in the making. Requests for translations into Arabic and Portuguese are being considered.

The standards of both the *CPI Manual* and the *PPI Manual* have been promulgated at various meetings, training workshops and technical assistance activities provided by international agencies. The initial reactions to the manual(s) in general were very positive. The UN Statistical Commission was very positive on the completion of both manuals, particularly with regard to the coordinated effort. The Conference of European Statisticians also noted the development of the manuals as a good example of coordination amongst international organizations and statistical offices worldwide. A number of economic journals have also provided comments and advertised the manual as one of the milestones for the calculation of CPI.

In order to elicit comments and promote discussion on specific topics covered in the manual, an electronic discussion group was created on the CPI Manual website. However, the number of comments received has not been significant. Specific comments for improving the manuals were received at the IMF conference in Helsinki in 2004. Some agencies, like the United States Bureau of Labour Statistics, have reviewed the content of the manual in full and have identified errors in equations and tables.

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<sup>1</sup> The report is prepared by Valentina Stoevska, ILO Bureau of Statistics. Comments and suggestions made by Carsten Boldsen Hansen, UNECE Statistical Division, are gratefully acknowledged. Silja Mueller- Weissmueller and Pierre Marie Da Sylva, interns at the UNECE Statistical Division and ILO Bureau of Statistics, assisted in processing the responses.

<sup>2</sup> ILO, IMF, UNECE, OECD, the World Bank, and Eurostat: *Consumer Price Index Manual: Theory and Practice*. ILO, 2004. Available at [www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm](http://www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm)

<sup>3</sup> [www.imf.org/external/pubs/ft/cpi/manual/2004/esl/cpi\\_sp.pdf](http://www.imf.org/external/pubs/ft/cpi/manual/2004/esl/cpi_sp.pdf)  
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Based on the comments received, the electronic version of the manual has been revised and errors, especially in the equations, have been corrected. Four chapters have been redrafted and/or reorganized: Chapter 7 on Quality Changes, Chapter 8 on Item Substitution, Chapter 9 on CPI Calculation in Practice and Chapter 21 on Hedonics. The new version of each chapter is disseminated on the CPI Manual website along with the original text. An erratum indicating all corrections to mathematical equations is added to the original text.

## 2007 Survey on the usefulness of the Manual

In order to obtain additional user feedback on the usefulness and completeness of the CPI Manual and to have an account of the countries' experiences with the manual, the Inter-Secretariat Working Group on Price Statistics (IWGPS), which has overall responsibility for the revisions of the manual, has requested the ILO and the UNECE to survey National Statistics Institutes (NSIs) and other potential users of the manual.

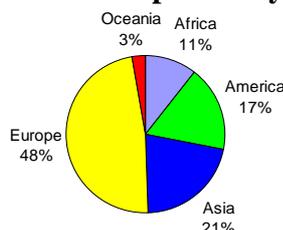
To this end, a questionnaire was formulated and finalized jointly by UNECE and the ILO and was dispatched in early June 2007 to all NSIs and a limited number of users mainly from the Ministries of Labour, Workers' and Employers' Organizations and Central Banks. Responses were requested by the end of August 2007, most of which were received in July and August. Some were received as late as December 2007.

The purpose of this survey was threefold: (i) to obtain user feedback on the manual and identify issues requiring further clarification for future revisions of the electronic version; (ii) to identify areas in which future *Supplementary Handbooks* may be needed; and (iii) to provide input for future meetings on CPIs. Respondents were requested not only to assess the completeness of the manual and the extent to which it met their needs, but also to identify the topics that should be added, expanded, or revised and to provide information on their current practices concerning some specific issues in the compilation of CPI.

The survey (see Annex 1) was structured into two parts. The first part (questions 1-9 in the survey questionnaire) gathered information from both compilers and users of CPI on the usefulness of the manual. The second part (questions 10-14 in the questionnaire) inquired about national practices in calculation methods, sampling and data editing.

A total of 104 responses covering 92 countries were received and processed, 86 of which came from the compiling agencies. 100 respondents completed the first part, and four respondents/countries did not provide any response either because they were not as yet sufficiently familiar with the manual or had no access to the manual. As shown in Chart 1, the responses were broad-based with almost 50% received from developed and/or European countries. Some reasons for the lower response rate from developing countries may be attributed to the fact that (i) the non-English versions were not available for a long period, (ii) their experience with the manual was limited, (iii) the time was too short for them to generate an informed comment.

**Chart 1: No. of responses by region**



## Results of the survey

This section reviews the quantitative and qualitative responses of the survey. Part 1 summarizes respondents' overall evaluation of the usefulness of the manual in general and of each chapter or topic, as well as the issues or topics that need to be further elaborated. Part 2 summarises the answers on country practices regarding data calculation methods, sampling and data editing.

The overall usefulness of each chapter was assessed on a 3-point scale ranging from 3= very useful, 2 = useful, and 1 = not useful. In addition, unanswered questions and responses indicating “do not know” were also recorded. The survey also evaluated the relevance and practicality of covering specified topics in the future revisions of the electronic version of the manual or in the supplementary handbooks. The relevance was graded on a similar scale.

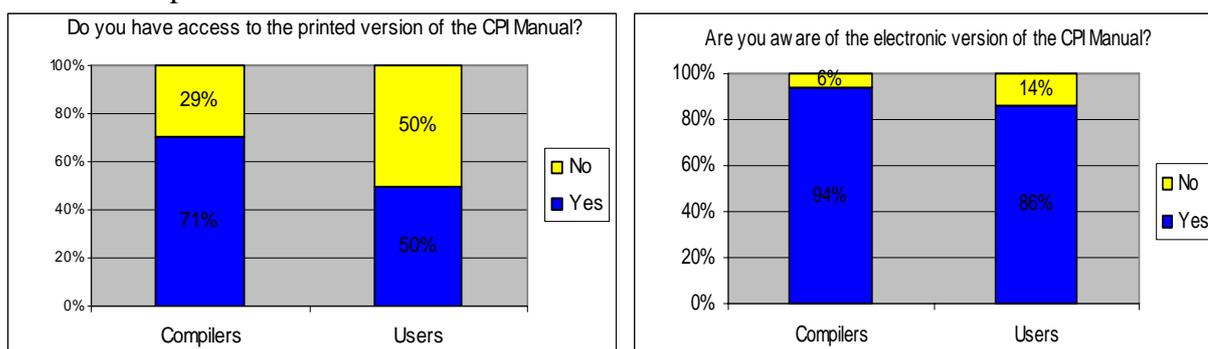
In addition to questions relating to the grading, the first part of the survey was supplemented by a series of open-ended questions about the specific proposals and general comments about the manual.

### Part 1

As the responses from the users were to some extent different from those of the compilers, they were classified and processed separately. Interestingly enough, the responses received from the UNECE member States were not much different from those received from the rest of the world.

#### *Questions 1 and 2. Access to the printed and electronic version of the CPI Manual*

Of the 86 compiling agencies that completed the questionnaire, 71% had access to the printed version of the manual and 94% to the electronic version. Corresponding percentages for the users were 50% and 86% respectively. Overall, less than 8% of all respondents had no access to the printed or electronic version of the manual.



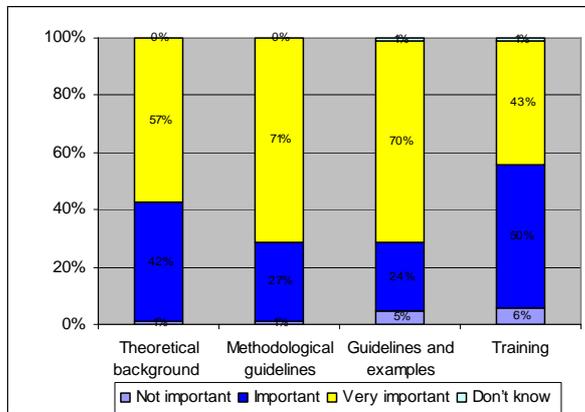
#### *Assessment of the purposes of the CPI Manual, the extent to which it meets the needs, and the balance between theory and practice*

In total over 90% of both compilers and users rated each of the four main purposes of the manual as “important” or “very important”. All respondents give more importance to the purposes of providing “methodological guidance” and “examples” than to the purposes of

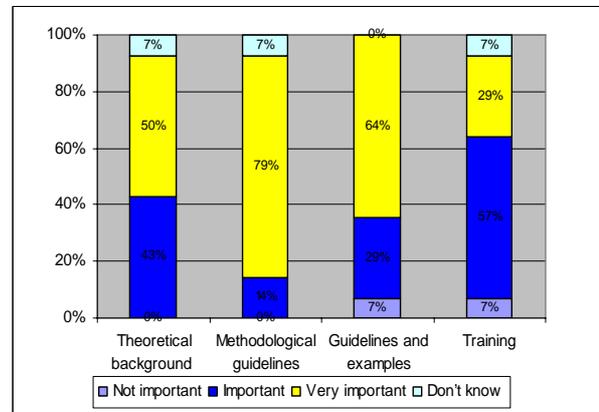
providing “theoretical background” and “training”, although there is some variation in the perception between compilers and users.

**Question 3. How do you assess the following different purposes of the CPI Manual?**

Compilers



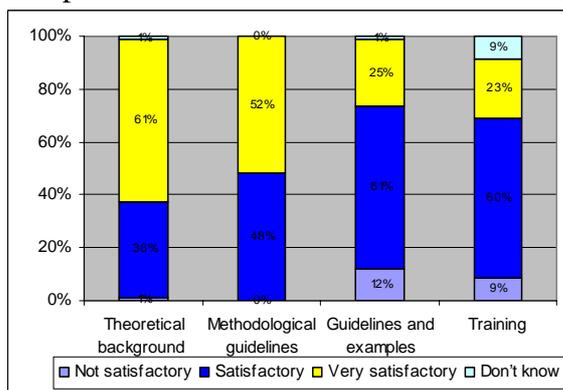
Users



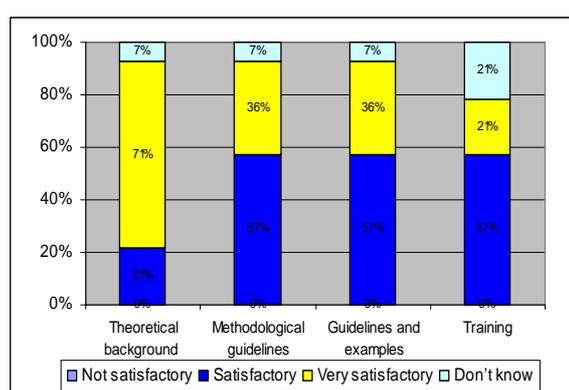
On the following question (question 4) regarding “the extent to which the manual meets the needs”, both compilers and users gave the highest score “very satisfactory” to the theoretical background (around 63%). However, the proportion of compilers who indicated that the manual meets the expectation in a very satisfactory manner with respect to the need to provide guidelines and examples is only 25% although 70% of them consider this purpose as very important.. Similarly, the use of the manual for training was assessed as “satisfying the need very well” by only 23% of the compilers. This suggests that there is a mismatch between the importance the compilers give to various purposes of the manual and the extent to which the manual meet the needs in these areas.

**Question 4. To what extent does the Manual meet your needs in the following areas?**

Compilers

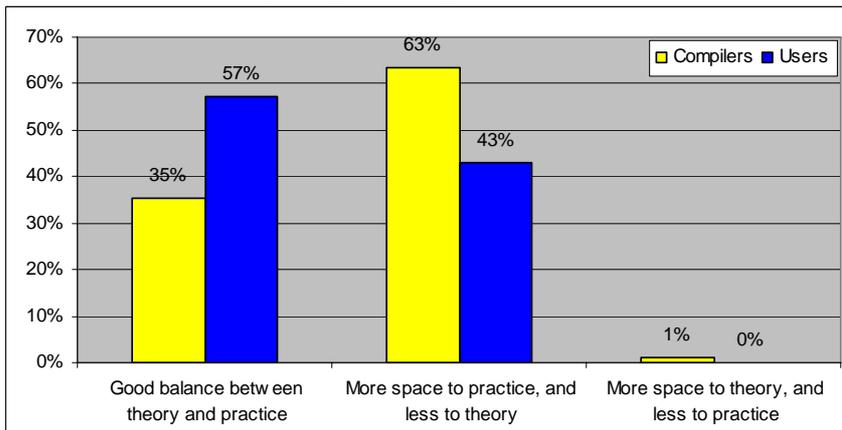


Users



Respondents also graded the balance between theory and practice in the CPI Manual. Here again, there is a big difference between the perceptions of compilers and those of users: Of the compilers, 63 % agreed that more emphasis should be placed on methodology and practical issues and less to theory, compared to 43% of users. Less than 1% of both compilers and users would like to see more theory in the manual.

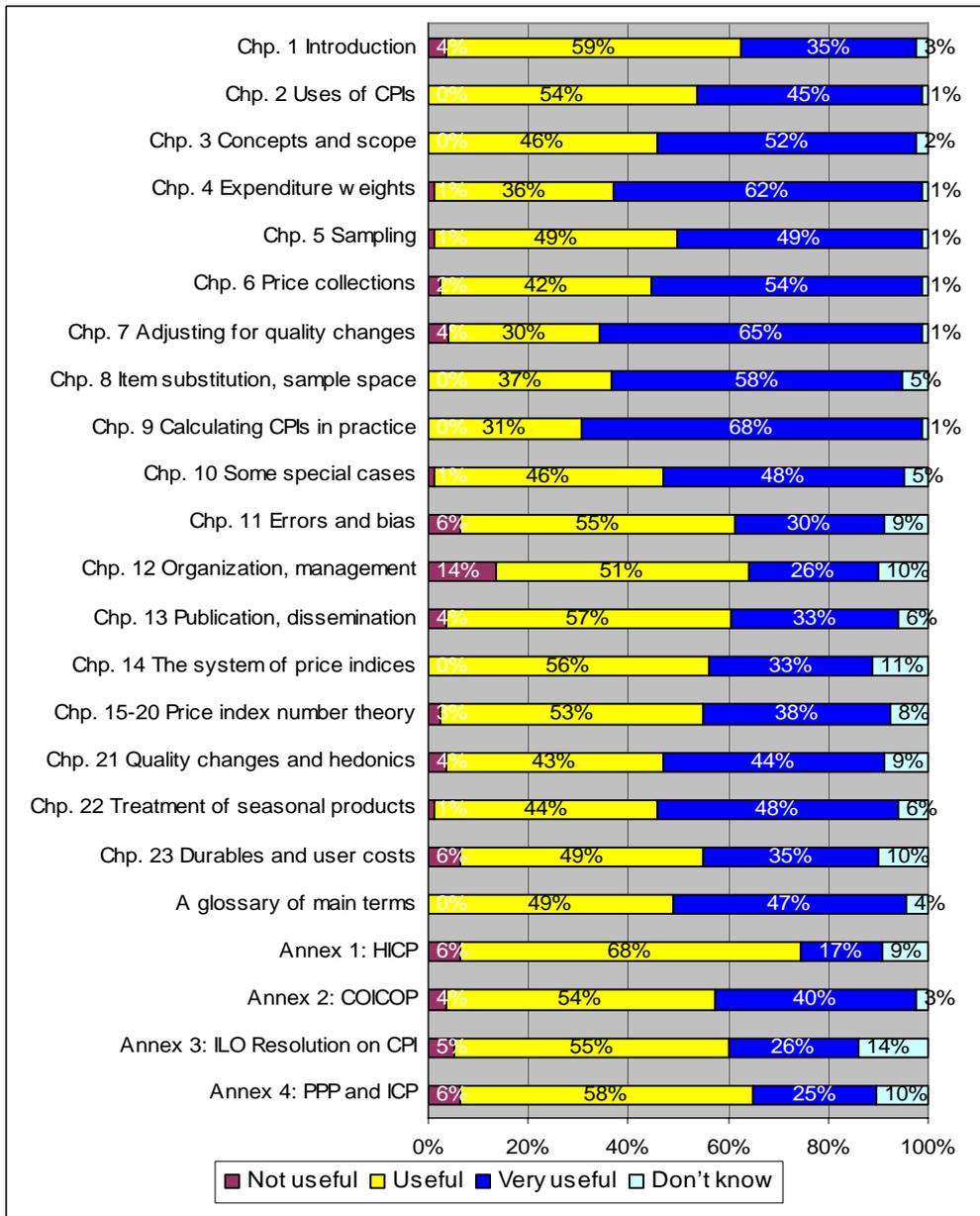
**Question 5. Which of the following statements about the manual do you agree with?**



***The usefulness of each chapter and areas where more practical examples are needed***

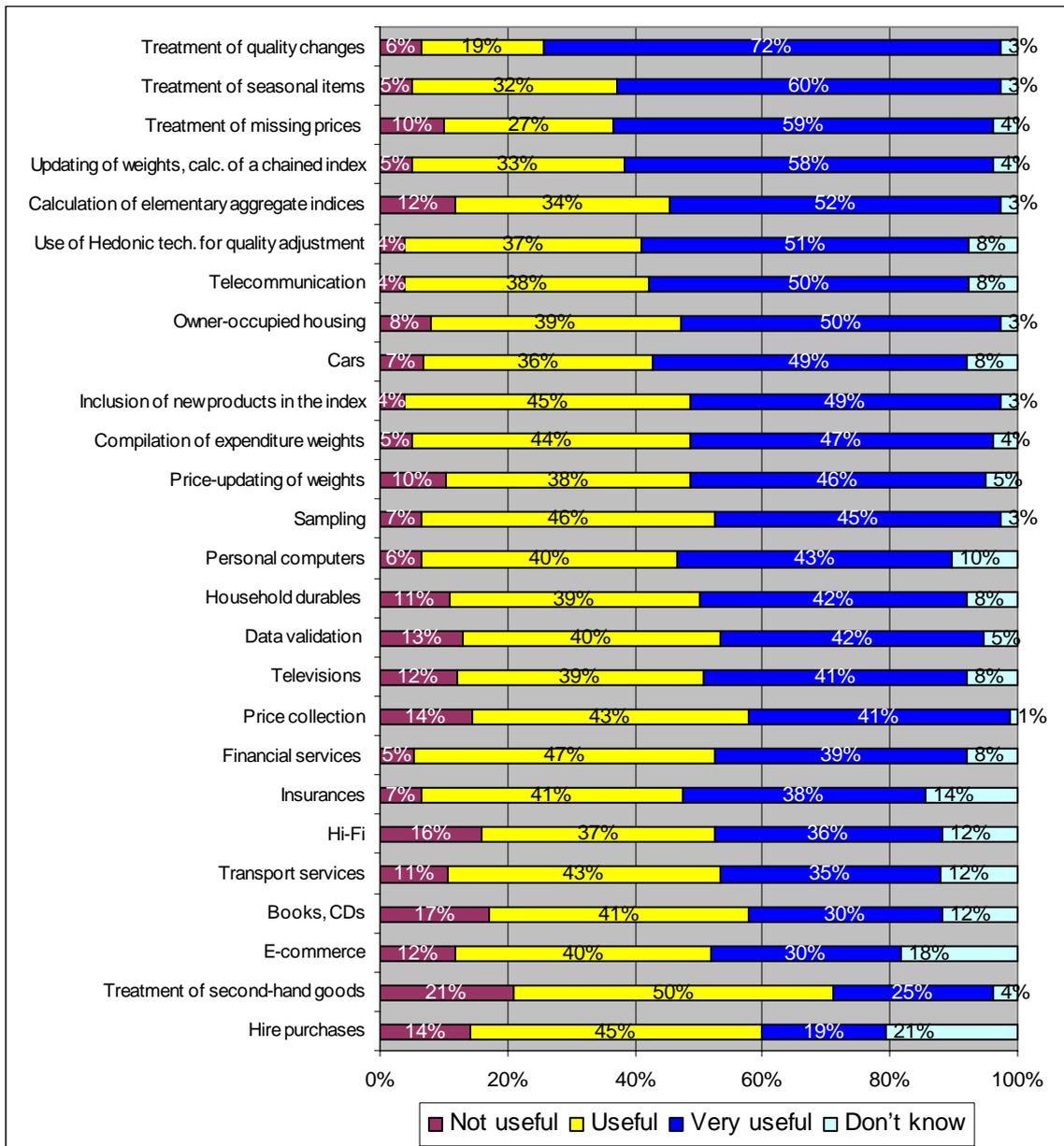
In total, almost 90% of all respondents from the compiling agencies consider each chapter of the manual to be either “useful” or “very useful”. When sorted according to the score “very useful”, Ch.9 on the CPI calculation in practice comes top with 68% of all compilers assessing it as “very useful”. It is closely followed by Ch. 7 on Quality Changes (65%) and Ch.4 on Expenditure Weights (62%). Given its regional perspective, it is not surprising that only 17% of respondents evaluate the Annex on HICP as “very useful”.

**Question 6: How useful do you consider the following chapters of the manual (compilers' responses)?**



The next question refers to areas where it would be useful that the manual provide more or better practical examples. Treatment of quality changes is indicated as the top area where more practical examples are required. Hire purchases, second-hand goods and e-commerce are ranked at the bottom end.

**Question 7. In which of the following areas of the manual would you find it useful to have more or better practical examples (compilers' responses)?**



**Proposals for specific issues/topics to be further elaborated or dealt with in Supplementary Handbooks**

The survey also identifies areas or specific issues that may be beneficial to incorporate in future revisions of the electronic version of the manual and/or in the supplementary handbook (question 8).

The following is a list of suggestions<sup>4</sup> for possible topics that could be dealt with in supplementary handbooks:

- Net price indices;

<sup>4</sup> In addition to the survey results, the list also includes suggestions received from sources other than the survey.

- Core inflation measures;
- Housing indices;
- Insurance;
- CPI precision and related sampling/statistical issues;
- Compiling expenditure weights and their quality;
- HBS using diaries;
- Quality adjustment methods using hedonics which are feasible to use;
- Method of aggregation, choice of formula for calculating elementary indices between geometric and arithmetic mean;
- Indicators of quality of CPI;
- Integration of ICP and CPI.

Suggestions for possible additions in future revisions of the manual:

- Overview of necessary steps to compile a CPI;
- A more detailed discussion on how to organize the price initiation and how to obtain relevant price observations that are based on detailed specifications;
- Implication of the main use of the index on the coverage – as a deflator and short-term indicator;
- Circumstances under which non-random sampling could be useful;
- Example on determining optimum sample size and sampling variance estimation;
- Links between sampling and quality adjustment;
- Fixed and variable weights;
- examples on treatment of specific products such as mobile phones, and pricing of services;
- New methods of data collection, scanner data and organizational and management considerations relating to these new methods;
- Further detail on the differences between time of acquisition, time of payment and time of consumption of services;
- Treatment of price cuts (e.g. buy 2 get 1 free, discount coupons, special price discounts during non-peak hours);
- Examples on the change in prices of goods and services previously provided for free;
- Monitoring the price movements in parallel markets (legal and illegal), controlled or subsidized prices;
- More details on linking time series.

### ***Criticisms, comments or suggestions on the CPI Manual as a whole***

Apart from the suggestions for specific areas or topics, the respondents also provided comments and suggestions on the manual as a whole (question 9). Here are some typical examples of the types of comments given:

*“The CPI Manual provides good theoretical and methodological background for CPI. However, it would be very useful for CPI compilers to have more practical guidelines and examples on how to treat difficult areas or implement methods recommended in the Manual. The guidelines should be written in simpler phrases understandable for ordinary CPI compilers, especially for those whose native language is not English.”*

*“Too theoretical and academic in tone and content. Not enough detail on the real problems faced by compilers in the real world. ... many chapters in the manual would be of very limited use to compilers in the less developed countries.”*

*“The manual is sometimes oriented to readers that are already acquainted to CPI problems and to CPI literature. The manual is perhaps not that easy to grasp by someone that starts compiling a CPI.”*

*“We find the CPI manual very useful as a reference resource. However, we feel that the supplementary handbooks suggested above would potentially greatly assist the learning and understanding of less experienced staff. The analyst made use of the CPI manual as a reference tool to assist with this work. However, he found that the manual was pitched at too high a level for the CPI compliers in the country to make practical use of it. So, potentially, having a condensed or simplified version, or practical supplementary material with simple examples, would be of benefit in such situations and for smaller agencies with limited resources.”*

## **Part 2**

The second part of the questionnaire included questions on the current practices with respect to calculation method, sampling and data editing. Only respondents from the compiling agencies were requested to respond to these questions.

### ***Question 10. The formula used for calculation of elementary aggregate indices***

Formula used for calculation of elementary aggregate indices	Direct form	Chained form
The arithmetic average of the price ratios (Carli index)	13	7
The ratio of arithmetic mean prices (Dutot index)	28	15
The ratio of geometric mean prices (Jevons index)	25	24
Other formulae	2	2
Total	68	48

The majority of countries are using either the Dutot or Jevons formulae for calculating elementary indices. Only seven countries reported using the Carli index in its chain form and 13 in its direct form. Four countries calculate elementary aggregated indices as weighted averages by using some kind of weights (expenditure or population). A number of countries are using different formulas for different elementary aggregates.

### ***Question 11. Do you price-update the weights from the weight reference period to the price reference period, i.e. from the period to which the weights refer to the period where they are included in the index?***

Of the answers, 65% of countries reported that they are price-updating weights while 35% uses the original weights as they stand.

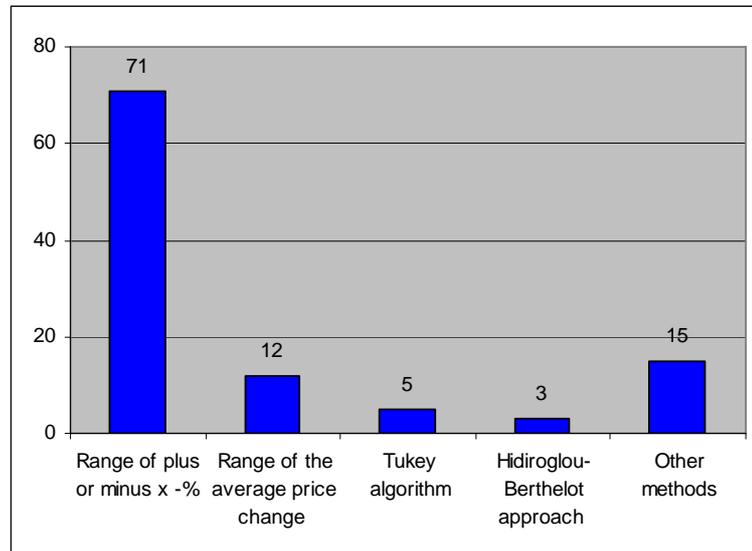
### ***Question 12. Do you use any method to optimize the allocation of price observations on product groups or elementary aggregate?***

Less than half of the 52 countries that responded to this question reported they are using a method to optimize the sample size. The following factors are considered regarding the number of prices to be collected:

- weight in total expenditure;
- variance of prices and price volatility;

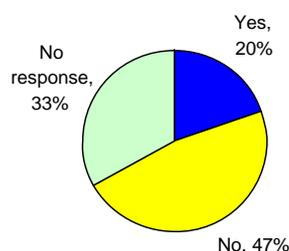
- geographical distribution of outlets; and
- cost of data collection.

**Question 13. Do you apply an automatic statistical procedure (or filtering) for checking prices?**



Out of 86 respondents (compilers), 77 reported that they apply at least one automatic statistical procedure for checking prices. Very few use more than one method. Most of the respondents (71) reported verifying price changes outside a given range of plus or minus x-percent as an automatic statistical procedure (or filtering) for checking prices. In 12 of these countries, this check is supplemented with verification that is based on the variation from the average price. A few respondents (8) also reported using models based on the Tukey or the Hidiroglou-Berthelot approach. 15 of the respondents indicated using other kinds of automatic checks (e.g. unchanged prices for a long period of time, price movement comparisons between localities, min-max price levels, standard deviation, decimal errors, etc.). Many of the respondents who do not use any automatic methods for checking prices are using a manual method to validate the price observations. A few respondents mentioned that no methods for checking the prices had been established as yet.

**Question 14. Do you apply automatic methods for checking price changes by the magnitude of their impact on elementary or higher-level indices?**



Concerning the methods for checking the price changes by their impact on elementary or higher-level indices (Q14), only 20% of compilers indicated performing this type of check. About one third of the respondents did not respond to this question, and almost half of the countries indicated not performing this type of automatic check. A number of these, however, manually calculate and check the contribution of a particular set of elementary aggregates on the overall index. The most commonly used automatic method is the one that is based on price

changes and weights, and ranks the elementary aggregates in order of importance of their contribution to the overall change. Several respondents mentioned that only the price observations resulting in a change in the relevant monthly elementary index of more than a given percent are flagged for verification.

## **Conclusions**

Since this survey was conducted in the early stages of the CPI Manual implementation, not all countries were using the manual. This may be extrapolated from the high number of respondents providing neutral responses to items concerning chapters of the manual, but also from the comments in the survey. A number of respondents indicated that they were not yet sufficiently familiar with the manual. When used, the manual appears to be a useful tool for the price compilers in completing his/her day to day activities. The majority of respondents evaluated the various chapters of the manual favourably, and the majority of other respondents gave neutral rather than negative responses. Respondents judged all chapters to be broadly useful and that all topics discussed in the manual were either relevant, or very relevant for CPI implementation. According to free-text comments, respondents were satisfied with the structured approach of the manual.

However, it is also clear from the comments provided that there is a need for (i) more practical guidelines and examples to be included in the future revisions of the manual, (ii) supplements to the manual which will address practical matters in more detail, and (iii) supplementary handbooks on specific issues. The forthcoming supplementary handbook to the CPI Manual<sup>5</sup> which focuses primarily on practical matters and less on theory than the manual, should to some extent address at least some of these needs. In future, however, there may be a need for more targeted supplementary handbooks dealing with specific issues in more practical details, for example on the measurement of core inflation or sampling

Additionally, the success of the manual is highly dependent on its widest possible usage, adherence and implementation. Therefore, providing adequate training would be an important initiative.

The comments received on the CPI manual may be applicable to other price manuals already or currently being developed.

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<sup>5</sup> Being prepared by UK Office for National Statistics Department for International Development

**ANNEX 1**

**Survey on the CPI Manual, 2007**

**Information about the respondent**

Country/Area/Territory	
The name of the organisation responsible for the compilation of the CPI	
Office completing this reply	
Contact person, name and e-mail address	
Are you a compiler or user of the CPI?	
Date of completing the questionnaire	

**Question 1**

Do you have access to a printed version of the CPI Manual?

Indicate your answer by "X"

Yes  No

**Question 2**

Are you aware of the electronic version of the CPI Manual, available on

<http://www.ilo.org/public/english/bureau/stat/guides/cpi/index.htm> ?

Indicate your answer by "X"

Yes  No

**Question 3**

How do you assess the following different purposes of the CPI Manual?

For each question a-d, indicate your answer by "X"

		Not important	Important	Very important	Don't know
a	To provide theoretical background for CPI				
b	To provide methodological guidelines				
c	To provide guidelines and examples on how to tackle practical problems				
d	For training of staff				

**Question 4**

To what extent does the Manual meet your needs in the following areas?

For each question a-d, indicate your answer by "X"

		Not satisfactory	Satisfactory	Very satisfactory	Don't know
a	To provide theoretical background for CPI				
b	To provide methodological guidance				
c	To provide guidelines and examples on how to tackle practical problems				
d	For training of staff				

**Question 5**

Which of the following statements about the manual do you agree with?

*Select all that apply by indicating "X"*

a	There is a good balance between theory and practice	
b	More space should be devoted to methodology and practice related issues, and less to theory	
c	More space should be devoted to theory, and less to methodology and practice	

**Question 6**

How useful do you consider the following chapters of the manual?

*For each chapter, indicate your answer by "X"*

	Not useful	Useful	Very useful	Don't know
Chp. 1 Introduction				
Chp. 2 Uses of Consumer price indices				
Chp. 3 Concepts and scope				
Chp. 4 Expenditure weights and their sources				
Chp. 5 Sampling				
Chp. 6 Price collections				
Chp. 7 Adjusting for quality changes				
Chp. 8 Item substitution, sample space and new products				
Chp. 9 Calculating consumer price indices in practice				
Chp. 10 Some special cases				
Chp. 11 Errors and bias				
Chp. 12 Organization and management				
Chp. 13 Publication, dissemination and user relations				
Chp. 14 The system of price indices				
Chp. 15-20 Price index number theory				
Chp 21 Quality changes and hedonics				
Chp. 22 The treatment of seasonal products				
Chp. 23 Durables and user costs				
A glossary of main terms				
Annex 1: Harmonized Indices of Consumer Prices (European Union)				
Annex 2: Classification of individual consumption according to purpose				
Annex 3: Resolution concerning consumer price indices adopted by the 17 <sup>th</sup> ICLS				
Annex 4: Spatial comparisons of consumer prices, purchasing power parities and the International Comparison Program				

### Question 7

In which of these areas would you find it useful that the manual provide more and/or better practical examples?

*For each question indicate your answer by "X"*

	Not useful	Useful	Very useful	Don't know
Compilation of expenditure weights				
Sampling				
Price collection				
Calculation of elementary aggregate indices				
The treatment of missing prices				
Inclusion of new products in the index				
Treatment of quality changes				
Updating of weights and calculation of a chained index				
Price-updating of weights				
Treatment of second-hand goods				
Owner-occupied housing				
Treatment of seasonal items, for example clothing, fresh foods and package holidays				
Personal computers				
Telecommunication				
Cars				
Televisions				
Hi-Fi				
Books, CDs				
E-commerce				
Household durables (washing machines, refrigerators etc.)				
Transport services				
Financial services				
Insurances				
The use of Hedonic techniques for quality adjustment				
Data validation				
Hire purchases				

If you think that other areas should be dealt with using more practical examples, please specify:

**Question 8**

Specific issues may be dealt with in *Supplementary Handbooks*, which would provide practical guidelines and examples on how to treat difficult areas or implement methods recommended in the manual. Which issues would you propose for such Supplementary Handbooks (this may include issues listed in question 7)?

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**Question 9**

Please provide any criticisms, comments or suggestions that you may have on the CPI Manual as a whole, or part of it. You are also welcome to indicate if you think there is a need to shorten or improve the focus of certain parts.

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**The following questions 10 – 14 are only for compilers of the CPI.**

**Question 10**

Please indicate the formula used for calculation of *elementary aggregate indices*. An elementary aggregate index is an index at the most detailed level, where prices are aggregated into indices for the detailed groups of goods and services. A *direct* index compares prices of each successive month (or quarter, if the CPI is quarterly) directly with those of a fixed reference month (or quarter). A *chained* index compares prices of successive months (quarters) and links together the monthly (quarterly) indices by successive multiplication.

*Indicate your answer by "X"*

	Direct index	Chained index
The arithmetic average of the price ratios (Carli index)		
The ratio of arithmetic mean prices (Dutot index)		
The ratio of geometric mean prices (Jevons index)		
Others – please explain		

**Question 11**

When a new set of weights is included in the CPI, do you price-update the weights from the weight reference period to the price reference period, i.e. from the period to which the weights refer to the period where they are included in the index?

Yes  No

**Question 12**

Do you use any method to optimize the allocation of price observations on product groups or elementary aggregates? If yes, please explain briefly the method.

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The two last questions are concerned with data checking. Question 13 concerns checking of input data, i.e. the recorded prices or price changes. Question 14 concerns checking of price changes by their impact on the index.

**Question 13**

Do you apply an automatic statistical procedure (or filtering) for checking prices?  
*Indicate your answer by "X"*

Price changes outside a given range of plus or minus x-percent are flagged for verification	
Models based on the Tukey algorithm (the CPI Manual, p. 175)	
Models based on the Hidioglou-Berthelot approach (the CPI Manual, p. 175)	
Others – please explain	

**Question 14**

Do you apply automatic methods for checking price changes by the magnitude of their impact on elementary or higher-level indices? If yes, please explain briefly the method.

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