

20 November 1997

Original: ENGLISH ONLY

**STATISTICAL COMMISSION and  
ECONOMIC COMMISSION FOR EUROPE**

**INTERNATIONAL LABOUR ORGANIZATION**

**CONFERENCE OF EUROPEAN STATISTICIANS**

Joint ECE/ILO Meeting on consumer price indices  
(Geneva, 24-27 November 1997)

Item 5 of the provisional agenda

**NATIONAL PRACTICES IN QUALITY ADJUSTMENTS FOR SPECIFIC ITEMS**

Note submitted by the ECE Secretariat

1. At the previous ECE/ILO meeting on CPI, held in Geneva, 20-24 November 1995, the ECE secretariat was asked to carry out a survey of national practices in making quality adjustments for specific items in ECE member countries. Following this recommendation the member countries were approached for information on their practices. The present note represents a summary of the countries which provided answers and contributions to the ECE Secretariat.
2. The evaluation of quality change, that is how the sample of price observations is adjusted to take into account changes in what is being observed, has always been regarded as an important aspect of price index construction in **Statistics Canada**. It is considered that the questions of sampling and item selection have been given less attention. While the weights for commodity groups are carefully determined from expenditure surveys, most samples for these commodities are selected by judgement. The samples are chosen, where possible, to be observable easily for a good length of time, as well as to be representative of all the varieties in the commodity group. The problems of item selection and quality change are described in more detail in document CES/AC.49/1997/32.
3. Because of the extremely high frequency of quality adjustments in clothing relative to other commodities, a study was initiated recently in Canada to explore ways of improving on the techniques currently used. A pilot study was launched to experiment with the use of checklists to find out how well they work in the field, in terms of facilitating the data collection

process and whether the information collected permits the use of hedonic models. Document CES/AC.49/1997/31 - An application of the hedonic approach to clothing items in the CPI: a pilot study using checklists - describes the progress of this study in Statistics Canada.

4. For the purposes of price collection in the **Czech Republic**, each selected good or service is defined by description of its main parameters and characteristics. The specific variety of a representative item is selected by the interviewer (price collector), whose duty is to complete the wide description of the representative item with supplementary specific information.

5. When the selected item is not on sale any more in the selected outlet, it is the price collector who makes the replacement with another variety of the same representative item. The description of the new variety should be within the description of the selected representative item. If a suitable item is not available in the selected outlet, the price collector proceeds with another outlet. The same problem arises when the outlet, which serves as a reporting unit, is closed down. Information on replacements of varieties or outlets is sent by the price collector to headquarters, where each case is considered individually.

6. Changes in prices due to above mentioned replacements are not only considered as net price changes, but also as a result of quality changes that have to be adjusted. The adjustment for some particular representative items is carried out as follows: (i) an average price of the representative item is calculated for all price quotations of all existing varieties of the item in the reference period, thus including new varieties; (ii) an average price of the same item is calculated both in the reference and preceding period over for all price quotations of only those varieties that were available in both periods; in that way the quotations of varieties which were replaced are excluded; (iii) based on the average prices thus calculated, the price development for the given representative item between reference and preceding period is calculated; (iv) then using the base index of the representative item for preceding period and price change as estimated according to (iii), base price index for reference period is calculated; (v) finally, using the base price index for the representative item for the reference period and the average price of the representative item in the reference period as calculated in step (i), the average price in the base period of the given representative is adjusted.

7. The method described is an imputation method, which is not applied in a mechanical way; each replacement of a variety or reporting unit is considered individually. Variety replacement is done also in cases when a variety in a selected unit becomes less representative or obsolete and another becomes dominant. The method is applied for domestic appliances, detergents and other very variable products.

8. Replacement of representative item in the consumer basket is done when it disappears from the market or its relative importance declines. The update of the consumer basket is done when needed, usually once a year, at headquarters on the basis of proposals and comments made by interviewers. The prices of new items are registered one month prior to their inclusion in the consumer basket. The indices calculated on the basis of the original representative items are then chained by the calculated monthly index changes of the new representative items. The method is used for the replacement of products comparable in terms of use value and the possible quality change is very difficult to measure. It is successfully used, for example, in replacing of vinyl records by compact disks.

9. The last method used is the method of direct adjustment. Among replacements of representative items where the quality change could be quantified was the replacement of the new passenger car Skoda Felicia for the previous Skoda Favorit in January 1995. Based on independent expert estimates, 5 percentage points out of the total price increase of 7 % was attributed to the higher quality of the new car.

10. As a basic rule, the CPI in **Denmark** is compiled by making quality adjustments based on estimates of the value of the quality change. Where no estimates are available, price changes are estimated as the difference between the price of the selected substitute and that of the item it has replaced. Automatic linking, where the whole of a price difference is taken as a measure of the quality change, is not used, unless this can be justified. The practice where the price of the replacing item is linked in without showing any price change is avoided. In many minor cases a mix of the two options of no quality correction and full quality correction is used. Hedonic indices are not used.

11. For clothing, adjustments for quality changes are made by the price collector visiting the outlet, often after consultation with the owner or the staff of the outlet or after contacting the CPI staff of Statistics Denmark. The same procedure is used when models change and new ones has to be included. Quality adjustments for rents are made on the basis of questionnaire filled in by landlords, asked to indicate the reasons for changes in the rent (whether it is a "pure" price change or due to expenditures incurred on improvements or conversions). The quality adjustments for cars are made after consultations with car dealers and/or importers of cars. The index for personal computers is based on a quality adjusted US export price index for computers, compiled by the US Department of Commerce. The index is converted to DKK by a basket of foreign currencies.

12. Statistics **Finland** gives high priority to the adjustment for quality change when calculating price indices. Different sources for potential bias have been identified in the compilation of CPI but the bias due to changes in the quality of goods and services is considered to be the biggest problem.

The problem also exists in other price indices calculated in Statistics Finland. Details about the quality adjustment procedures in the Finish CPI and the application of hedonic methods in the CPI, house price index and rent index are described in Working Paper No 2 (31 October 1997) presented under item 5 of the provisional agenda of the meeting.

13. Various quality adjustment methods are used for the CPI in **France**. In 1995, 31.9% of the 134,000 price quotations (excluding fresh produce and centrally-collected data) underwent at least one substitution during the year. This figure rises to 42.6% if the quotations which underwent several successive substitutions during the year are included. In two sectors, clothing and durable goods, the substitution rate of monitored items is enormous: at least one substitution for 74.7% of clothing quotations and 62.1% for durable goods. In resolving the problem related to the introduction of new items or substitution of one item for another at a given outlet, the effect on price movements of a "pure" price change have to be separated from the effects of a change in the quality of the item. The "quality" is defined by all of the item specifications which determine the level of usefulness for a given consumer by the purchase of the item. Different methods are used to deal with the problem of "quality effect" at different stages of processing the data.

14. At the collection stage, since 1996, INSEE has been engaged in a major effort to train staff responsible for collecting and verifying price survey data. A new data collector's manual has already been produced. Currently a "manager's guide" is in preparation for those responsible for supervising price collectors, data imputing and checking, and sampling in the 18 INSEE Regional Centres. A programme for training field staff in accurate identification of the technical characteristics of items has been instituted.

15. At the processing stage, in assessing the quality effect of an item substitution, various methods are used:

16. "Equivalent" substitution is the method used systematically for homogeneous varieties and, sometimes, for heterogeneous varieties. It is applied to approximately 40% of all item substitutions observed in the field. The two items (initial item in period "t" and substitute item in period "t+1") are taken to be directly comparable. The whole price difference is treated as price effect. The "equivalent" substitution assumes that the technical characteristics used in determining the item price level are limited in number. It is, therefore, only used for relatively simple products.

17. "Dissimilar" substitution is the method most frequently used for heterogeneous varieties. Basically, the method establishes a direct link between the two items. It treats a price difference as a quality effect and thus takes the price change to be nil - the opposite of the procedure followed for an equivalent replacement.

18. An improved version of this method is used as far as possible in the form of the "corrected dissimilarity". One weakness of the "dissimilar" substitution method is that it takes no account of any price change between "t" and "t+1". The "corrected dissimilarity" method partly overcomes this problem by assuming price movements for those items which have disappeared to be the same as for most similar items, for which data is available. Though the assessment of the quality effect is not actually dealt with, it is considered that this method has the advantage over "dissimilar substitution"

when an option for a model becomes mandatory (e.g. air bag, ABS, air-conditioning). The price increase resulting from this improvement in equipment is assumed to be equal to the cost of the option on the initial model. It is treated as half price-effect and half quality-effect. The choice is justified in two ways: (i) the actual cost of installing the option as "standard" on the substitute model is less than on the initial model and an assumed reduction of half the cost is considered realistic; (ii) some consumers would not have taken the option in question if given the choice; it is considered, therefore, that there is no quality effect as far as consumers are concerned.

23. In the case of more substantial technical changes to a model (e.g. change of engine) the price movement is not estimated by the options method. A method close to the corrected dissimilarity is used.

24. Hedonic methods The use of econometric models is considered a promising method for a number of complex items such as durable goods (household appliances, cars, electronics) or clothing. However, development and day-to-day management of hedonic models is difficult and expensive and requires abundant and high-quality information. For this reason, they are generally used on a very limited scale. In France, work is currently in progress on durable goods and clothing. It is expected that the international working groups set up by Eurostat as part of the harmonization of HICPs will enable the research facilities of the various European countries to be coordinated, as problems are more or less the same from one country to another. The development of direct quality evaluation methods is seen to be the work of the future, though it will be long and difficult and will require considerable efforts.

25. Pricing procedures followed in **Ireland** are strictly based on the principle that an identical quality or brand of each selected variety must be priced as far as possible in the same shop on each occasion. The specifications of selected varieties are of a general nature. These delineate a range of products (i.e. particular brands, qualities, sizes, etc.) from which individual price collectors are free initially (or on replacement) to choose a specific product for regular pricing.

26. For example, in the present series a selection of four different varieties is listed under the heading tinned vegetables. One of these varieties is baked beans. No further specifications are given and individual price collectors are free initially to select for regular pricing any of the different types of baked beans available locally. The only restriction to their choice is that the particular baked beans has to be popular, suitable for regular pricing (i.e. can be specified precisely) and likely to be available in the long term. Once chosen initially, individual price collectors are required to price identical product on each successive month. The price booklets are specially designed so that the exact specification of each selected product is recorded to ensure that the identical set of

articles is priced on each occasion as required.

27. Under these arrangements the specific products priced by different price collectors for a particular variety are not the same. This is not considered necessary since the index is concerned with measuring price change and not the absolute level of average price of particular items on each occasion. It is thought that the method used ensures that the prices of a wide variety of brands and qualities are collected in different locations (reflecting local tastes and preferences) and give a better representation of the price movements of the variety in question than would be realised if a single narrowly defined identical variety was priced everywhere.

28. A further advantage of the approach is considered that it facilitates the handling of discontinuities which can occur in the monthly sets of price quotations due to model and quality changes. If a price collector discovers that a particular product is no longer available an alternative popular article is substituted in its place. The price booklets are designed to allow the detailed specifications of this new product to be inserted. The particular discontinuity is in this manner restricted to a single price booklet and the relevant price is excluded for the index calculations until two consecutive quotations are again obtained for the substitute.

29. Price collectors are also allowed to substitute a new article in place of any original product which is in low supply or no longer in popular demand locally. However, the price of a particular product is used in the compilation of the index only when two consecutive monthly price quotations are available for it.

30. According to the procedures applied in Ireland, a change in a shop surveyed is also treated as a discontinuity and the prices for the particular products affected are not used in the index calculations until successive monthly quotations are obtained from the same shop. The price booklets are designed so that the shop in which each particular product is priced is clearly identified. If a particular outlet can no longer be used (e.g. goes out of business, refuses to co-operate, etc.) the price collector replaces it with a similar popular shop in the same area.

31. To ensure that price collectors adhere to the pricing arrangements, an official of the Irish CSO regularly visits all provinces. The CSO officials who survey prices in Dublin are instructed in the Office. It is believed that the pricing procedures described substantially reduce biases which can occur in the CPI.

32. In **Lithuania**, differences in products with respect to the material they are made from, technical parameters, consumer characteristics or changes in size are evaluated as quality differences. In cases when new representative products replace the old ones an estimation of the consumer characteristics as well as quality assessment is made with the help of the price collectors

and the salespersons.

33. In replacing the old products with new, an effort is made to choose the most similar commodity in terms of consumer properties and quality characteristics. When products are similar or their differences insignificant (e.g. a model is slightly changed), the prices are compared directly. Different method is used when it is necessary to replace an old product by a new one and prices for both items are available. In this case the price of the old item (A) over (t) period is compared with its price from the previous period (t-1) and the price for the new item (A') over the (t+1) period is compared with its price for the previous period (t).

34. Real difficulties arise to introduce the price of a new product in the CPI calculation when there are essential quality differences between the old products and their replacements and no common period during which the prices for both items are available. In that case, the quality difference is evaluated by the price collectors (interviewers) with the assistance of the sales people and the information is transmitted to the Central Statistical Department. The quality adjustments are made on the basis of the evaluation provided by the price collectors.

35. In cases when information on quality differences is insufficient, the price of the old product is repeated for one more month and the price for the new one is introduced in the CPI calculation only when prices for the new good are available during the reference period and the period prior to it. It should be noted that the method applied in Lithuania is considered to be too subjective and is under criticism. The price adjustments for quality changes are carried out manually as no software is foreseen in the index calculation. It is felt that lack of experience affects the work in this area.

36. The Central Office for Statistics and Economic Studies (STATEC) of **Luxembourg** follows the Community regulations concerning the harmonised consumer price indices which make provision, in the event of changes in quality, for the use of explicit estimates of the value of such changes. STATEC applies this method whenever it has the necessary data for the estimate. This is the case with simple changes in quality or when features or characteristics previously available as options or in parallel models are integrated in the price of the standard model. It is considered that a more generalized application of the procedure will not be possible until the European Commission (Eurostat) is able to supply precise details, provided by the manufactures, of the value of changes in quality.

37. When no estimate is available, the Community regulations stipulate that the changes in price should be estimated as the difference between the price of the selected substitute and that of the good or service it has replaced. It is felt at the STATEC that if applied indiscriminately, this rule could lead to nonsensical results or open the way for arbitrary decisions, in view

of the fact that in many fields there are a large number of potential substitutes and the price levels vary widely.

38. To get around the difficulty, the STATEC has chosen to replace out-of-date goods systematically by recently designed substitutes before the former start to disappear from the market. The link between the two varieties is being established by means of double recording of prices during a given period. The method does not disregard any price movement. On the other hand, it neutralizes the difference in price levels between the initial good and its replacement.

39. In **Poland**, no adjustments for quality changes have been done yet. At present, work on the adapting of a proper method for quality adjustment is underway. Each year the list of representative items used in the consumer price survey is verified before it is finally accepted. The idea is that through the verification procedure the list of representative items includes only those goods and services which are supplied systematically, in sufficient quantities and commonly accessible on the market. In case of a major quality change, the observation of the item is suspended until the annual verification procedure when it is replaced by a new representative item characterised with new quality features.

40. The reform of the economy in the **Russian Federation** demanded new methods for the calculation of price indices: the administrative "list of prices" previously used was abandoned in favour of indices based on recorded prices and tariffs for goods and services. In shifting to the methods of monitoring price levels and movements used world-wide, similar problems as in other transition countries were encountered. In particular, decisions had to be taken on how to account for changes in quality when recording the prices and constructing the consumer price index.

41. The rate of inflation in the Russian Federation slowed down over the past two years which necessitated more judicious collection of price information. It has been decided that the best way of accounting for quality changes in recording the prices for representative items is to use the goods specifications adopted by other countries. It is thought that in that way the information collected is less dependent on the skills of the price collector.

42. In the unstable consumer market that still exists in Russia there is a high probability that a particular item and its detailed specification will have disappeared by the next time prices are recorded. Therefore, the goods specifications are interpreted with some flexibility. Thus for example, for some particular entries (mainly industrial goods), prices are recorded for several items corresponding to the general description. The item description, as presented in the form, includes information on the producer country, the raw materials used and other quality features and characteristics which help the price collectors to distinguish one item from

another. If during a particular period the price collector does not find at the selected outlet the same item as the previous time for which prices were recorded, he/she selects a substitute item at the same outlet that is closest in quality and volume of sales, and its price level is close to the level recorded for the previous item.

43. Provision is made for correction of the base price if the good or the outlet are replaced during the reference period. In every case when necessary to substitute an item, a detailed analysis is made before it is decided whether the substitution is possible. The most widespread methods of replacing items that have temporarily or permanently disappeared from the market are the following: (i) replacing the price of a good from an outlet which is closed with the price of a similar item at a different shop; (ii) using the price from the last registration preceding the disappearance of a certain good (used when prices are unchanged or increase insignificantly), but not for more than two months; (c) replacing the price for an item which is disappearing with that for a similar item in the same group (duplicating a price); (d) using a derivative (estimated) price for an item that has reappeared, or has temporarily disappeared. The estimated prices are derived by using price indices for a group of items to which the missing item belongs, the price of a similar item or group of items.

44. The choice of the method depends on the information available, the specific conditions in which particular items are sold, the shortage of these items on the market and other factors. When an item is not available at the selected outlet for a long period, it may be excluded from further observations at that outlet. The most effective method, which allows the best adjustment for quality change in the CPI calculation, is one whereby the prices for the "old" and "new" items can be recorded side-by-side for two adjacent months. If the monthly indices for the two items do not diverge, it is possible to make a smooth switch from the price of one to another representative item.

45. In **Slovak Republic**, prices of goods and services included in the consumer basket are collected monthly in 38 locations. Price collectors select the particular goods and services using the general description of the representative items. When recording the prices, price collectors record also the detail specifications of the selected product according to which the same product is identified during the next price registration until the product disappears from the selected outlet. It is considered that this procedure ensures that every price collector keeps a track on the real price development of "his/her product"; at the same time, the average price computed for the representative item and the price index itself reflect the variety of assortment on sale in the domestic market.

46. When a given product disappears from the market, the price collector chooses another product after comparing its basic parameters with those of the replaced one. If a quality change is identified, the collector provides

to the regional statistical offices "comments" where all the specifications of the new product are described. These "comments" are then checked by staff of the Consumer Price Division at headquarters when data are processed. However, statistical experts are not in a position to make a "parametrical comparison of utility characteristics" of the products and evaluate the individual qualitative parameters as they do not have the necessary technological knowledge. At present, no co-operation has been established yet with experts in technology of merchandise.

47. In the absence of a good system for evaluating the quality change, price changes of products are estimated by replacing the items and changing the base period price based on information provided by the regional statistical offices. In the case of simple substitution of the product (without comparing the technical parameters), it is assumed that the base price of the new product is the same as the old one. In the case that there is a change in the base price, it is assumed that the price level is kept to 100% in the month to month indices; the real price movement of the new product is thus observed as from the following month. In the case that qualitative parameters change significantly in respect of the general descriptions used by price collectors, the prices for that product are excluded from the CPI computation.

48. The problems with quality changes are dealt with in **Slovenia** on the basis of: (i) nature of specifications; (ii) information on the reasons for a price change; (iii) overlap pricing and imputation during the year; (iv) replacement of representative items at the end of each year.

49. Specifications. The specifications for durable goods (cars, electronic equipment, household electrical appliances) are tight while the specifications for other goods are more loose.

50. Information on the reasons for a price change. The price data transmitted by price collectors to the Statistical Office are accompanied with information (codes) on the reasons for a price change. When the code indicates a quality change, additional information, including the current description, is required.

51. Dealing with quality changes during the year. In the case when the old variety is permanently missing, the overlap pricing method is applied. If information on both prices does not exist for the overlapping month, then the price of the old variety for the current month is imputed, usually using the price change information from elsewhere in the CPI, rarely also from other sources (e.g. producer price index). In some cases the imputed price could be the "carry forward" price of the old variety. Starting with the next month, the percentage change of the new representative item is used.

52. When the old variety is missing temporarily or the information about it is uncertain, the "carry forward" procedure is used for a maximum of three

months. Starting with the fourth month the percentage change of the new representative item is used. In all cases the base prices (December of the previous year) are not changed, except when the quality change appears in January.

53. Annual linking. The annual linking is the main method applied in Slovenia in response to the requirement for quality adjustment. Every year in December, which is also an overlapping month, new representative goods and services are introduced in the price index calculation accompanied with new or adjusted specifications. These changes are made at two levels: centrally at the representative item level and by price collectors at the variety level.

54. Centrally, every year, about 10% of the items in the sample are revised using different approaches: (i) the old product is still maintained, its weight is split to "replaced" and "replacement" product; (ii) the old product is omitted, its weight is attributed to "replacement" product; (iii) the new product is introduced and the weight of the category, to which the item belongs, is redistributed; cars is the category most regularly revised.

55. An important issue in calculating the CPI in **Turkey** is the development of a methodology which estimates the quality changes due to the continuous changes in the commodity specifications and structure of the production.

56. The method of substitution is applied in the following cases: when the commodity is no longer available in the selected outlet; the outlet is closed down; quality changes are observed; the commodity has disappeared from the market. The substitution is done in different ways. Direct comparison is used when the new product has exactly the same specifications as the old one; it is assumed that the new product has the same base price. Direct quality adjustment is the method used when the product specifications have altered. In that case the base price of the new product is adjusted to reflect the quality differences with the old one.

57. When a new commodity appears on the market but it can not be placed in any of the existing commodity groups covered by the CPI, this commodity is left out of the index until the weights are updated. If the new commodity can be placed into one of the commodity groups and if the sub-group weights can be altered without changing the group index, then the commodity is covered by the index. In this way, the index becomes more sensitive to the on-going changes in the market. If the commodity is taken as a substitute, then the necessary adjustments should be made.

58. The entry of new outlets in the market necessitates the reconsideration of the sample of outlets. In addition, there might be other reasons for the increase in the number of outlets from where prices are to be collected, such as for example a considerable competition among the establishments which takes place in an irregular manner.

59. One of the more difficult issues in producing the Retail Price Index (RPI) in **United Kingdom** is the accurate measurement and treatment of quality change due to changing product specifications. Being a measure of price change alone, the RPI should reflect the cost of buying a fixed, constant quality basket. However, products disappear or are replaced with new versions of a different quality or specification, and new products become available. When such a situation arises, a nominal price in the base month is needed for the new or replacement product; this nominal base price is used until the following January. If the retailer can supply the previous January's price for the new product, this can be used as the new base price with no further adjustment. Otherwise, one of the following methods is adopted: (i) direct comparison; (ii) direct quality adjustment; (iii) imputation.

60. Direct comparison. If there is another product which is directly comparable (that is, it is so similar to the old one that it can be assumed to have the same base price), for example a garment identical except that it is a different colour, the new one replaces the old one and its base price remains the same. (The current price may not be unchanged, since it refers to a later month.) This is described as obtaining a replacement which may be treated as essentially identical, and is equivalent to saying that any price difference between the new and the old product is entirely due to price changes, not quality differences. It is considered essential, for the method to work, that relevant and detailed product descriptions are available to confirm that the replacement product is sufficiently similar. A programme to improve the detailed descriptions supplied by price collectors is under way; it is concentrating on clothing, food, audio-visual equipment and durable goods.

61. Direct quality adjustment. This is the preferred method of dealing with the situation where of necessity a replacement product is of a different quality or specification. An attempt is made to place a value on the quality, or specification, difference and the price is adjusted accordingly. The procedure is equivalent to saying that any difference in price level between the old and the new product is partly due to true price change and partly due to quantifiable quality/quantity differences. The true price change is deemed to be the residual price change after removing the effects of these quality/quantity differences.

62. The major use of direct adjustment is when a product's pack size changes permanently. For example, in October 1995 many items were changed from imperial to metric quantities. In this case, in each outlet the nearest equivalent new size of the product priced in that outlet was found, and an adjustment was made for the change in weight. For example, if in January a pack of 1lb (454g) was priced at 56p and in October the nearest new size was 500g at 62p, its adjusted base price is:  $56 \times 500/454 = 61.674\text{p}$ , so its price relative is:  $62/61.674 = 1.0053$ .

63. Another example is the Radio Times and TV Times, magazines that give details of TV and radio programmes. During 1991, new deregulation laws meant that these publications were allowed to contain listings for all channels rather than just those of the British Broadcasting Corporation and Independent Television respectively, as before. Thus, most consumers of these magazines were getting more for their money than before. It was decided that there were three types of consumers: (i) those who previously bought neither; they were assumed to continue not doing so; (ii) those who previously bought both (the majority of the circulation); they would split into two groups, those who would change to buy just one of them and those who would continue to buy both; (iii) those who previously bought only one of them; they were assumed to continue doing so.

64. Some numerical assumptions were made by studying market and newspaper reports on circulations. Firstly, that 80% of the circulation of both magazines fell into category (ii), and that of these, 85% would stop buying both magazines and buy only one. For this latter group of consumers, the quality improvement was regarded as having roughly doubled which meant that the average improvement in quality over all consumers of these magazines was 68% ( $80 \times 85 / 100$ ).

65. It was also noted that these two magazines were in the RPI basket not just representing expenditure on themselves, but also as proxy indicators for a larger category, adult magazines. Analysis of adult magazine circulations showed that the proportional weight of the Radio and TV Times, based on their own circulations only, was only 44% of the actual weight they were given in the RPI basket. Thus, the quality adjustment actually applied to the prices of these magazines from that month onward for the rest of the year was about 30% (44% of 68%), equivalent to a price reduction of around 23%.

66. Other methods to do quality adjustment such as option costs and hedonic regression are not used in the United Kingdom RPI, although they are used in the Harmonised Index of Consumer Prices.

67. Imputation. If the replacement product is of a different quality or specification, and no information is available to quantify the difference by the methods described above, assumptions are made. A base price is calculated for the new product by assuming that its price change from the base month up until that month equals the average change for that item. Thus if the price is £14.99 and the index for that item (calculated excluding the product in question) is 108.34, the new base price is:  $\text{£}14.99 / 108.34 \times 100 = \text{£}13.836$ . This is equivalent to saying that any difference in price level between the old and the new product is entirely due to quality differences, not to price changes.

68. If an outlet closes, or refuses to allow further price collection, all items priced there are dropped. In that case, a new outlet is selected in the same location and new base prices are imputed for items priced in that

outlet. When the sample of outlets is drawn for a location, a list of reserve outlets is also drawn. Thus a new outlet can be selected with minimal delay from this reserve list.