Chapter 11 Selected Special Cases

A. Introduction

11.1. Certain products have proven to be problematic for Consumer Price Index (CPI) compilers in terms of both developing weights and collecting prices. Chapter 11 focuses on selected special cases and provides detailed advice for some of the more problematic products and issues facing compilers. These include the treatment of seasonal products, housing, internet purchases, second-hand goods, own-account production, tariffs, telecommunications, transport services, health, education, social protection, and financial services.

11.2. Wherever possible, the chapter identifies the preferred approach for the treatment of each special case; however, as stressed below, at this time there is no preferred approach for the treatment of owner-occupied housing. The housing section provides an overview of the different methods for the treatment of owner-occupied housing and describes the advantages and disadvantages of each method.

B. Seasonal Products

1. Introduction

11.3. Seasonal products are those products that are either not available in the market during certain seasons or periods of the year or are available throughout the year but with regular fluctuations in their quantities and prices that are linked to the season or time of the year.

11.4. Climate, traditions and institutional arrangements are the main causes of regular variations in the supply and demand for products. Fresh fruit and vegetables often have particularly marked seasonal purchasing and consumption patterns and certain fruit and vegetables may not be available at all at certain times of the year. Other products which can display some seasonality include other fresh foods, clothing, water, electricity, and fuel. The list of seasonal products cannot be expected to be uniform across countries. For example, oranges may be available for purchase year-round in some countries but only at certain times of the year or at a premium price in other countries. Similarly, seasonality can vary between different regions within the same country. Certain religious and other festivals can also be associated with goods or services whose consumption is limited wholly or partially to the festival period, such as Christmas trees, or products which are in high demand or especially produced, such as certain gifts given at the end of Ramadan.

11.5. In the compilation of a CPI a useful distinction can be made between “strongly” seasonal products, which are available only part of the year when “in season”, and “weakly” seasonal ones, which are available throughout the year but their prices (and their availability and purchase) fluctuate significantly with the time of the year. “Weakly” seasonal products generally do not require any direct intervention by the index compiler. The seasonal fluctuating prices of “weakly seasonal products” will typically be captured in the index although they are not without their problems for users of a CPI. For instance, when the “weakly” seasonal commodity is “out of season”, its price may be unusually high or low and the annual basket will reflect these unusual price fluctuations, leading to seasonal fluctuations in the overall index. This volatility can cause “statistical noise” with the analysis and understanding of
inflation. For some purposes, users want a CPI which measures the underlying price change and not these seasonal fluctuations. Measures of “core inflation” address these issues (see Chapter 12). It is the “strongly” seasonal products which pose the biggest problem for the index compiler. If a price is available in only one of two periods being compared, then it is not possible to calculate a price relative for the product and traditional bilateral index number theory breaks down.

11.6. There are two preferred approaches at this time for the treatment of strongly seasonal products. Ignoring the issue and excluding all the ‘challeging’ products from a CPI is not a solution in the context of an index whose purpose is to reflect changes in all consumption prices. If these products have some importance in the index basket then there is no justification for ignoring them.

11.7. This section looks at the alternative ways of dealing with strongly seasonal products. Essentially, there are two methods: a fixed-weight approach which uses the annual weight for the seasonal product in all months using an imputed price in the out-of-season months; a seasonal weights approach where the weight is zero for out-of-season months and the annual weight is used for in-season months. The 2003 International Labor Organization (ILO) Resolution states that “the way these (strongly seasonal) products are dealt with should be determined by the main purpose of the indices, national circumstances and the practicalities of compilation”. For instance, the relative importance given to measuring month-on-month inflation and how the alternative methods of treatment perform in practice may inform a decision on which method to use.

11.8. It should be recognised that there is no completely satisfactory way of dealing with strongly seasonal products. Index number theory can provide reasonably effective solutions where the focus is on comparing prices in one month with prices in the same month a year earlier. But the estimate of month-on-month inflation can vary, depending on the approach which is used, making the analysis of short-term inflation trends difficult, since under the fixed-weight approach the absence of price quotes in particular months means that no month-to-month price ratio can be compiled without imputing a price. Thus, the end result will depend on the method of imputation. Alternatively, a zero weight can be attached to the missing product, as in the seasonal weights approach, but the resulting monthly variations in the composition of the CPI basket hinders month-to-month comparisons of inflation. In general, very large seasonal fluctuations in volumes combined with large systematic changes in prices can make month-on-month price index comparisons behave rather poorly.

11.9. Thus, the difficulties that are raised by the existence of “strongly” seasonal items and their seasonal unavailability can be tackled by choosing one of two main approaches:

- The fixed weights approach (sometimes referred to as the strict annual weights method). Allocating fixed annual weights, on the assumption that seasonal products are to be treated in the same way as all other products. Prices will need to be imputed in the out-of-season period either from the last observed price or from what is considered the "typical" or "normal" price. The main imputation methods are overall mean imputation or class mean imputation (see Chapter 6 for more details on these imputation methods).
• **The seasonal weights approach**\(^1\). Allocating seasonal weights, according to the consumption pattern found in the base period. Items are given a zero weight in the out-of-season period and the expenditure on other selected items are adjusted so that the basket weights sum to 100.

11.10. These methods will result in different price series and more particular different monthly price changes in the out-of-season period.

11.11. The methods are discussed below in more detail. A common predicament is the determination of the in-season and out-of-season periods. A reserved approach is recommended in determining the in-season period to avoid abnormal prices from entering the index, from, for instance, high prices being charged for the first supply appearing in the shops of a fresh crop of, say, summer fruit where quantities may be low and demand and prices high. The chances of this happening are minimised in the fixed weights approach by imputing from what is considered a "typical" or "normal" price. There is no universally accepted standard definition of what constitutes a "typical" or "normal" price. For the EU, in the HICP the average price in the previous season or the regular price observed before the sales period is used. The aim is to prevent exceptional prices having an impact on the indices during the full out-of-season period.

11.12. It is worth noting at this point that even though existing index number theory cannot deal satisfactorily with seasonal products in the context of constructing month-to-month indices of consumer prices, it can better deal with seasonal products if the focus is changed from month-to-month CPIs to CPIs that compare the prices of one month with the prices of the same month in a previous year, that is individual annual inflation rates. But changes in annual inflation rates can be confounded.

11.13. The use of seasonal adjustment techniques to extract the seasonal components of a CPI for analysis are not covered in this chapter and should be used only for analytical purposes (for more information, see Chapter 14). It should also be noted that, in general, the imputation of missing prices does not eliminate of seasonal fluctuations in prices. The CPI should reflect actual prices paid by consumers and these fluctuations should be included.

### 2. Fixed weights approach

11.14. This approach, where the weights remain constant over all months of the year and which imputes a price when the product is out-of-season and not available to price, is theoretically consistent with the concept of a fixed basket. However, it raises the issue of the choice of imputation method for the unobservable out-of-season prices. The most commonly used approach is to impute a price using the last available observed price (that is “reliable”) and multiplying this last available price by the amount of price inflation for the most “similar” group of products that has taken place since the time of this last available price. The latter might be, for instance, a “similar” product or group of products, which is in season. The missing prices can be estimated using the monthly rate of change in the prices of the set of products

\(^1\) Referred to in Eurostat's Harmonised Index of Consumer Prices as the class-confined seasonal weights method.
within the same class of the Classification of Individual Consumption by Purpose (COICOP) or using an appropriate sub-set. Higher level aggregates inflation is likely to be influenced to a large extent by factors that are not so relevant for the seasonal product. Using products from the same COICOP class or group also enhances comparability with the seasonal weights approach, thus increasing statistical integrity.

11.15. The updating index could be an elementary one that uses Dutot or Jevons averaging, depending on the formula used for the CPI at the elementary aggregate level or it could even be the all-items CPI (i.e., at the aggregate level) if there is no “similar” group of products.

11.16. It should be noted that the use of the carry-forward method (repeating the last collected price) is discouraged. Using the carry-forward method may introduce bias into the index, as month-to-month changes would be zero.

11.17. The main drawback of the fixed weights approach is that the annual fixed weights will not be representative of the monthly consumption pattern. Oranges might be available for sale only in some months, but the fixed weights approach assumes that they are on sale throughout the year and introduces artificial prices which do not actually exist in the market-place but which are based on the price movements of a “comparable” product, such as bananas, which in reality may be of limited comparability. The limited comparability of the “comparable” product can lead to an extreme fluctuation in the oranges sub-index when oranges return to the market and are available again for direct pricing. But that said, in practice the fixed weights approach does normally give reasonably smooth 12-month rates of change. The imputation of prices by reference to the most “similar” group of products normally reflects reasonably well the price inflation expectation when the product returns to the market and thus is often considered appropriate for the medium and long-term measurement of inflation. However, the use of carry-forward prices can, of course, bias the month-to-month changes to zero.

11.18. There are alternative methods for the imputation of prices to the one described above. For example, another option is to apply the following procedure:

- In the first month of the out-of-season period the price of an out-of-season product is estimated by a typical or average price observed during the in-season period.
- From the second month on, the price of an out-of-season product is estimated by applying the price change for a set of related products or a product for which prices have been observed for the current month to the estimated price from the previous step (i.e., the typical or average price observed during the in-season period).

11.19. In summary, the advantage of the fixed weights approach where missing prices are imputed is that it is easy to explain and implement and keeps the annual fixed basket methodology more or less intact.

11.20. A word of caution is necessary at this point. It should be noted that ideally whatever method is applied to deal with seasonal products, it should be “self-correcting”, that is if the item after the out-of-season period reappears at the same price as it left the market, then the method should ensure that this will take the index back to 100. Similarly, if the price reappears 10% higher, it should take the index to 110 etc.

3. **Imputation of prices under the fixed weights approach: overall mean or class mean imputation**
11.21. The principle behind imputation is that it makes use of the best available information to provide an unbiased estimate of price and price movement. There are essentially three choices:

- **Impute the missing price by reference to the average price change for the prices that are available in the elementary aggregate (overall mean imputation).** This assumes that the price change of the missing product, if it had been available in the shop, would have been equal to the average change in prices in the elementary aggregate. This may be a reasonable assumption if the elementary aggregate is relatively homogeneous. This method of imputation is equivalent to “omitting” the product from the elementary index, no matter whether a Jevons, Carli or Dutot method of aggregation is used at the elementary aggregate level.

- **Impute the missing price by reference to the average price change for the price of a “comparable” item from a similar outlet (class mean imputation).** This represents a more precise match between the missing product and the products supplying an imputed price. It is normally preferable to imputation using the average price change in the elementary aggregate unless the imputations are unreliable because of small sample sizes.

- **Counter seasonal imputation.** Impute by using only the prices of seasonal products in the COICOP sub-class, class or group (counter-seasonal imputation). The reasoning underlying counter-seasonal estimation is that both in-season and out-of-season products serve similar purposes, although in different conditions. In contrast, non-seasonal products within the same COICOP sub-class, class or group may have different uses. For instance, formal ball gowns are available all year round to serve a specific purpose, so it is argued that they cannot be substituted either by a summer or winter dress. However, warm and lightweight clothes have the same purpose of protecting the body and are substitutable according to the temperature conditions.

11.22. There are many examples of consumer products that are available seasonally. The worked example in the tables below illustrates the method of imputing prices for out-of-season products based on price movements of related in-season products. In this example, there are two seasonal products but only one is available during any one collection period. In addition, there are occasions when neither is available. The two products are men’s summer nightwear and men’s winter nightwear. As both products serve the same purpose, they are substitutes for each other within their respective seasons. This allows the compiler to assume that the price movements of the available product would be suitable price movements from which to impute price movements for the unavailable product. This assumption would also hold in situations where both products are available in the same pricing period (i.e., the seasons overlap for a short time). There would simply be no need to impute any prices during these periods.

11.23. A well-constructed CPI structure would have goods and services that could be considered substitutable or very similar in nature as neighbouring components. This allows the index structure itself to determine the appropriate price movements to be used in computing price movements for unavailable seasonal products.

11.24. Table 11.1 shows the price relatives for a monthly index for most of a year, in this case the short-term monthly price relatives noting the same can be applied using long-term price relatives. Only the structure for one small portion of the entire CPI structure is displayed. There
are four elementary aggregates shown: *Underwear, Socks, Summer nightwear* and *Winter nightwear*. The prices that have been collected and for which short-term price relatives can normally be calculated from actual non-imputed prices are the figures not in italics. *Underwear* and *Socks* are available (and priced) all year round. Both seasonal elementary aggregates are grouped together under an aggregate component (sub-index) labelled *Nightwear*. No other elementary aggregates are included in this aggregate component. Consequently, the structure implies that each seasonal nightwear elementary aggregate is the ‘best’ index from which to impute price movements for the other. Price relatives calculated from prices imputed in this situation are in italics. When there are no prices available for either of the two seasonal products, other components must provide suitable price movements to be used in the imputation process. If the structure has been organised to group like components as neighbours, then the ‘best’ components for providing appropriate price movements are likely to be the sibling components of the parent component of the seasonal elementary aggregates. In this example, the components *Underwear* and *Socks* are the siblings of *Nightwear*. Therefore, a weighted average of the price movements of *Underwear* and *Socks* will be considered as the ‘best’ estimate of an appropriate price movement for both *Summer nightwear* and *Winter nightwear*. Price relatives calculated from prices imputed in this situation have been shaded in bold italics.

11.25. The example commences with pricing conducted in February. As this is the winter season (in the northern hemisphere), no prices are available for *Summer nightwear*. Under this method, the price movement for *Summer nightwear* is imputed to be the same as for *Winter nightwear*. The same situation occurs in March.

11.26. However, in April no prices were collected for either summer or winter nightwear items. Price movements in the sibling components of the aggregate nightwear component must be used to impute a price movement for all nightwear items, that is the corresponding price relative for underwear and socks combined (the weighted average of the short-term price relatives for underwear and socks using the weights in Table 11.1).

11.27. In May, summer nightwear was again available and so prices were collected. The price relatives for the summer nightwear items are calculated from the collected prices. The price movements for summer nightwear items in May are measured as the change from the imputed prices for April to the actual prices collected in May. This method does, therefore, self-correct if the imputed prices do start to diverge from the ‘true’ level.

11.28. Note that while this example has shown price imputation occurring at the elementary aggregate level, this has been done for the sake of simplicity in presenting the method. It can be thought of as an example where there is just one price observation in each of the elementary aggregates. In practice, most CPI systems would impute price movements for individual items in the price samples within an elementary aggregate using the same figures for the imputation as referred to above. Index calculations would then proceed as normal.

11.29. The resulting indices are given in Table 11.2. The figures in italics are based on imputed prices as per Table 11.1.

11.30. This method can also be applied to other products, such as fresh fruit and vegetables, as long as the CPI has an appropriate structure. For instance, seasonal fruits should be imputed from price movements of other in-season fruits and seasonal vegetables should be imputed from other in-season vegetables.
Table 11.1 Short-term price relatives based on monthly indices for four selected elementary aggregates

<table>
<thead>
<tr>
<th>CPI Structure</th>
<th>2018</th>
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<td>Feb</td>
<td>Mar</td>
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<td>May</td>
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<td>Jul</td>
<td>Aug</td>
<td>Sep</td>
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<td>Men's clothing</td>
<td></td>
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<td></td>
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<td>Sub-index: underwear, nightwear and socks</td>
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<tr>
<td>Elementary aggregates:</td>
<td>Underwear</td>
<td>1.010</td>
<td>1.000</td>
<td>1.050</td>
<td>1.005</td>
<td>1.010</td>
<td>1.000</td>
<td>1.030</td>
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<tr>
<td></td>
<td>Socks</td>
<td>1.000</td>
<td>1.005</td>
<td>1.000</td>
<td>1.030</td>
<td>1.020</td>
<td>1.005</td>
<td>1.000</td>
</tr>
<tr>
<td>Nightwear</td>
<td>Winter nightwear</td>
<td>1.010</td>
<td>0.970</td>
<td>1.036</td>
<td>1.100</td>
<td>1.050</td>
<td>0.980</td>
<td>0.950</td>
</tr>
<tr>
<td></td>
<td>Summer nightwear</td>
<td>1.010</td>
<td>0.970</td>
<td>1.036</td>
<td>1.100</td>
<td>1.050</td>
<td>0.980</td>
<td>0.950</td>
</tr>
</tbody>
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Table 11.2 Monthly Price Indices using imputed prices for missing values of winter and summer nightwear

| CPI Structure | Weights (base period) | 2018 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| Men's clothing | | | | | | | | | | |
| Sub-index: underwear, nightwear and socks | 1000 | 118.6 | | | | | | | | |
| Elementary aggregates: | Underwear | 500 | 119.0 | 120.2 | 120.2 | 126.2 | 126.8 | 128.1 | 128.1 | 131.9 | 134.6 |
| | Socks | 200 | 120.0 | 120.0 | 120.6 | 120.6 | 124.2 | 126.7 | 127.3 | 127.3 | 127.2 |
| Lower level-index: nightwear | 300 | 116.0 | 117.2 | 113.6 | 117.8 | 129.5 | 136.0 | 133.3 | 126.6 | 128.4 |
| Elementary aggregates: | Winter nightwear | 150 | 116.0 | 117.2 | 113.6 | 117.8 | 129.5 | 136.0 | 133.3 | 126.6 | 128.4 |
| | Summer nightwear | 150 | 116.0 | 117.2 | 113.6 | 117.8 | 129.5 | 136.0 | 133.3 | 126.6 | 128.4 |

4. Seasonal weights approach

11.31. This approach gives a zero weight to an item when out of season and reverts to the annual fixed weights when the product is in season and available for pricing. It is usually applied within a COICOP category, the weight for the latter being held constant. When the out
of season item is assigned a zero weight, the upper level weight is redistributed proportionally to the available in season items. For example, take the seasonal food category which might cover fresh fruit and vegetables. Only the item weights within fresh fruit and vegetables can vary between zero and the annual fixed weight, though the section weights are fixed so that, at least at the upper levels, the principle of the fixed basket is maintained.

11.32. The underlying assumption is that total expenditure on the relevant COICOP category (often synonymous with an elementary aggregate) does not vary between different times of the year, the main tendency being for expenditure to switch between “similar” items only (consumers will tend to buy other fruits if oranges are not available).

11.33. The seasonal weights approach has the advantage of minimizing the practice of price imputation, as prices will not be imputed for those months when the product is not available for purchase. Prices are observed only in months where weights are not zero. For products that have prices observed in two consecutive months, the monthly changes of the product price indices are computed using matched samples. When a product has a positive weight after the weight has been zero for some months, the product index is compiled by matching the price observation in the first month of the new season with the observations from the last month of the previous season and applying the difference to the last index of the previous season to give the price index for the first month of the new season.

11.34. The seasonal weights approach has two key disadvantages:

- It is conceptually inconsistent with a fixed basket index.
- Month-on-month price changes reflect not only changes in price relatives but also changes in the weights (from zero to the fixed annual approach). This makes it difficult to interpret month-on-month changes in the price index.

11.35. In addition, concerns have been expressed about the variability in the precise timing of the seasons from one year to the next means that the imputation of prices is not totally avoided. For instance, if unusual weather conditions delay the appearance in the market of, say, oranges, then prices would need to be imputed for the months in which oranges are unavailable but where they have been allocated a non-zero weight.

11.36. It is strongly recommended that the set of products defined as seasonal should not vary from year to year, unless strongly justified on grounds of necessity to keep the sample representative.

5. Fixed or seasonal weights?

11.37. Comparing the fixed and seasonal weights approaches, the two approaches provide similar results. The imputation of prices based on the price movements of similar products – the fixed weight approach - is a form of re-weighting where further weight is given to the price movements of products which are available for pricing.

11.38. A ‘perfect’ solution to the treatment of seasonal items does not exist, particularly where the existence of seasonal products (especially strongly seasonal products) means that it is impossible to compute a completely satisfactory month-to-month index that accurately measures month-to-month price change.
11.39. If the focus of the CPI is the accurate measurement of annual price inflation, then the problems associated with strongly seasonal products are minimized (although changes in seasonal patterns from one year to the next continue be problematic).

11.40. The advantages and disadvantages of each method should be considered and, if possible, the impact on measured inflation assessed for reasonableness before a particular method is implemented. The use of the index will also be an important consideration. For example, if the main purpose of the index is for indexation then the fact that the seasonal weights approach means that the month-on-month price change will reflect not only changes in price relatives but also changes in consumption baskets may be considered a significant disadvantage, i.e., users might question the meaning of comparing the price of this month’s basket with the price of last month’s basket which might be very different. More generally, if user focus is on month-to-month change then the seasonal weights approach has much to recommend itself, despite the problems of interpretation, as the annual weights attached to each month-to-month price relative under the fixed weights approach can be misleading. If user focus is on long-term index changes then the use of an annual basket and annual expenditure shares is the most appropriate.

6. Monthly approach: maximum overlap – not an alternative

11.41. This type of index deals directly with the seasonality problem but strictly speaking is not an alternative to the fixed and seasonal weight options for dealing with particular products – rather it is a method of index construction which overcomes the challenges of seasonal products by considering only those observations present in both compared months. In this case, it seems reasonable at first glance to prefer a chained index, which compares prices in adjacent months because a fixed-base index could fail to effectively follow closely market-place developments. This is due to the dynamics in the retail market resulting from seasonality, the introduction of new products, and disappearance of older ones.

11.42. The expenditure shares for month \( m+1 \) are calculated excluding the products not priced in that month.

11.43. The main problem of the maximum overlap price index is that it can have a significant downward bias due to the chained nature of the index. Seasonal products tend to enter the market at relatively high prices, which drop in the subsequent months. The initial high prices are not always captured by the maximum overlap index. When these products first become available, they come into the marketplace at relatively high prices and then, in subsequent months, their prices drop substantially. The effects of these initially high prices (compared to the relatively low prices that prevailed in the last month that the products were available in the previous year) are not captured by the maximum overlap month-to-month indices, so the resulting indices build up a tremendous downward bias. The downward bias is most

\footnote{The focus on annual price inflation leads to the possibility of a further solution - the construction of 12 year over year monthly Lowe indices (or geometric Young indices or four quarter over quarter indices, using seasonal baskets that are appropriate for each month or quarter. From a practical point of view, annual Household Budget Surveys (HBS) would have to be augmented to cover seasonal products in more detail and this would entail more expense. But if a national statistical office (NSO) is using the Rothwell formula, then it is already collecting seasonal expenditure information.}
pronounced in the Paasche indices, which use the quantities or volumes of the current month. Those volumes are relatively large compared to the volumes in the initial month when the products become available, reflecting the effects of lower prices when the quantity in the market increases.

11.44. The maximum overlap method is not recommended when there are particularly large price variations.

11.45. In summary, the month-to-month maximum overlap method is generally not recommended due to the possible chain drift bias. However, the method can be checked to see if this is a problem in practice by comparing the product of 12 consecutive month-to-month maximum overlap indices with the corresponding direct year over year comparison. If the product of the 12 links is reasonably close to the corresponding year over year index, then the month-to-month overlap method can be used.

7. Some common implementation problems

The identification of seasonal items in the basket and the corresponding length of the seasonal cycle

11.46. The most important characteristics which can be associated with a strongly seasonal product are: that it is not available for purchase during certain months (or the quantity available for purchase is negligible); that there is a significant variation in demand during the year; and that there are corresponding large fluctuations in price. The variations in supply and demand, mean that prices cannot be observed during these months. Seasonal products are associated with variations both in availability of products and in their demand and this can lead to pronounced variations in stocks in outlets, expenditure levels and prices. Any period of non-availability for pricing in outlets should have some typical annual cyclical pattern. If for some reason a product becomes unavailable in a month where it would normally be available and sold at a normal price, this does not make it a seasonal product. The out-of-season period of a product includes the months in which no prices are observed or used in the compilation for that product because the product is not available for pricing or only available in small quantities in very few outlets at abnormal prices. The latter point is important because the inclusion of abnormally high “start-of-season” prices collected from a relatively few number of outlets can potentially introduce a downward bias in the index for both the fixed weight and seasonal weight approaches. It may also cause difficulties for price collectors attempting to find the products.

The geographical dimension

11.47. The seasonal availability of products may vary between regions within a large country. There may also be a difference in supply (and demand) between markets in rural areas and those in urban areas, or between market stalls and more upmarket outlets catering to higher incomes. For example, some prices may be collectable in the capital city even though the product is generally not available elsewhere. Where this is the case, different seasonal cycles may be applied, particularly if the differences are marked and regional or urban/rural sub-indices are being computed. The decision should take account of the extent of the differences and the needs of users.

Lack of well-defined seasons
In practice, seasonal products do not always appear and disappear in the same month every year. This presents a problem both for year-on-year monthly comparisons of monthly indices as well as for year-on-year comparisons of quarterly indices but is particularly pronounced for the former. The consequence of neglecting the importance of carefully pre-defined seasons can contribute to a method, particularly the seasonal weight approach, failing to correctly reflect the price changes in the price index in the short term. Decisions made regarding the relevance of prices which could have been observed but were not (and have not been included in the index or the imputation of non-existent prices) can affect the stability of the price index. Thus, the fact that seasonal patterns change and the need to confront whether to accept this or force data into a pre-determined seasonal pattern poses a dilemma to compilers of the CPI. It is particularly important that when data are published, the statistician should provide background explanations for the 12-month rate of change, and whether this is influenced by a change in the timing of sales and in what direction and by what magnitude. Similarly, for monthly changes.

**Domestically produced products being replaced with imported products when out-of-season**

The product description is important in these circumstances. The price statistician will need to make a judgement on whether the imported apple is of the same quality as the domestic one and if so whether it can be treated as an “equivalent” fruit. This judgement should be based not just on variety of apple, its general condition and flavour but also on whether the market perceives it to be the same and treats it as the same. For instance, the imported apple may be so highly priced that only a small number of higher income consumers will buy it. It may then be regarded as being unrepresentative and not equivalent to the domestic apple and excluded from the sample. The decision to exclude the imported apple may be made even if the apple is of the same variety as the domestic one. It is important, that the price collector is properly trained to identify these product changes.

In order to correctly define the months in which the price index of the seasonal product will be calculated from observed prices, particularly in the situation where the methodology requires a fixed seasonal pattern, the NSO should examine in detail the historical data on prices and availability for each product and undertake a sensitivity analysis to identify working rules for determining the inclusion and exclusion of products in the index in specific months:

- The data on availability are needed in order to decide whether it is likely that in any specific month the product will keep returning to the market every year.
- The prices data will show how inclusion of the product in the index for the first month in which the product returns to the market may contribute to the volatility of the index. For example, if the entry price is particularly high (say, more than 250% higher than the product's last actual price), then it would be reasonable to consider not including the product for that month, especially as it is improbable that the product was widely purchased at such a high price.
- Strongly seasonal products enter the market at high prices that decline towards the end of the season but, as already argued, can go up sharply before exiting the market. This will also have an impact which may vary depending on the calculation approach used.

**8. Some common seasonal products and their treatment**
Fruits and vegetables

11.51. The prices of seasonal fruits and vegetables are strongly dependent on supply conditions, such as weather, and are thus liable to show extreme price movements and shifts in seasons, as well as seasonal unavailability. However, changes in specification or quality are not common and therefore do not cause the same problems as are experienced when dealing with, for example, seasonal clothing (see paragraphs 11.50 to 11.52).

Clothing

11.52. The treatment of seasonal clothing can be far more problematic, especially because fashion is involved. In many countries, the price patterns of clothing are the result not just of seasonal availability (for example, winter coats, or bathing suits) but, especially for fashion goods, of discounts in seasonal sales. In addition, the problem of extreme price movements is combined not only with seasonal unavailability, but by annual changes in the products themselves, in other words, the effect of fashion. New stocks of clothes that arrive in the shops at the beginning of their season may have styles that are different from those that disappeared at the end of the previous season, so there is the question of whether the new styles are different in quality from the old styles. In addition, prices generally fall over the course of the season: prices at the end of a season are often discounted as shops clear their stocks in readiness for the next season. Of course, for seasonal items, comparisons must be made between the new replacement products and the old products that disappeared at the end of the previous season, maybe six months earlier. Dealing with these issues can be challenging:

- **Specification changes.** Since it can be difficult to make like-to-like observations for many categories of clothing, the rules for judging whether a replacement is comparable to an original item may need to be somewhat relaxed. For example, this season’s high-fashion coat can be viewed as comparable to last season’s model, unless there are obvious differences in important characteristics such as textile replacing leather. For high-fashion items, only changes in compositional and material characteristics, if significant, should be treated as quality changes – see Chapter 6). The primary characteristic of most high-fashion items is the product brand, which incorporates the fashion element. Keeping the same or an equivalent brand is often the key to measuring the fashion element.

- **Discounted end-of-season prices.** In the case of a product showing temporary discounts or promotions, where it seems likely that the price will return to its normal level after a short period, then the discounted price should be included, and no special method is needed to handle it. If, however, the discounting is seasonal in nature and intended to help the shop clear stocks of old styles, then the issue is more problematic because, unless specific procedures are applied to ensure a return to normal prices, the index will be subject to a systematic downward bias. The exclusion of such situations is an important consideration in defining the in-season period. Products that have flaws or irregular should not be included.

11.53. As a result of the above complications, some NSOs employ the following procedures during the period covering the time when a “seasonal” clothing item is not available. This adopts the fixed weight approach and imputes missing prices by applying price movements (using the overall mean or the class mean – see Chapter 6) to the last available normal price:
In the first month that the item is unavailable, record the price at its “normal” level; in other words, in the first month impute the last available normal price.

Impute a price during the period of unavailability, for the second and subsequent months, by applying the monthly movements for clothing items for which prices are available to the last normal price.

When the normal season resumes, select a replacement as similar as possible to the variety that was priced during the previous season and compare its price directly to the final imputed price of the old variety. It is important that the index reflects the full extent of the price difference between the last month in which a price was imputed and the first month of the new season. If the replacement has a different level of quality, then the price should be adjusted using one of the quality adjustment methods presented in Chapter 6.

Continue price collection using this new variety for the new season.

11.54. The reader should refer to Chapter 5 for further guidance on the treatment of “sale” prices.

9. Intractable problems and serious challenges?

11.55. In the context of constructing a month-to-month index that accurately reflects price inflation facing households, there is no fully effective method of dealing with large monthly fluctuations in prices and quantities generated by strong seasonality. The fixed and seasonal weights approaches yield the same results. If user focus is on month-to-month change then it has been argued that the seasonal weights approach is probably the preferred method as it avoids the problem associated with the fixed weights approach where the annual weights attached to each month-to-month price relative can be misleading. But the fixed basket has been compromised. From a presentational point of view, indices showing the 12-month inflation rate assist in trend analysis but do not easily identify changes in the monthly trends. It has already been noted that month-to-month indices using maximum overlap are prone to downward bias.

11.56. Finally, it should be noted that when estimating the contribution of a sub-component of the CPI to the change in the all-items CPI, the way this is calculated is different for a seasonal component. This is dealt with in Chapters 9 and 14.

C. Internet purchases

1. Introduction

11.57. The traditional concept of consumers entering stores to purchase goods and services has been changing dramatically over recent years. The importance of shopping for goods and services on the internet has been growing significantly. Conceptually, the CPI should broadly represent the expenditure patterns of the reference population; therefore, online purchases need to be included in the CPI to maintain the relevance of the index by properly representing consumer purchasing habits.
11.58. Internet shopping is a form of electronic commerce which allows consumers to directly buy goods or services from a seller over the internet using a web browser. Consumers find a product of interest by visiting the website of the retailer directly or by searching among alternative vendors using a shopping search engine which displays the product's availability and price at different e-retailers.

11.59. In principle, internet purchases also include in-app purchases, purchases via social media, and other similar avenues which provide a mobile, desktop, and internet-based sharing application. These services can be extended to allow the consumer to get the product name and price information for items in a photo. By clicking on a specific item, consumers are taken to its product page, and if they click the "Shop Now" button, they are taken to the brand's website to complete their purchase. While these services have been excluded due to the practical difficulties of identifying these avenues of purchase and estimating the volume and value of purchases, there is need to collect from households on how they make purchases on the internet. The HBS can be used to collect these data.

11.60. The growth of internet purchases facilitates more efficient price collection as collecting prices online can be relatively easy and cheap compared to sending price collectors into shops. But identifying and measuring online purchases to develop weights and augment outlet samples can be a challenge.

11.61. The practical measurement issues of including internet shopping in the CPI share some common issues with other types of shopping. Whether internet shopping is any different from any other form of retailing is debatable. Perhaps the main distinction from more traditional forms of shopping is the practicality of measurement, that is estimating the expenditure weights and collecting price observations proportional to sales.

11.62. As mentioned in Chapter 5, prices for goods and services made at web-based outlets can be collected in the same way as the online collection of prices from the websites of outlets with a corresponding physical location. The sample of items to be priced should be representative of online purchases and may be different from the prices charged online by physical outlets. The prices recorded should represent the full cost of purchase, including any tax and surcharges. Online purchases may include delivery charges. For CPI compilation, charges that are directly connected to the purchase of the priced product and which are not separately invoiced, should be included in the price. If the charge is separately invoiced or relates to the purchase of a number of items, then it should be included under transport services.

11.63. This chapter explores the conceptual issues and challenges as well as the practicalities of incorporating internet purchases into the CPI. The underlying principles of measurement are the same as with collecting prices from physical outlets.

2. Coherence and data integration

11.64. Internet purchases can occur through retailers that have both an online and physical presence (multi-channel retailers) or just an online presence (web-based retailers). For multi-channel retailers, there may not be a need to price both methods of purchasing if there is no

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3 In-app purchasing refers to the buying of goods and services from inside an application on a mobile device, such as a smart phone or tablet.
difference in price, terms and conditions of purchase, or product availability. For the online side of the outlet, the collection of delivery charges and credit card surcharges might need to be addressed. When the prices are the same, CPI price collection could simply switch from collecting prices in-store to collecting prices online to save on collection costs. Where prices and price movements are similar in both modes of collection, the different market shares of online versus in-store will not play a role in the calculation of average price movements. The fundamental question is whether prices online do in fact match the prices in the physical outlet. If not, online purchases should be treated as a distinct outlet type requiring separate and proper representation in the CPI.

11.65. A study by Cavallo (2017) undertook a comparison of online versus offline prices in large multi-channel retailers across 10 countries. The findings indicate that the price levels were identical in approximately 72 percent of cases across sampled countries and was highest for electronics and clothing goods where these percentages rose to 83 percent and 92 percent respectively. Based on these findings, there is scope for the internet to be utilised as an alternate mode of collection when the same prices are available online. However, when utilising the internet for price collection the NSO should confirm that the online prices do in fact match the in-store prices and that the strong correlation between movements of in-store and online prices continues. The relationship between in-store and online prices can change over time and this should be monitored.

11.66. The simplest method for determining whether a website matches in-store prices is to concurrently price in-store and online for a few number of periods to confirm that both the price and price change are the same. Another option would be to meet with the respondent and discuss whether the prices online are similar to those in the physical outlet. Where prices and price changes are considered different and the expenditure is considered representative and significant across both shopping channels then ideally both modes of shopping should be priced.

11.67. From a more strategic viewpoint consideration needs to be given to whether internet shopping in general should be considered as purchases from a distinctive type of "outlet", in which case it should be fully integrated into the structure of the elementary aggregates and into the CPI outlet and item samples. It would follow that internet shopping should be treated as a separate stratum for sample selection and elementary aggregation.

3. Estimating expenditure weights for online shopping and selecting samples

11.68. The requirement that a broadly representative basket of goods and services is used to compile the CPI and that the same basket is re-priced month after month can be particularly challenging for internet prices. This is especially so when having to account for changes in the characteristics of products, and their disappearance from a website from one month to the next, along with the appearance of new or updated items and varieties. Purchases from the internet represent a certain proportion of the whole data universe available for the products that are to be sampled and, as such, represent a particular outlet type engaged in the selling of different goods and/or services. Online outlet and product selection are based on the same criteria and methods used for traditional collection, drawing on information on modes of purchase for different products as recorded in a HBS and on sales information supplied by, for instance, the online retailers themselves. The sales information, of course, should exclude sales to businesses
and should conform with the geographical concept followed by the CPI (see 11.67) however, as this can be difficult to separately identify from sales data supplied by retailers, information from a HBS is often preferred, despite the fact that it is sample-based and can be out-of-date. The latter can be updated using commercial information on trends in internet shopping, but care must be taken to ensure consistency of weights to reflect shopping in the weight reference period.

4. Geographical Coverage

11.69. Internet purchases can be made from either domestic websites or from foreign websites. The treatment of these transactions can cause challenges for producing a CPI and is dependent on the geographical coverage of a CPI. The CPI follows either the national or domestic concept, as described in Chapter 2. The concept followed determines from a geographical perspective what expenditure are included in the weights and what goods and services are priced.

The National versus the Domestic Concept

11.70. The national concept means that the CPI should cover all expenditure (and prices) relating to the resident households of the country, regardless of where the expenditure takes place. The national concept aligns with the System of National Accounts (SNA)\(^4\). Household final consumption expenditure in the SNA refers to the expenditure incurred by resident households, regardless of whether that expenditure is incurred within the economic territory or abroad. The national concept is appropriate when the primary use of the CPI is for indexation of incomes or payments. The weights for expenditure abroad can be computed from the HBS, at least in theory, but measuring prices paid abroad can pose significant practical and operational problems especially for purchases from physical outlets as opposed to purchases made online.

11.71. The domestic concept means that the CPI should cover all the expenditure made within the domestic territory of the country, including the non-business expenditure made by foreign visitors. It excludes the expenditure abroad of the resident households. It is appropriate where the CPI is used for national inflation analysis and making monetary policy decisions. Many countries conduct surveys of expenditure made by foreign visitors, for example, via surveys conducted at major border crossings and airports. This is particularly important for those countries which have large numbers of foreign tourists or large numbers of cross-border shoppers. The treatment of purchases made online requires special consideration. In principle, the domestic and national concepts could provide guidance on how to treat the expenditure made on goods, services, and digital downloads purchased via the internet. For many countries, however, internet-based outlets may be based (registered) abroad and would be considered cross-border shopping. For those countries following the national concept, the approach is clear. Strictly speaking, under the domestic concept, these expenditure would not be included.

\(^4\) Another issue raised by the increasing use of the internet for purchases is the distinction between goods and services. The Impact of Globalisation on National Accounts (UNECE 2015) includes a chapter on e-commerce. This chapter includes a Table (Table 13.1) on whether to classify different types of purchases on the internet as goods or services according to the 2008 SNA concepts and the Sixth Edition of the IMF’s Balance of Payments and International Investment Position Manual (BPM6). In the discussions about the problems in measuring globalization the issue of having suitable price indices for deflation of flows of goods and services is often mentioned as a major challenge.
because they could be defined as expenditure abroad; however, in practice, requires a broader interpretation. The nature of internet shopping requires a different way of thinking and special consideration, especially with regard to the domestic concept. Additionally, internet shopping continues to grow in importance.

11.72. Many countries have carefully considered how to include the expenditure (and prices) made on goods and services via the internet. For the purchase of goods, the expenditure and prices, should be reflected in the country where the goods are delivered.

11.73. Services purchased on the internet can be more problematic because there are both tangible and digital services. Tangible services would include the traditional services such as transportation, hotels, entrance to cultural/sporting events, education, etc. Digital services would include telecommunications, broadcasting (e.g. streaming or downloading music, streaming or downloading movies and television content, etc.) and digital services (e.g. software). If the service is consumed in the economy where the household is resident, then it should be included in the CPI; however, if the service is consumed outside of the economic territory of the country, then it would be excluded. For example, if a household reserves a hotel room that will be used and paid for in another country, it would be considered out of scope. For digital services, because the service is being consumed within the economic territory of a country, the expenditure and prices should be included in the county where the consumer resides.

11.74. The estimation of expenditure weights can be a more challenging measurement issue.

11.75. When expenditure or alternative sources of data are not readily available, but internet purchases are known to be substantial, a NSO could investigate augmenting the CPI basket using an estimated weight until the precise weight can be established. By doing this the relevance of the CPI basket is better maintained.

11.77. In terms of item and variety selection, online retailers will often identify their top selling products on their websites. This can help with identifying which products to price.

11.78. **Determining the location of the online retailer and of the transaction**

11.79. The location of the purchaser, the location of the website and the location of the transaction may be spread across many different countries. Several alternative locations may be considered in determining whether an online transaction complies with the national or domestic concept:

- Purchaser's domicile at the time of the order.
- Address where the product is delivered to.
- Purchaser's address.
- Billing address.
- The location where the product is consumed.
- Country where tax, most particularly Value Added Tax (VAT) or Goods and Services Tax (GST), is paid.
11.80. As noted above, internet shopping forces a broader interpretation of the domestic concept. A pragmatic approach needs to be adopted rather than establishing and adhering to rules and regulations designed to maintaining strict consistency with national accounts.

11.81.

11.82. For this reason, alternative workable approaches are sometimes used. Feldman and Sandberg (2012) suggest using the address where the product is delivered to as a practical solution. The country of delivery is where the consumer and the product come together. If the purchaser's country is not listed as the standard delivery location for the delivery of purchases from the website, then it may be assumed that the seller’s location is in another country. Following this approach, downloads of music, e-books or software should be classified as domestic purchases as these are normally delivered instantaneously to the user. Although, conceptually, this deviates from the concept of a foreign online purchase, as it will most likely capture purchases from some foreign-based websites, practically it is considered by some as the next best alternative. However, it can lead to inconsistencies between a CPI and the coverage of both the national accounts and of the balance of payments.

11.83.

11.84. Another approach is the one adopted by Eurostat which broadly mirrors the Feldman and Sandberg approach described above but uses administrative rules relating to taxation as the basis for determining how to treat internet shopping. Eurostat's recommendations on the treatment in the European Union (EU) of cross-border internet purchases, borrow from the VAT rules as applied to all member states. The VAT rules consider the fact that an increasing number of products are electronic (an e-book, for example), rather than a physical good or service in the traditional sense. The rules make a distinction between goods, digital services, and other services. For goods ordered via the internet, the place of delivery determines the VAT rate and usually this will be the country of residence of the purchaser. For digital services, the VAT rate is determined by the country where the purchaser normally resides. For non-digital services – even if booked online – such as flights and package holidays, the VAT is determined by the country where the tangible service is provided. The recommendations also cover purchases ordered over the telephone or by mail order catalogue, which are treated in the same way as internet purchases because of the similarities between different forms of remote purchase.

11.85. In the EU, the scope of the HICP follows the domestic concept, as it covers all household final monetary consumption expenditure (as defined on the EU Regulations on HICP) in the economic territory, regardless of the nationality or normal residence of the consumer/purchaser.

11.86. Applying the VAT rules results in the following:

- The expenditure and the prices for goods purchased through the internet are recorded in the HICP of the country where the product is delivered.
- The expenditure and the prices for services of a tangible nature purchased through the internet are recorded in the HICP of the country where the service is provided.

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• The expenditure and the prices for digital services (communication, broadcasting and electronic services) are recorded in the HICP of the country where the consumer usually resides.

• The price to be recorded should be the full price, including any compulsory additional costs, provided that these costs can be attributed solely to the purchase of the product concerned.

5. Price collection

11.87. In terms of price collection and the maintenance of a fixed basket, pricing online poses similar, but more difficult to resolve, challenges to collecting prices in physical outlets, such as non-availability of products and the issues of substitution and quality adjustment, as well as the treatment of delivery charges\(^6\). The standard principles of price collection apply. Under traditional price collection, if a product is sold out or is no longer available, the price collector can speak to the store owner and choose a replacement item and make any necessary quality adjustments. With internet pricing, it is unlikely that there will be the opportunity for interaction with the retailer and the availability of an item can often only be determined by attempting a purchase. Moreover, if an item is unavailable it can be difficult to determine online whether it is permanently or temporarily unavailable and, in the former case, the detailed product information needed to select a replacement and make any necessary quality adjustment is generally not accessible given the limited information that is generally contained on a retailer’s website. NSOs should investigate potential websites for online price collection to ensure that there are sufficient numbers of products and enough product detail to be able to price consistently and to constant quality. For example, for products like clothing, websites should contain enough characteristics, such as brand, material, style and cut, to facilitate the selection of a suitable replacement for an article of clothing which is discontinued and, where necessary, to perform a quality adjustment.

6. Treatment of additional costs over the internet

11.88. Often, when purchasing goods and services over the internet, there are additional costs associated with buying that product. These costs can include delivery charges, credit card fees, etc. In some cases, these are separately invoiced and in other cases they are not. It can also be noted that some additional costs only become apparent at the point of purchase. It can be argued that if the cost is inescapable to the consumer, that is, if ownership of the good cannot be transferred unless these costs are incurred by the household, then it should be included in the CPI as part of the transaction. The delivery charges may vary according to the geographical location of the purchaser and this variation will need to be taken account of both in the national CPI and in a regional or city CPI. The approach can also be applied when the delivery is provided by another business, if this is part of the transaction. In this case, the cost of transport would be priced separately and included under transportation services for purposes of index compilation.

\(^6\) As mentioned in Chapter 5, delivery charges should be included in the cost of the online purchase where these are not separately invoiced and where they are inseparable from the purchase.
11.89. For delivery charges, COICOP 2018 classifies delivery charges separately from the purchase price. This will allow the CPI to more accurately reflect the appropriate price change. In the former version of COICOP, delivery charges were included in the price paid for the good. If the delivery fee changed, this would be reflected as a price change for the item. For example, let’s assume the price of a table was $500 in period one and remained unchanged in period 2 at $500. If delivery fees for that table increased from $50 to $70, under COCIOP 1999, the final price would show a change from $550 to $570 because the CPI compiler includes the delivery fee in the price of the item. Consequently, even though the price of the item has not changed the index is showing a movement which relates not to the product itself but to a transport service.

11.90. Although this classification is different to the SNA, which defines the ‘purchaser’s price’ to include any transport charges paid separately by the purchaser to take delivery at the required time and place, when this is not feasible many countries' national accounts deviate from this approach and include delivery charges under transport services rather than allocating the cost to the price of the product.

11.91. Similarly, credit card fees should be captured if it is an inescapable cost of buying the item and incurred by most households buying that product. Some websites charge multiple fees for the use of different credit cards. If this is the case, mark-up rates (percent charged to use a specific credit card) should be obtained where possible to weight the different fees, otherwise an estimate could be derived by taking an average of the different fees. For example, if an airline charged a fee of 1.3 percent for the use of a credit card and 0.6 percent for the use of a debit card, and it was estimated that the take-up rates were 70 percent and 30 percent respectively, the compiler would calculate a weighted percentage fee of 1.09 percent. Alternatively, if no take-up rates are available the compiler could average the two card fees together generating 0.95 percent. This rate can then be applied to the price of the airline ticket.

11.92.

D. Housing

1. Introduction

11.93. This section first looks at the treatment of owner-occupied housing costs and then at the costs borne by tenants. The treatment of owner-occupier housing costs in the CPI depends on the agreed conceptual approach and the practical constraints relating to data availability. The treatment of rented accommodation is more straight-forward, and the costs borne by tenants are often used to impute owner-occupier housing costs.

2. Owner-occupied housing

11.94. The treatment of owner-occupied housing in CPIs is arguably one of the most difficult issues faced by CPI compilers. Depending on the proportion of the reference population that are owner-occupiers, the alternative conceptual treatments can have a significant impact on the CPI, affecting both weights and, especially in the short term, measured inflation.
11.95. Ideally, the approach chosen should align with the conceptual basis that best satisfies the main use of the CPI. However, the data requirements may be such that it is not feasible to adopt the preferred treatment. Also, the CPI may be multi-purpose and it may be difficult to ascertain the main use of the index. The dual use of CPIs as both macroeconomic indicators and for indexation purposes (as described in Chapter 2) can lead to clear tensions in designing an appropriate treatment for owner-occupier housing costs that suits all needs. In these circumstances, it may be necessary to adopt a treatment that is not entirely consistent with the approach adopted for other items in the CPI. National house market structures and practical measurement issues are also important considerations in determining which approach to apply in practice.

11.96. In a national context, the inclusion of owner-occupier housing costs will improve the representativeness and relevance of a CPI. When used in an international context, for example to measure economic convergence, the inclusion of owner-occupier housing costs should, in principle, enhance the comparability of national CPIs across countries. However, for this purpose two major concerns have been expressed. First, including owner-occupier housing costs could impact on the inflation rate and its volatility. Secondly, it could add to cross-country divergence in inflation rates and may make it more difficult for an individual country to meet inflation convergence criteria set for a block of countries, due to differences with regards to the relative importance of each country’s owner-occupier housing market and divergences in the respective movement in house prices across countries. This could be the case, for instance, if an inflation target was set by the European Central Bank for the Euro-zone, which included owner-occupier housing costs.

11.97. It can also be noted that, depending on the methodological approach used, data on owner-occupier housing costs may not be as timely as other data for the CPI and the compilation of representative owner-occupier housing costs indices might only be feasible on a quarterly basis. Both aspects will impact on the underlying statistical quality and usability of the CPI.

11.98. Once a decision has been made to include owner-occupier housing costs, all the above considerations need to be taken into account by a NSO in deciding which approach to adopt. The criteria for choosing which approach will include: alignment with user needs and the main purpose of the CPI; consistency with the rest of the CPI; alignment with international practices (although in the case of housing costs there is no single agreed methodology); public acceptance; and practicality of implementation.

The different conceptual approaches

1) The Use Approach: valuing the flow of services

11.99. The general objective of this approach is to measure the change over time in the value of the flow of shelter services consumed by owner-occupiers. Detailed approaches fall under one of two headings: user cost and rental equivalence.

11.100. The user cost approach attempts to measure the changes in the cost to owner-occupiers of using the dwelling. In the weighting base period, these costs comprise two elements: recurring actual costs, such as those for repairs and maintenance, and property taxes; and the opportunity cost of having money tied up in the dwelling rather than being used for some other purpose. At its simplest, and where houses are purchased outright, this latter
element is represented by the rate of return available on alternative assets. More usually, house purchase will be at least part financed through mortgage borrowing. In this case, the opportunity cost can be viewed as an average of interest rates on mortgages and the alternative assets, weighted by the proportion of the purchase price borrowed and paid outright, respectively.

11.101. Estimation of the base period weights for recurring actual costs such as expenditure on repairs and maintenance is generally obtainable from the HBS. However, care must be taken to distinguish between routine repairs and maintenance, which maintain a dwelling in its original condition, and alterations and additions, which represent significant functional improvements in the dwelling (such as converting an attic into a room or building an extension). Alterations and additions are outside of the user cost approach. In practice, distinguishing between major repairs and maintenance on the one hand, and alterations and additions on the other, may prove difficult when relying on information gathered from a HBS. In contrast, the construction of price measures for these items generally presents few difficulties.

11.102. Estimation of the base period weight for opportunity costs is more complicated and will require modelling. One somewhat simplistic approach is to assume that all owner-occupiers purchased their dwellings outright at the beginning of the period and sold them at the end. During the period their opportunity costs comprise the amount of interest forgone (i.e., the amount of interest they might have earned by investing this money elsewhere), transaction costs and depreciation. Offsetting these costs would be any capital gains earned on the sale of the dwellings. Construction of the required measures of price change is likewise quite complicated and, particularly for the depreciation element, a good deal of imputation is required. Allowing for house purchases part financed by mortgage borrowing, a typical formula for user cost (UC) is:

\[ UC = rM + iE + D + RC - K \]

Where \( M \) and \( E \) represent mortgage debt and equity in the home, and \( r \) and \( i \) represent mortgage interest rates and the rate of riskless return available on alternative assets, respectively. \( D \) is depreciation, \( RC \) other recurring costs and \( K \) capital gains. From an aggregate perspective, this means computing the proportion of homeowners who have a mortgage and the average size of mortgage and apply to this the mortgage rate. The other rate in the user cost formula must be a riskless nominal interest rate which is applicable to capital.

11.103. No NSO is currently using the full user cost approach. This partly reflects the conceptual and methodological complexity of the measure, which may also make it difficult to obtain widespread public understanding and support for the approach. For this reason, the methodology is not discussed in detail here. It is, however, worth noting that both the weights and the ongoing measures of price change are significantly influenced by the relative rate of change in house prices. Since the user cost formula is typically dominated by capital gains and

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7 An alternative to this approach would be to use ex ante or forecasted costs for a suitable period. Verbrugge (2008), discusses various methodologies for this in the paper The Puzzling Divergence of Rents and User Costs, 1980-2004 in the Review of Income and Wealth, Series 54, Number 4, December 2008.
interest rates, where house price inflation exceeds nominal interest rates the user cost weight is likely to be negative (implying a negative price for user cost).

11.104. In practice, it is possible to avoid some of these difficulties by adopting a variant or a narrower definition of user cost. For example, some countries have adopted a variant of the user cost approach focusing on gross mortgage interest payments and depreciation, in part, because these items are readily recognizable as key costs by home owners. The former may be viewed as the cost of retaining housing shelter today, while the depreciation element represents current expenditure that would be required to offset the deterioration and obsolescence in dwellings that would otherwise occur over time. Methodologies for calculating actual average mortgage interest payments for index households are described in the section on the payments approach to owner-occupied housing costs (paragraphs 11.129 to 11.140).

11.105. It should be noted that the use of mortgage interest payments in the user cost approach and the payments approach, as described later (paragraphs 11.129 to 11.140), may pose conceptual and practical difficulties for some users depending on the stated purpose of the CPI. For almost all items in the CPI basket an increase in price represents an increase in living costs for the target household population in aggregate. However, this is not necessarily the case for mortgage interest payments. An increase in interest rates generally benefits savers, of whom there will be many in the target population. An increase in savings interest rates will leave this section of the target population commensurately better off. For pensioners, in particular, who tend to be savers rather than borrowers, indexation of pension entitlements to a CPI that is based in part on mortgage interest charges may perplex the general public. Explaining to those financially disadvantaged when interest rates fall why mortgage interest payments are in scope of the CPI whereas savings interest is out of scope may prove difficult. A more fundamental concern, from a macroeconomic perspective, is that including mortgage interest rates in a CPI diminishes its relevance and usefulness for monetary policy purposes, as interest rates are one of the main macroeconomic levers for controlling inflation. If interest rates increase so will inflation.

11.106. A way of overcoming the issue of indexation for savers and borrowers under a user cost approach is to compile population subgroup indices alongside the official CPI. The population subgroups can be derived through income, wealth or life stages and can be weighted using HBS data. A separate index for that portion of the population receiving indexed pension entitlements can be created excluding mortgage interest charges thereby removing the payments that are not relevant for that subgroup of the population. Such disaggregated estimates can assist in the formulation of policy. More generally, it is open to countries to compile supplementary CPIs aimed at measuring the inflation experience of different segments of the population. Many would argue that if a certain subgroup of the population is to be compensated for increases in the living costs, then in principle, expenditure weights should be constructed for this subgroup accepting that this re-enforces the continuation of the current expenditure patterns of the subgroup.

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8 In general, the primary purpose of indexation of payments is to hold payment recipient’s purchasing power constant rather than eliminate the effects of financial shocks on payments.

9 The HBS provides data about household characteristics such as income and number of members. This is useful for ensuring that the expenditure correspond to those of the CPI reference population and can also be used for
Depreciation is a gradual process and so is best represented by the amount that needs to be put aside year by year as opposed to actual expenditure (which will typically be large but infrequent). The base period weight for depreciation may be estimated from the current market value of the owner-occupied housing stock excluding land values, multiplied by an average rate of depreciation. The latter may be derived from national accounts estimates of housing capital consumption. Imputed this way, the appropriate price indicator should ideally be an index of house prices, excluding land, rather than an index of the costs of renovation work. Discussions on how this could be achieved are included below (see acquisitions approach).

The rental equivalence approach attempts to measure the change in the price of the housing service consumed by owner-occupiers by estimating the market value of those services. In other words, it is based on estimating how much owner-occupiers would have to pay to rent their dwelling. Under this approach, it would be inappropriate to also include those input costs normally borne by landlords such as dwelling insurance, major repair and maintenance, and property taxes, as this would involve an element of double counting. The rental equivalence approach is recommended in the 2008 SNA for measuring housing services to be included in the household final consumption expenditure estimates and is also used in constructing international comparisons of living standards. The price indicator for imputed rents can be sourced from either a readily available price series for rents, weighted to reflect the current composition of the stock of owner-occupier housing, which can then be applied to the rental equivalents in the base period, or from acquiring on a regular basis from an expert, the current equivalent rents for a sample of houses with different characteristics which are representative of the owner-occupier housing stock10.

The rental equivalence approach is considered as a viable option for many developing countries but there is, of course, a requirement to have a transparent rental market and reliable information on rents by type of accommodation, location and other rent-determining factors. A number of countries use this approach for conceptual and practical reasons. This is because newly constructed dwellings (sometimes self-builds) on family owned land, or older dwellings, that have been significantly upgraded, make up a significant proportion of the housing stock. Differences in quality between newly constructed dwellings can be significant and housing mobility may be low resulting in limited markets for the rental or sale of dwellings. The above can be further complicated by a lack of formal transfers of ownership or of transparent property rights. The lack of this information, normally readily available in more developed countries, makes the rental equivalence approach a practical option for incorporating owner-occupier housing costs in a CPI for developing countries. Some developed countries also use this approach in their national CPIs, for instance if their purpose is to compile a cost-of-living index or their aim is to be in alignment with national accounts.

10 The use of a private sector data source should be done with care as the methodology employed by the private entity could be less superior and potentially predisposed to bias than one produced by an independent authority.
11.110. Deriving the weight for rental equivalence requires estimating how much owner-occupiers would have paid in the weighting base period to rent their dwellings. This is not something that owner-occupiers can normally be expected to estimate reliably in a HBS. In principle, however, it can be estimated by matching the dwellings of owner-occupiers with comparable dwellings that are being rented and applying those rents to the owner-occupied dwellings.

11.111. In practice, this raises a number of problems, particularly in countries where the overall size of the private rental market is small or if rented housing is of a different type from owner-occupied housing in terms of general quality, age, size and location. Direct imputation from actual rents may also be inappropriate if the rental market is subject to price control\textsuperscript{11}.

11.112. In those countries where the reference population for the CPI corresponds to all resident households, estimation problems can be comparable to those faced by the national accountants. In this instance a collaborative approach to dealing with issues such as sample sizes, lower level weights and specific market variations could be beneficial. The corresponding price series for the rents of owner-occupiers can be derived from an actual rent index, except where such rents are subject to price control. Depending on both the relative significance of owner-occupiers to renters and the composition of the two markets in terms of dwelling characteristics, any existing rent surveys may need to be modified to meet the requirements of an owners’ equivalent rent series. If the total value of owners’ equivalent rent is significantly larger than actual rents, the absolute size of the existing price sample may be deemed insufficient. If the characteristics of owner-occupied dwellings differ significantly from the overall rental market, the existing rent survey may also require stratifying more finely (e.g., by type and size of dwelling, and by location) if the sample size is large enough to do so. The price measures for the different strata can then be given different weights when calculating the actual rents and the owners’ equivalent rent series.

11.113. While it may be acceptable to include subsidized and controlled prices in the actual rent series, these should not be used in calculating the owners’ equivalent rent series. Given the increased significance of rent prices in the overall index, it may also be necessary to pay greater attention to the measurement of price change for individual properties when tenancies change. As a change in tenancy often presents landlords with an opportunity to refurbish properties and to increase rents regardless of any refurbishment, the practice of regarding the whole of any such price changes as arising from quality change should be avoided. For these reasons, a stock-based index is most appropriate under the user cost/service-flow approach. A flow-based rental index compiled from new rental agreements may behave quite differently to a stock-based rental index. A stock-based rental index is generally more stable and as such is more representative of the owner-occupier sector which, by definition, enjoys security of tenure. Furthermore, the rent series may need to be quality-adjusted to take account of ongoing depreciation to housing structures – depending on the treatment in the CPI of owner-occupiers’ repair and maintenance costs.

\textsuperscript{11} In addition, it is also argued that owner-occupiers may be considered to derive significant additional utility from features such as security of tenure and the ability to modify the dwelling, implying a need to make additional adjustments to the initial imputations.
11.114. Whilst the rental equivalence approach has the advantage of relative simplicity, requiring nothing more than a suitable rental price index and appropriate weights, it is a method based on notional or imputed prices rather than actual transaction prices. This could be viewed both as a significant conceptual departure from how other items are treated in a CPI and as an over-reliance on imputed rather than actual prices.

11.115. Double-counting can also be an issue. Where expenditure on repairs, maintenance, local property taxes, water charges etc. are included in rents, these costs should not be included elsewhere in the index. It is also important that HBSs determine if the renter household receives any additional services, such as electricity or use of facilities outside the housing unit, such as off-street parking. It is also important to learn if the household must pay any additional costs, such as taxes, that the owner of the dwelling does not pay. The value of any supplementary items provided, and the cost of any items borne by the tenant should be allocated to their proper CPI category. For example, the dwelling may have water supplied at cost by the landlord: in this case, CPIs may either leave landlord-supplied water in the rent or move an estimated value for it from the rent index to an index for water, but this must be done consistently in the weights and the rent survey. Leaving supplementary items in the rent avoids the need to adjust the weight but leaves the potential problem that if the landlord ceases to provide them, the CPI compiler will need to adjust the values of the rents collected in the rent survey.

2) The Payments Approach

11.116. The item domain for a payments index is defined by reference to actual outlays made by households to gain access to consumer goods and services. Thus, the payments approach covers the expenditure actually incurred, in occupying a dwelling. The set of outlays specific to owner-occupiers in the weighting base period includes:

- down payments or deposits on newly purchased dwellings;
- legal and real estate agency fees payable on property transfers;
- repayments of mortgage principal;
- mortgage interest payments;
- alterations and additions to the dwelling;
- insurance of the dwelling;
- repair and maintenance of the dwelling;
- property rates and taxes.

11.117. While it is conceivable to include all these items in the index, it is generally agreed that at least some represent capital transactions that ought to be excluded from a CPI. For example, while down payments and repayments of the mortgage principal result in a running down of household cash reserves, they also result in the creation of a real asset (at least part of a dwelling) or in the reduction of a liability (the amount of mortgage debt outstanding). Similarly, any cash expenditure on alterations and additions result in a running down of cash reserves offset by increases in dwelling values. In other words, those transactions which result in no net change to household balance sheets should be excluded.
11.118. The remaining items can be regarded as current expenditure which do not result in any offsetting adjustments to household balance sheets. It is therefore considered appropriate that these items be included in a payments-based CPI. By defining a payments index in this way, the aggregate payments equal a household’s source of funds. The latter comprises income after tax (wages, transfers, property income, insurance claims, etc.) and net savings (as a balancing item). It is for this reason that a payments-based CPI is commonly considered to be the best construct for assessing changes in net money incomes over time.

11.119. It is sometimes argued that the payments approach is more consistent with the traditional approach to CPI construction, which is a carry-over from a time when the CPI was mostly used as a compensation tool. It also has much to commend it from the point of view of public acceptability. It measures costs directly, thereby avoiding imputation. In addition, “mortgage interest” is more likely to be understood than “rental equivalence” and, unlike the latter, the index will reflect changes in house prices and interest rates. But there are also disadvantages to using this approach. The items of direct expenditure by purchasers of property include: mortgage interest payments; repayment of capital; large repairs (associated with depreciation from wear and tear as properties get older). A CPI should only relate to consumption items and should exclude cash disbursements or expenditure, which is in the nature of a saving or “investment” and the acquisition of a house will normally over a period of time represent a substantial capital asset – a point which emerges when comparing the position of owner-occupiers with tenants who rent. It can therefore be argued that the capital element of mortgage repayments should be regarded as an investment or saving rather than consumption expenditure and should therefore be excluded from the index. The question arises over whether the weight and price indicator should be net of any tax allowances for mortgage interest payments. It is recommended that, in accordance with the principle that a CPI should be based on the amounts actually paid, the weight and price indicator should both be based on payments after tax relief. Perhaps the biggest barrier to the adoption of this method is that it requires a large volume of data, which may or may not be available to the compiler. Mortgage interest payments will be affected by changes in both interest rates and house prices in different ways. Changes in interest rates will affect all of those buying a house apart from those on fixed-interest loans, while changes in house prices will affect only those buying a house in the current period. Thus, a price indicator consisting of the current interest applied to a standard-sized mortgage to a standard-sized house would not be appropriate. An appropriate indicator involves two components - the rate of interest and the average amount of mortgage debt outstanding. To calculate the average outstanding debt at any one point in time can be problematic as it consists of a large number of individual debts, some from mortgages taken out recently and others from mortgages taken out some time ago at historic prices and with some of the debt paid back. It is unlikely that not all countries, and many developing countries, will have the necessary data to apply this method. Returning to more fundamental issues, some argue that the problem with this approach is that it includes a major (explicit) cost of owning a home, namely mortgage interest, but it does not include a major offsetting (implicit or imputed) benefit, namely possible price appreciation or capital gains on the home. This neglect of this benefit is particularly troublesome when there is moderate or high inflation in the economy: the observed mortgage interest cost can increase compared with other costs and give a very misleading picture of the homeowner’s true long run costs of living in the home (because the offsetting benefit is neglected). But the counter-argument is that the capital gains of owning a house which appreciates in value is of limited relevance when people have to bear such costs from current
income and the value of the underlying asset can only be materialized if the home is sold and the proceeds are not used to purchase another property for own occupation. This is, perhaps, a case where the measurement approach which is adopted will vary depending on the use and purpose of the CPI.

11.120. Estimation of gross expenditure on these items in the weighting base period is readily achievable using HBS data, as the items are generally reportable by households. The construction of price indices for real estate agency fees and insurance is discussed later in this chapter under the section on financial services. Indices for repair and maintenance, and property rates and taxes, are not considered particularly problematic so are not discussed here. The remainder of this section is therefore devoted to the construction of price measures for mortgage interest charges.

11.121. The construction of price indices for mortgage interest charges is not altogether straightforward. The degree of complexity will vary from country to country depending on the operation of domestic financial markets and the existence (or otherwise) of any income tax provisions applying to mortgage interest payments. What follows therefore is a description of an overall objective for producing the required index in the most straightforward of cases. The methodology will require modifying to account for additional complexities that may be encountered in some countries.

11.122. The general approach may be summarized, briefly, as follows. Under a fixed basket approach, the objective of the index is to measure the change over time in the interest that would be payable on a set of mortgages equivalent to those existing in the weighting base period. This base stock of mortgages will, of course, vary widely in age, from those taken up in the base period itself to those taken up many years previously. In compiling a fixed base index, the distribution of mortgages by age is required to be held constant.

11.123. The amount of interest payable on a mortgage is determined by applying some rate of interest, expressed as a percentage, to the monetary value of debt. Changes in mortgage interest charges over time therefore can, in principle, be measured by periodically collecting information on a representative selection of mortgage interest rates, using these to derive an average interest rate, and then applying this to an appropriate debt figure. At least for standard variable rate mortgages, interest due on the revalued stock of base period mortgages may be derived simply with reference to current mortgage interest rates.

11.124. The main problem then is in determining the appropriate debt figure in each of the comparison periods. Since the real value of any monetary amount of debt varies over time according to changes in the purchasing power of money, it is not appropriate to use the actual base period monetary value of debt in calculations for subsequent periods. Rather, it is necessary first to update that monetary value in each comparison period so that it remains constant in real terms (i.e., so that the quantities underpinning the base period amount are held constant).

11.125. To do this, it is necessary to form at least a theoretical view of the quantities underpinning the amount of debt in the base period. The amount of mortgage debt outstanding for a single household in the base period depends on the original house purchase price and loan-to-value ratio, and on the rate of repayment of principal since the house was purchased. An equivalent value of debt can be calculated in subsequent comparison periods by holding constant the age of the debt, the original value of the debt (as some fixed proportion of the total
value of the dwelling when the mortgage was initially entered into) and the rate of repayment of
the principal (as some proportion of the original debt), and applying these factors to house
prices for periods corresponding to the age of the debt.

11.126. To illustrate the above, suppose a base period household purchased a dwelling
five years earlier for $100,000 and financed 50 percent by mortgage. If, between the time of
purchase and the base period, the household repaid 20 percent of this debt, then the outstanding
debt on which base period interest charges were calculated would have been $40,000.
Considering a subsequent comparison period and supposing that it is known that house prices
doubled between the period when the household originally purchased and the period five years
prior to the comparison period, then the equivalent amount of outstanding debt in the
comparison period would be calculated by first taking 50 percent of the revalued house price
(of $200,000) to give $100,000, and then reducing this by the principal repayment rate (of 20
percent) to give $80,000.

11.127. Under these assumptions, it is clear that the comparison period value of
outstanding debt may be estimated directly from the base period value of outstanding debt
solely on the basis of house price movements between five years prior to the base period and
five years prior to the comparison period. In other words, while preservation of original
debt/equity ratios and rates of repayment of principal help in understanding the approach,
estimates of these variables are not strictly required to calculate the required comparison period
debt. All that is required is the value of the outstanding debt in the base period, the age of that
debt and a suitable measure of changes in dwelling prices.

11.128. Supposing that all mortgages are of the variable rate type, and that average
nominal interest rates rose from 5 percent in the base period to 7.5 percent in the comparison
period, interest payments in the two periods can be calculated as $2,000 and $6,000
respectively, and so the mortgage interest payments index for the comparison period is 300.0.
An identical result may of course be found directly from index number series for debt and
nominal interest rates. The mortgage interest charges index equals the debt index multiplied by
the nominal interest rate index divided by 100. In this example, the debt index equals 200.0
and the nominal interest rate index equals 150.0. Therefore, the mortgage interest rate index
equals (200.0 \times 150.0)/100 or 300.0. This simple example also serves to illustrate the very
important point that percentages (interest rates, taxes, etc.) are not prices and cannot be used as
if they were. Percentages must be applied to some monetary value to determine a monetary
price.

11.129. While the single-household example shown above is useful in explaining the
basic concepts, it is necessary to devise a methodology that can be employed to calculate a
mortgage interest charges index for the overall reference population. The main complication
when moving from the single-household to the many-household case is the fact that the age of
the debt will vary across households. Given the importance of re-valuing base period debt to
maintain a constant age, this is no trivial matter. While it is conceivable that information on the
age of mortgage debt could be collected in HBSs, the additional respondent burden and the
generally small number of households reporting mortgages often serve to make estimates from
this source unreliable. Another option is to approach a sample of providers of mortgages
(banks, building societies, etc.) for an age profile of their current mortgage portfolio. This type
of data is normally available from financial institutions and is generally reliable.
11.130. To calculate final mortgage interest charges, a nominal mortgage interest rate index series is applied to the aggregate level of outstanding debt. A nominal mortgage interest rate index number series is obtained by calculating average quarterly interest rates on variable rate mortgages from a sample of lending institutions (starting in period Y0 Q1) and presenting them in index number form. The nominal interest rate series can then be combined with the debt series to calculate the final mortgage interest rate charges series, as illustrated in Table 11.3.

Table 11.3 calculation of a mortgage interest charges series

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Debt index</th>
<th>Nominal interest rates index</th>
<th>Mortgage interest charges index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y0</td>
<td>Q1</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>100.7</td>
<td>98.5</td>
<td>99.2</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>101.4</td>
<td>100.8</td>
<td>102.2</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>101.9</td>
<td>101.5</td>
<td>103.4</td>
</tr>
</tbody>
</table>

11.131. The construction of equivalent indices for fixed interest mortgages is more complicated in so far as an interest charges index needs to be calculated separately for each age cohort of debt to reflect the fact that interest payable today, on a loan four years old, depends on the interest rate prevailing four years ago. This requires the compilation of a nominal fixed interest rate index extending back as far as the dwelling price series. To the extent that the interest rates charged on fixed interest loans also depend on the duration of the loan, calculation of the nominal fixed interest rate series is also more complex. The additional complexity of these indices may make the construction of a mortgage interest charges index impractical for countries where fixed interest rate mortgages predominate.

11.132. The construction of the index for mortgage interest payments is predicated on the assumption that the purpose of the mortgage is to finance the purchase of the dwelling (hence revaluation of debt by changes in dwelling prices). However, it is increasingly common, particularly in developed countries, for households to draw down on the equity they have in their home. That is, households may take new or additional mortgages, or redraw part of the principal already paid to finance other activities, for example to purchase a large consumer durable such as a car or a boat, to go on holiday or even to purchase stocks and bonds. If these alternative uses of the funds made available by way of mortgages are significant, it may be appropriate to regard at least some proportion of mortgage interest charges as the cost of a general financial service rather than a housing cost. For that proportion of the debt deemed to be used for other purposes, it would be more appropriate to use a general index of price inflation for debt revaluation purposes.

11.133. Despite being a relatively straightforward method of representing owner-occupier costs, the payments approach is open to conceptual challenge. As discussed in the user cost approach, including mortgage interest payments could be problematic for monetary
policy purposes. However, another issue is that if both house prices and mortgage interest rates remain unchanged for a period, the mortgage interest charges index does not usually remain unchanged for the same period. This is because the mortgage debt index will continue to change, as changing house prices prior to the stable period continue to work their way through the various debt age cohorts. Conceptually, this may prove unsatisfactory to many users, whom generally expect CPIs to reflect current interest rate movements only.

3) The Acquisitions Approach

11.134. The item domain for an acquisitions index is defined as all those consumer goods and services acquired by households for own consumption. Those countries which compile their CPIs on an acquisitions basis have generally concluded that the principal purpose of their CPI is to provide a measure of price inflation for the whole of the household sector. Based on the view that price inflation is a phenomenon peculiar to the operation of markets, the domain is also normally restricted to those consumer goods and services acquired in monetary transactions. Consumer goods and services provided at no cost to households by governments and non-profit institutions serving households are excluded (as discussed in Chapter 2).

11.135. The expenditure of owner-occupiers that could be included in an acquisitions index are:

- net purchases of dwellings (i.e., purchases less sales by the reference population);
- direct construction of new dwellings;
- alterations and additions to existing dwellings;
- legal and real estate agency fees payable on property transfers;
- repair and maintenance of dwellings;
- insurance of dwellings;
- property rates and taxes.

11.136. As already mentioned, the construction of price indices for real estate agency fees and insurance is discussed later in this chapter under the section on financial services. Indices for repair and maintenance, and property rates and taxes are not considered particularly problematic so are not discussed here. The section “Practical options for measuring owner-occupied housing under an acquisitions approach” (paragraphs 11.157 to 11.161), that follows this one, is therefore devoted to a discussion of the issues involved in constructing measures for dwelling purchase, construction, and alterations and additions. The advantages of the acquisitions approach compared to the user cost and payments approaches are also discussed at the end of this section (paragraphs 11.160 and 11.161).

11.137. As CPIs are constructed to measure price change for a group of households in aggregate (the reference or target population), the index should not include any transactions that take place between those households. In the case of an index covering all private households, the weight should only reflect net additions to the household sector owner-occupied housing stock. In practice, net additions will mainly comprise those dwellings purchased from businesses (newly constructed dwellings, company houses, or rental dwellings) and those purchased from or transferred from the government sector plus any purchases, for
owner-occupation, of rental dwellings from reference population households. If the CPI is constructed for some subgroup of the population (e.g., wage and salary earners), the weight should also include purchases from other household types.

**Figure 11.1. The Acquisitions Approach for owner-occupied housing**

![Diagram](image)

11.138. The acquisition approach can be represented by Figure 11.1 above. The circle on the left represents the existing owner-occupied dwelling stock. The circle on the right represents all other existing dwelling stock (rented dwellings and vacant dwellings). The rectangle on top represents newly constructed dwellings. The rectangle on the bottom represents self-builds. The flows of properties from one sector to another are represented by arrows. There are also internal flows within the existing owner-occupier dwelling stock (as one owner-occupier buys an existing dwelling from another) and within the other existing dwelling stock.

11.139. In consumer price indices, a normal procedure is to account expenditure that are used in weighting in ‘net’ terms. For most products, the reference population makes purchases, not sales; however, for some product groups sales are significant. This happens, of course, with the purchase of dwellings, where it would be necessary to net out the sales from the purchases. These same principles apply to all second-hand goods.

11.140. According to the net acquisition approach, sales of dwellings between households have a negative weight and purchases have a positive weight. Any sale/purchase between households has no impact unless an intermediary, such as an estate agent is involved in which case the estate agents’ fees add to household final consumption expenditure. Thus, it is the net acquisition cost which is followed. Under the net acquisitions approach, only four flows are considered, depicted by A, B, C and D in Figure 11.1. A is the flow of new dwellings to the owner-occupier sector (the expenditure owner-occupiers make on new dwellings). B is the flow of self-builds to the owner-occupier sector (by definition, self-builds must flow to this sector only). C is the flow of existing dwelling stock to the owner-occupier sector. And D is the counter-flow of existing dwellings from the owner-occupier sector to the non-occupier sector. Under the net acquisitions approach, the net expenditure by owner-occupiers on
dwelling acquisitions is given by the following (note that this refers to the dwelling purchase component only, and other costs, such as major renovations and transfer costs, are not included):

\[ \text{Acquisition} = A + B + C - D \]

11.141. In many countries, the flows C and D will be similar and will largely cancel each other out. Thus, the owner-occupied housing net acquisition weight will largely be determined by A and B, the purchase of new dwellings and self-builds. In exceptional circumstances, for example after a particularly severe down-turn in the property cycle, it may be that the rate of owner-occupier acquisition of new and existing dwellings becomes very low. If there is a net flow of existing dwellings from the owner-occupier sector to the non-occupier sector (i.e., if \( D > C \)), then the owner-occupied housing net acquisition weight may fall to zero (negative weights are not permissible). Conversely, if there is a construction boom, A and/or B may grow very large. Property boom and bust cycles will therefore have considerable effect on the owner-occupied housing weight under the net acquisitions approach, with implications for the stability of the CPI.

11.142. In the national accounts, all housing is recorded as gross fixed capital formation, which would exclude purchases of dwellings from household final consumption expenditure. While this is unambiguously the case for housing purchased for rental, the case is less cut when it comes to owner-occupied housing. Housing represents both an asset and shelter. The challenge for compilers. Although households recognize the likelihood of making capital gains when they purchase housing and invariably regard their dwelling as an asset, they also commonly cite the primary motivation for the purchase of a dwelling as being to gain access to a service (i.e., shelter and security of tenure). From the households’ perspective, therefore, the costs borne by owner-occupiers in respect of their principal dwelling represent a mix of investment and consumption expenditure, and the total exclusion of these costs from an acquisitions-based CPI would be seen as counter-intuitive and could lead to criticism by the population at large. This is particularly so in those countries where the rental sector is relatively small, with limited opportunities for substitution between owner-occupation and renting. In these circumstances it might be argued that the consumption element dominates.

11.143. The problem confronting CPI compilers is how to separate these two elements so as to include only the consumption of housing services in the CPI. Although there is no single agreed technique, one approach is to regard the cost of the land as representing the investment element and the cost of the structure as representing the consumption element. The rationale for this is that, while the structure may deteriorate over time and hence be “consumed”, the land generally remains at constant quality. As the land (or location element) accounts for most of the variation in observable prices for otherwise identical dwellings sold at the same point in time, the exclusion of land values may also be seen as an attempt to exclude asset price inflation from the CPI, although measures of asset price inflation are, of course, useful in their own right. The conceptual simplicity of this approach recommends it to many CPI compilers, including EU NSOs which follow this method for compiling owner-occupier house price indices.

11.144. Derivation of weighting base period expenditure on the net acquisition of dwellings (excluding land), the construction of new dwellings, and alterations and additions to existing dwellings pose some problems. Although HBSs may yield reliable estimates of the
amount’s households spend on alterations and additions, and construction of dwellings, it is unlikely that they will provide reliable estimates of net expenditure on existing dwellings exclusive of the value of the land.

11.145. An alternative approach is to combine data from censuses of population and housing and building activity surveys. Population censuses normally collect information on housing tenure, from which average annual growth in the number of owner-occupier households represents a good proxy for net additions to the housing stock. Building activity surveys are also conducted in most countries, providing data on the total value of dwellings constructed. These data can be used to estimate the average value of new dwellings, which can then be applied to the estimated volumes derived from the population census. Of course, the suitability of this approach would need to be assessed by each country and may be complicated if the CPI relates only to some sub-set of the total population, for example, by excluding the very rich who will purchase expensive homes.

11.146. The price index is required to measure the change in price over time in existing dwelling structures, newly constructed dwellings and alterations and additions. As the appropriate price for existing dwelling structures is current replacement cost, an index measuring changes in prices of newly constructed dwellings is also appropriate for this purpose. Given that the prices for both newly constructed dwellings, and alterations and additions are, in principle, determined by costs of building materials, labor costs and builders’ profits, it may also be satisfactory to construct a single price sample for all elements. The requirement for a separate price sample for alterations and additions will depend on the relative significance of this activity and whether the material and labor components differ significantly from those for a complete dwelling (e.g., if alterations and additions are predominantly to kitchens and bathrooms). In all cases, it is important that the price indices are mix-adjusted to eliminate price variations that reflect changes in the characteristics of newly constructed dwellings.

11.147. The type of dwelling constructed in each country will significantly influence the complexity and cost of constructing appropriate price measures. If each newly constructed dwelling is essentially unique (i.e., individually designed to meet site or other requirements) it will be necessary to adopt “model pricing”. This requires the selection of a sample of building firms, the identification of samples of recently constructed dwellings and the collection of prices for constructing identical dwellings in subsequent periods (exclusive of site preparation costs, which will vary from site to site). This approach is likely to entail significant costs for the respondents. Moreover, care needs to be taken to ensure that the supplied prices truly reflect all prevailing market conditions. That is, prices need to reflect the amount builders could realistically expect to be able to charge in the current market rather than the prices they would like to be able to charge based on conditions prevailing in some prior period.

11.148. It should be noted that in many countries, purchasing a new or existing dwelling can have tax implications. The transaction may be liable for ‘stamp duty’ also known as ‘taxes on transfers’ or a related registration fee. In this case, the national tax authorities may be able to provide comprehensive information on both the number and the value of new and existing dwelling purchases. If detailed dwelling characteristic information is available, including the exact location, the floor area of the dwelling and the plot size of the land, it may be possible to decompose each individual dwelling price into implicit structure and land prices, using hedonic
methods (described in Chapter 6), to arrive at aggregate owner-occupier expenditure on new and, where relevant, existing dwellings that exclude land price. If this level of detailed information is not available in the transaction data, it may still prove possible to estimate the aggregate expenditure on dwellings (excluding land) from combining the transaction numbers with standardized building costs (typically building costs per square meter) that may be available from construction representative bodies, chartered surveyors, building insurers or other third parties.

11.149. Whilst having price indices for new dwellings, exclusive of the land cost, is ideal under the net acquisition approach, in practice this is not always possible. Sufficient information to compile satisfactory dwelling construction price indices is not always available. In this situation, house price indices that include the land component may be a necessary compromise.

**Practical options for measuring owner-occupied housing under an acquisitions approach**

11.150. In some countries, a significant proportion of newly constructed dwellings are of the type referred to as “project homes”. These are homes, that builders construct on a regular basis from a suite of standard designs maintained for this purpose. This practice is most feasible in countries where a significant proportion of new dwelling construction takes place in new developments (i.e., land recently developed or re-developed specifically for residential housing). Where project home construction is significant in scale, then it is possible to select a sample of these project homes for pricing over time, safe in the knowledge that the prices provided will be actual transaction prices (in this case priced net of any site preparation costs to ensure the fixed-basket approach is adhered to). Even if project homes do not account for the majority of new dwellings constructed, they may still provide a representative measure of overall price change.

11.151. In pricing project homes, it is necessary to monitor the selected sample to ensure that the selected plans remain representative and to detect changes in quality arising from modifications in design and changes to basic inclusions. Whenever a change is made to the plans, the change in overall quality needs to be estimated. For physically measurable characteristics, such as a small increase in the overall size of the dwelling, it may be assumed that the change in quality is proportional to the change in the relevant quantity. Other changes, such as the addition of insulation, inclusion of a free driveway and so on, will need to be valued, preferably in terms of the current value to the consumer. These could be estimated by obtaining information on the amounts that consumers would have to pay if they were to have the items provided separately (the option cost method). An alternative is to ask the builder if a cash rebate is available in lieu of the additional features. Where plans are modified to meet changed legal requirements, the consumer has no choice in purchase and it may be acceptable to classify the full change in price as pure price movement (even though there may be some discernible change in quality).

11.152. In some countries, attached and semi-detached dwellings such as apartments, flats and townhouses, make up a significant component of additions to dwelling stock and the price index needs to be mix-adjusted to adhere to the principle of a fixed basket. As mentioned previously, measuring owner-occupied housing excluding land and/or to constant quality can be a challenge and a matched model approach may not be possible due to the heterogeneous nature of the buildings being constructed. In these instances, the component cost approach or
hedonic models may be viable alternatives depending on the type and amount of data available. A component costs approach is most commonly used in Producer Price Indices (PPI) and entails the aggregation of a basket of representative items used to construct the type of dwelling being measured. The assumption with this measure is that price change is predominately influenced by changes in the price or cost of goods and or services used to construct the dwelling. Depending on the state of the owner-occupied housing market, this may not always be representative of consumer final prices and adjustments in the index compilation method may need to occur, for example for changes in profit margins. If undertaking a component cost approach, it is important to ensure the selected components continue to reflect current building standards, materials and estimates for both builder and developer profit margins are considered.

11.153. To conclude the discussion on the treatment of owner-occupied housing it is worth stating again that there is no single agreed approach which is internationally recommended or applied. Rather, there are four distinct approaches that have gained recognition, each with its own conceptual basis. These four approaches are summarized in Table 11.2 below. The precise approach to adopt in any given country depends very much on the primary purpose of the CPI and on practical issues such as data availability. Ideally, if circumstances permit, more than one approach can be applied.

11.154. In general terms, the most prevalent owner-occupied housing approaches tend to be the rental equivalence approach and the net acquisitions approach. The former is relatively straightforward to apply where there is a suitable rental market. The latter, although more complex, is consistent with the treatment of most other goods and services in the CPI and is not directly affected by methods of financing for house purchases.

Table 11.4 Relationship between the choice of owner-occupied housing (OOH) approach and CPI purposes

<table>
<thead>
<tr>
<th>Approaches to OOH</th>
<th>Primary purpose of CPI</th>
<th>OOH Price Definition</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User cost</strong></td>
<td>Measures the change through time of the total value of all goods and services that are actually consumed by households.</td>
<td>Opportunity cost associated with the use of a dwelling by a household for own occupancy.</td>
<td>Approach consistent with a cost of living index (COLI). Uses imputed prices/ rental equivalence. Can be difficult to implement in practice.</td>
</tr>
<tr>
<td><strong>Rental Equivalence</strong></td>
<td>Measures the change through time of the total value of all goods and services that are actually consumed by households.</td>
<td>Implicit cost that owner-occupier households would have to pay to rent their dwelling.</td>
<td>Approach more aligned with a COLI. Approach is recommended in 2008 SNA. Uses imputed prices. Requires a suitable private rental index.</td>
</tr>
<tr>
<td><strong>Payments</strong></td>
<td>Measures the change through time of the total payments for all goods and services by households.</td>
<td>Cash outlays associated with owner-occupied dwellings.</td>
<td>More appropriate for the evaluation of money income. Consistent with a COLI. No imputed prices.</td>
</tr>
</tbody>
</table>
### Measures of Acquisition

| (Net) Acquisition | Measures the change through time of the total monetary expenditure by households for acquiring and goods and services for consumption. | Acquisition and maintenance cost of a dwelling, usually on a net to the sector basis. | Approach more suitable for measuring monetary inflation. Consistent with treatment of other CPI items. No imputed prices. Prone to volatility in the housing market. |

#### 3. Rented accommodation

11.155. Unlike owner-occupiers, renters buy shelter from others who own the dwellings that the renters occupy. Consequently, there is a market transaction to observe and the cost of rented accommodation is, in principle, relatively easy to observe in the market.

#### Weights

11.156. Obtaining the weight for renter-occupied housing in the CPI basket is relatively straightforward. HBSs typically collect data from households at their place of residence. The surveys obtain the rents from those residences that are renter-occupied, and the NSOs estimate the annual expenditure on rents using standard methods. The HBS should also inquire whether the household rents other housing in addition to its main residence, perhaps near to a job or in a holiday location.

11.157. It is important that the HBS determines if any additional services are included in the rent. This is to ensure that no double-counting takes place and that a consistent approach is taken on where the expenditure is accounted for in the CPI.

#### Prices – rent surveys

11.158. The rent to be recorded is the amount that the household pays, including taxes and excluding subsidies. If the rent is subsidized or taxed, the amount the household pays will not be the same as what the landlord receives so, although information on rents may be collected from any knowledgeable respondent, as one of the dwelling’s occupants, its landlord or the landlord’s representative, obtaining rent information from the latter two can be problematic for a CPI. To respect the “fixed basket” principle of the CPI, an effort should be made to continue collecting prices from the same dwelling units over time. Despite the perceived difficulties, a longitudinal survey of rental units will often be the best solution to ensure that the proper rents are collected.

11.159. Alternatively, it may be possible to collect rents from an existing continuous household survey, such as a labor force survey. In this case, a specific rent-based auxiliary questionnaire can be distributed to those tenants who participate in the main survey. Clearly, the respondent should be knowledgeable. For example, some occupants may not be the ones who actually pay the rent and may be quite unsuitable as respondents. The important feature of any such survey is that it provides rents at multiple time intervals but, because people may move, it will not necessarily follow the rents of a fixed basket of housing units. In these circumstances, the rent data should be stratified by rent-determining characteristics, so that the average rent increase for a house with pre-assigned characteristics or for a “fixed basket” of house types can be determined.

---

12 With longitudinal studies, the same units are observed at regular intervals over long periods of time.
11.160. If rents change rather infrequently, it may be more efficient to use a relatively large sample that is divided into representative subsamples to collect less frequently than every month from each household. The CPI requires monthly data on rent. Given the nature of rental contracts and the reality that rent does not change every month, the panel survey approach satisfies the monthly data needs of the CPI and minimizes respondent burden.

11.161. Where a survey of rental dwellings is undertaken, a sample can be drawn from any frame that contains the residential units of an area. This may be the census of population (if it has a shelter component), postal lists, or street directories.

11.162. If the population census can provide information on the average rent or dwelling value by geographic area, sampling of the areas by probability proportional to rent/value will increase the final sample’s representativeness. Where a sampling frame is not readily available, a grid can be placed on a map of the area and a sample of cells in the grid can be selected. The grid method can also be used as a second stage of sampling after selecting larger areas using available information on rents or values. Several countries, including developing countries, have used satellite images of the selected areas to obtain an accurate view of the housing in the cells or target areas. Ideally, all the dwellings in the selected cells should be enumerated and from this a random sample selected for the data collector to visit to determine if they are tenant-occupied and, if so, to obtain their rents and initiate them into the sample. The initial selection of target areas for enumeration should be small enough to be manageable and relatively homogeneous and large enough to allow for a big enough initial sample selection to allow for non-response and the fact that some dwellings will be owner-occupied. Where an enumeration exercise is not possible, for example because of the cost, judgmental or purposive sampling may be used but, in this case, it is particularly important that the individual cells on the grid are relatively homogeneous, (i.e., that there is little variation in the type, size and quality of the dwellings), to minimize the potential for drawing an unrepresentative sample.

**Calculating the rent index when data collection is less frequent than monthly**

11.163. As previously mentioned, spreading price observations by pricing the rent for a particular dwelling less frequently than monthly (i.e., pricing a sub-sample of rents each month) is a strategy used for increasing the sample without necessarily having to allocate more resources to the collection exercise. Ideally, a panel survey is used to collect rent on a monthly a basis. Many countries divide the sample into six panels and collect rent from each household twice each year. Another option may be to divide the sample into twelve representative panels and collect rent prices from each household one time each year.

11.164. Where rent changes are not obtained monthly for the full sample of dwellings, the monthly rent index from months $t$ to $t-1$, $\Delta_{Rent}^{t-1\rightarrow t}$, can be derived from a sub-sample of rental units for that month. To obtain the full estimates of rent change over longer periods, the values from the different monthly sub-samples are chained together in succession.

11.165. To calculate the monthly rent index with a sub-sample of units, $\Delta_{Rent}^{t-1\rightarrow t}$, the same set of rental units is priced at intervals $m$ months apart. The monthly change obtained at time $t$ is the $m^{th}$ root of the sum of the weighted sample rents in period $t$ to the sum for the same dwellings in period $t-m$:
\[
\Delta_{Rent}^{t-1\rightarrow t} = \frac{\sum_i \left[ W_i \times r_i^t \right]}{\sum_i \left[ W_i \times r_i^{t-m} \right]}
\]

Where:
- \(\Delta_{Rent}^{t-1\rightarrow t}\): change in rents from period \(t-1\) to period \(t\)
- \(r_i^t\): the rent of sample dwelling \(i\) in period \(t\)
- \(r_i^{t-m}\): the rent of sample dwelling \(i\) in period \(t-m\), (the last time a rent for that dwelling was collected)
- \(W_i\): the optional weight of sample rented dwelling \(i\)

11.166. It can be noted that sample weights may be ignored for simplicity if the sampled rental dwellings represent roughly the same number of rental dwellings in the sampling frame. Equivalently, one can set the weights in the formula to “1” in most cases, and this will provide a mechanism to handle non-response and sampling anomalies appropriately.

11.167. Geometric rather than arithmetic averages can be taken in the above formula to avoid the defects of the Dutot index, that it is not invariant to changes in the units of measurement of the dwellings or, in the present context, very expensive dwellings will get a large implicit weight. Alternatively, expensive dwellings can be treated as outliers and be excluded from the calculation.

**Accounting for missing observations**

11.168. When a dwelling fails to respond because of a temporary failure to collect the information (perhaps the data collector was not able to contact the respondent) but data relating to the other dwellings were collected that month, the collected dwellings should be given the weight of the missing unit. For example, if there are three assigned dwellings in a cell each with a weight of 1 (because they are equally weighted) and two are collected and one is not, the rent of the missing dwelling can be imputed from the two that are collected as follows:

\[
\hat{r}_m^t = r_m^{t-m} \times \frac{r_{collected1}^t + r_{collected2}^t}{r_{collected1}^{t-m} + r_{collected2}^{t-m}}
\]

11.169. If all observations in an elementary aggregate are missing (perhaps because of a data collection problem), they can be omitted entirely from the calculation for that month; however, their rents must be estimated for use the next period. If a rental dwelling is a non-response in period \(t\), its imputed rent for period \(t\) is as follows:

\[
\hat{r}_m^t = r_m^{t-m} \times \left( \Delta_{Rent}^{t-1\rightarrow t} \right)^m
\]
This imputed rent is not used until period $t+m$. Notice that it cannot be computed until after period $t$, when the value for $\Delta_{Rent}^{t-1 \rightarrow t}$ is known.

11.170. Where dwellings become unsuitable for inclusion in the CPI – for example, they become uninhabitable because of a fire - they can be dropped from the sample (if deemed unlikely to be repaired) or, if there is reason to believe they will be repaired and returned to use, treated as non-response.

11.171. Dwellings that cease to be rental dwellings – for example, they become owner-occupied or are converted to non-housing use - should be dropped from the sample, but it is good practice to find a replacement dwelling nearby, if feasible. Until the replacement dwelling can be used in the index, the old dwelling should be treated as a non-response.

11.172. It should be noted that geometric imputation is more desirable if a Jevons index is being constructed at the elementary level as geometric imputation is consistent with the Jevons formula. The use of geometric weighting also avoids the problem previously referred to of large expensive houses dominating the calculation.

**Updating the sample**

11.173. The rent sample, like all CPI surveys, needs to be kept up-to-date. This is especially important to ensure that the sample reflects new construction of rental dwellings. An entirely new sample can be drawn, run in parallel with the old one, after which the old one can be dropped. The new sample should be based on a new sampling frame. Deploying an entirely new sample at one time can be quite expensive. An alternative is to replace part of the sample each year. If the rent sample uses several sub-samples or panels, the usual way to do this is to rotate out one or more panels per year and replace them with equally representative sub-samples or panels. For example, replace the January/July sub-sample one year and the April/October one the next year. Select the new area cells and assign them to sub-samples all at one time, but then limit the data collection work to one sub-sample at a time. Rents for the old and new sub-samples need to be collected at the same time so that the new sub-sample is spliced in using the overlap method - the CPI uses the old sub-sample for the last time while collecting the initial rents for the new sub-sample.

11.174. The index is a chaining of the rent change values:

$$I_{Rent}^t = I_{Rent}^{t-1} \times \Delta_{Rent}^{t-1 \rightarrow t}$$

**Depreciation, major home improvements and quality change**

11.175. Sample rental dwellings can change between visits from CPI data collectors. Sample dwellings that undergo dramatic changes - either improvements or deteriorations - are best dropped from the sample, at least temporarily. More subtle changes affect all dwellings: they get older and depreciate. Regular maintenance - for example, replacing the roof - offsets this phenomenon to some extent at least. Some countries make an explicit quality adjustment to observed rents to take account of the fact that a rental dwelling that is older has depreciated and hence is generally not as desirable as it once was. However, an older property does not necessarily become less desirable especially when it is properly maintained (e.g., a "heritage property"). In the case where money is spent on a property for the repairs needed due to depreciation as the property gets older, care should be taken not to double count these ongoing
and long-term maintenance costs associated with depreciation as they will often be reflected in the overall level of rents charged. Only the costs of repairs and maintenance for which the tenant is responsible should be included in the CPI and these can be obtained through the regular CPI survey of prices as with any other household expenditure. A study of rental agreements between landlord and tenant should provide the information needed to identify whether the dwelling is depreciating, and which maintenance costs should be covered by the price survey.

11.176. Empirical estimates of the net depreciation of dwellings generally, including those of owner-occupiers, mostly indicate that it can be small, at least in the short-term, so that where depreciation is not measured either directly or indirectly, ignoring it should not be too problematic for users of a CPI who are interested in inflationary trends in the short term. The compiler should nevertheless be aware of this phenomenon.

11.177. As mentioned earlier, for owner-occupied dwellings there is no internationally accepted method of treatment of the quality change associated with depreciation or the cost of major repairs.

E. Second-hand Goods

1. Introduction

11.178. Paragraph 31 of the 2003 ILO Resolution on CPIs states that “the expenditure weights for second-hand goods should be based either on the net expenditure of the reference population on such goods, or on the gross expenditure, depending on the purpose of the index”. A CPI is generally understood to be a price index that measures the changes in the prices of consumption goods and services acquired and should use weights consistent with this concept. Chapter 2 reiterates that second-hand goods are in scope of a CPI and introduce the “net expenditure” concept, in other words total purchases less sales, for weights. The latter is in line with the concept of household final consumption expenditure as defined in the 2008 SNA.

11.179. The use of gross expenditure as weights for changes in the prices of second-hand goods is inconsistent with the SNA\(^\text{13}\). The SNA states that sales of second-hand goods (i.e., partly used durables) have to be accounted for and are treated as negative expenditure to be consistent with the treatment of the original purchases (\(2008\ SNA\), paragraph 10.38). Furthermore, putting the national accounts argument to one side, the use of gross expenditure weights and the inclusion of disposals also would be inconsistent with an index based on acquisitions and could clearly overstate, potentially by a substantial amount, the resources that are devoted by households to acquiring second-hand goods. It is therefore not appropriate for

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\(^{13}\) The SNA does not directly treat consumer durables as fixed assets or their acquisition as gross fixed capital formation (\(2008\ SNA\), paragraphs 10.32 to 10.37). The one exception is dwellings. However, through a recognition that consumer durables are goods that can be used repeatedly or continuously over time, the SNA does indirectly recognise them as durable goods, despite their purchase being treated as consumption. So by implication durables are subject to the SNA guidelines relating to expenditure on gross fixed capital formation. These guidelines explicitly define the latter as acquisitions less disposals of fixed assets (\(2008\ SNA\), paragraphs 10.38 to 10.42).
either a cost-of-living-index (COLI) or a non-COLI (for example, a cost-of-goods index (COGI)).

11.180. In nearly all cases net weights should be used in the CPI compilation.

11.181. For purposes of the weights, below details four different scenarios for the “net expenditure” concept:

- **Directly from another household.** The net expenditure is zero as the transaction is between households. It follows that these purchases should be excluded from a CPI.

- **From another household via a dealer.** In this case, dealers purchase second-hand goods from households and re-sell them. Theoretically these purchases should be included with a “net” weight reflecting the difference between the buying and the selling price which is deemed to represent the “service” the dealer is giving the buyer.

- **Directly from another sector** (i.e., from an establishment, government, non-profit institution serving households, or from abroad). The appropriate “net” weight is household purchases from these other sectors less any sales to them.

- **From an enterprise or from abroad via a dealer.** Following the same principles as applied above, the appropriate “net” weight consists of household purchases from dealers minus household sales to dealers plus the aggregate value of dealers’ margins on the products that they buy from and re-sell to households.

11.182. One consequence of using net weights, with sales and purchases being treated in the same way, is that it is necessary to reverse the sign of the price changes for second-hand goods sold by households for the CPI to properly reflect changes in cost with the consequence that price changes for second-hand goods sold directly from one household to another will carry a zero weight. Thus, for both a COLI and a COGI the wording can be simplified and “household” transactions in second-hand goods can be divided into three groups:

- **Transactions between households.** The net expenditure are zero. The changes in the prices of the goods concerned carry no weight and have no effect on a CPI.

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14 A COGI measures the percentage change in expenditure a household requires to purchase a fixed basket of goods and services. As its name implies it seeks to measure the change in cost. In contrast, a COLI measures the percentage change in expenditure needed to maintain a household’s standard of living. As its name implies its objective is to measure the change in the cost-of-living.

15 There is one important exception that occurs when the user cost approach is used for the measurement of owner-occupier housing costs. The loan costs associated with house purchase enter the index regardless of whether a newly-built home is being purchased or a home from another owner-occupier. But under an acquisition approach owner-occupied housing would be based on a net acquisition cost basis, that is, the cost of purchasing all newly built houses or converted dwellings or existing dwellings newly acquired by the household sector (for example, private purchases of houses previously owned by the government) less disposals of houses (such as demolitions or sales of private houses to government).

16 This category covers, for instance, both imports and domestic sales of former company cars.

17 The payment for the services of estate agents and other intermediaries such as housing agents, auctioneers, salesroom operators come under COICOP 13.9.0 (Other Services, not elsewhere specified).
Purchases by households from units in other sectors including the rest of the world. The price changes are weighted by the values of the purchases or expenditure incurred.

Sales by households to units in other sectors including the rest of the world. The price changes are given negative weights equal to the values of the receipts from the sales.

11.183. As already stated, one consequence of using gross expenditure for weights will be that the weights carried by second-hand goods in the index would be greater than if net expenditure were to be used and too large compared with other goods and services as it would overstate in relative terms the amount of household resources taken up by transactions in second-hand goods. If the price of a second-hand good increased, the index would reflect the purchasing household being worse off but not the selling household being better off. Similarly, from a national accounts’ perspective, there is no justification for including acquisitions but arbitrarily excluding disposals. Such a procedure would be illogical and inconsistent with the SNA. Thus, putting aside some highly specialized uses, in general there does not appear to be a circumstance in which use of gross expenditure can be justified in a mainstream price index for household consumption, especially one intended to be used to adjust rates of compensation for changes in the cost of living.

11.184. From the above discussion, guidelines for the measurement of second-hand goods in a price index can be derived whose practical implications are most pronounced for durable second-hand goods such as houses where the treatment is dependent on whether a use, payments or acquisition approach is adopted. For further details relating to house purchase see paragraphs 11.102 to 11.161 relating to the alternative treatments of owner-occupied housing. Where the second-hand good is semi-durable, such as for second-hand clothes and cars, its treatment is not practically affected by whether the use, payments or acquisition approach is adopted.

11.185. Some goods such as vehicles may be sold by households to dealers who subsequently re-sell them at a higher price to other households. This implies that households’ net expenditure on goods that are purchased indirectly from other households via a dealer should be positive. It can be argued that the net expenditure should be treated as purchases of intermediate services provided by the dealers and not as purchases of second-hand goods (see footnote 14). The weight carried in the overall CPI is the same whichever interpretation is adopted although the estimated price changes might be different.

11.186. Weights are generally derived from HBSs, which should cover second-hand goods and be designed to generate the information required to separate the weights of second-hand items from new items. Explicit weighting is recommended even when based on approximate estimates of expenditure. Administrative records of, for example, the value of imported second-hand cars and of changes in second-hand car registrations may provide an alternative source of information to compute approximate weights when adequate information is not forthcoming from the HBS. Weights can be estimated “top-down” by taking total sales and making an approximate distribution between old and new goods or “bottom-up” by computing separate estimates and summing them.

11.187. There are several practical difficulties in pricing second-hand goods. These exist whether using the traditional approach of sending price collectors to outlets or pricing second-hand goods online. Firstly, it can be difficult to determine what prices are actually paid, since bargaining is more common with second-hand goods than new ones, for instance.
concerning the condition of the item. Secondly, two sampling problems are particularly challenging:

- The initial selection of a representative sample.
- Following the prices of a fixed basket of items.

2. Initial sample selection

Items

11.188. A number of factors need to be considered when choosing a representative sample of a specific second-hand good:

- The items chosen must be generally available and easy to find by price collectors.
- The item description must be sufficiently detailed for the item to be easily identified both initially and on repeat visits to outlets and shopping locations and websites to provide sufficient guidance when a replacement needs to be chosen.
- The item must be representative of the second-hand market.

11.189. For most second-hand goods the selection of precisely which items to be priced is likely to be purposive. To facilitate this, the price statistician will need to identify not only which characteristics physically differentiate one item from another item, but also which factors have a significant impact on price, including, most particularly, the age and condition of the good concerned. The latter may need to be deduced by observation based on a number of price influencing attributes. For instance, with clothing there may be noticeable thinning of the material. The attributes may be determined in part indirectly, for instance in the case of a car by reference to its age. These should make up part of the item description and be used when selecting an item to price each month.

11.190. Specifications should be kept up-to-date to reflect the second-hand market so that problems relating to sample depletion and “forced” replacements are minimized. Forced replacements are to be avoided, particularly for cars as explicit forms of quality adjustment are problematic\(^{18}\).

Outlets/online websites

11.191. The outlet or website needs to be representative of where second-hand goods are purchased, whether from shops, fixed markets, street traders or online. It also must be chosen with the need for continuity in mind, so price collectors are able to collect as far as possible from the same retailers each month. It is likely that selecting the locations for price collection and the sample of actual outlets/website selling second-hand goods will be judgmental. From a practical perspective there are two main approaches:

- Periodically conducting a full enumeration of the relevant outlets selling second-hand goods at a specific location and then selecting one at random for price collection each month. The difficulty with this approach is that it is not only resource intensive but also may not be particularly efficient in circumstances where it is unlikely that the item

\(^{18}\) For example, option costing, which is commonly employed for new cars, cannot be applied to second-hand cars, and hedonic regression techniques require a rich data source. In these circumstances, expert judgment is often used to inform quality adjustment for differences in technical specifications, mileage or condition of vehicle.
priced in an outlet/website at the previous price collection will still be available the following month as it is likely to have been sold. By definition, second-hand goods are unique. In addition, it is not a practical option when outlets are moveable, which can often be the case for street traders selling second-hand semi-durable goods (especially unbranded clothing).

- A form of quota sampling where the price collector visits a pre-selected location, for instance a market which is known to sell goods in a mid-price mid-quality range, taking a “random” walk around the stalls until a second-hand item meeting the required description is found. This may be the preferred method, especially under the circumstances described above and is a departure from the conventional CPI practice where the same outlet is visited each month and the same good is priced. Outlets and other points of sale for specific types of second-hand goods, such as clothing, can often be identified by their specific location on a market day. Choosing the appropriate day of the week for the collection of prices from street traders is also important because street traders may change their position (and prices) on different days.

11.192. In practice, a mixture of the two approaches described above might be desirable and possible.

11.193. Under both approaches, stratification by outlet type - for example, shop, market stall, street trader and online - is recommended to keep the sample representative.

3. Following the prices of a basket of items

11.194. In ideal circumstances, after initial selection and pricing in an outlet, the identical item should be priced each month. In practice this is almost impossible to achieve for second-hand goods because, for instance, the identical t-shirt is unlikely to be on sale in two consecutive price collection periods as it is likely to have been sold in the intervening period. In addition, the price collector is unlikely to be able to identify and know whether he or she is pricing exactly the same good. A more practical approach, and a departure from normal price collection practice, is to re-select an item each month - in this case a t-shirt - which most resembles the one priced in the previous month. Selection of the new item is based on the price-determining characteristics previously identified. This is essentially the second option above. To facilitate this approach, the price collector will need a check-list of characteristics for each item requiring a price quotation. This can be completed during each price collection and a price adjustment made at head office when there is a deviation from the stated price-determining attributes. Advice from the retailer can be sought to assist this process. An example of a price collection form is given at Appendix A for a man’s branded t-shirt.

4. Quality adjustment

11.195. An over-detailed checklist of characteristics should be avoided as it can result in difficulties in locating products matching the exact definitions due to sellers not being able to guarantee that the second-hand goods that they acquire for re-sale will not vary from one period to another. This may in turn require a large number of quality adjustments as replacement items have to be constantly chosen. Where a matching item cannot be located, price collectors should be asked to collect the price of a product which most closely meets the specifications. The price statistician will then need to make a quality adjustment to the price to
reflect the value of the difference (if any) between the specified item and its replacement. The option most suited to second-hand goods is expert judgement. This relies on product experts, often in consultation with shopkeepers, determining the value of a change in specification. This role is often undertaken by price collectors.

11.196. When there is a planned change of model, for instance in the pricing of second-hand cars, the use of overlap pricing is often seen as a way of making quality adjustments, as the prices of both old and replacement models can be collected in the overlap month. Their price ratios can be presumed to reflect the market value of relative quality when linking price quotes for different models. This removes any need for explicit quality adjustment. But the compiler should beware the possibility of computing a flat index as a result of a high turnover in models rather than any real stagnation in the second-hand prices.

11.197. Chapter 6 provides more general guidance on the subject of quality adjustment.

5. Alternative approaches

11.198. Given the potential for finding challenging practical sampling problems associated with collecting the prices of second-hand goods, as described above, some NSOs do not collect prices directly but instead adopt one of two possible alternative approaches, depending on circumstances and the goods involved. Either they ask a dealer in second-hand goods to complete a questionnaire with the current price that they would expect to achieve. This is sometimes done for clothing, for instance, where market traders purchase bundles of second-hand clothes from suppliers (normally from other market traders who act as wholesalers). It is then assumed that retail prices will move in parallel to wholesale prices. Or they assume that the price trends for second-hand goods are the same as those of the corresponding new goods obtained from the main CPI price collection. The latter is most likely to be the practice where purchases of second-hand goods have been historically much less important than purchases of new goods. Both cases use other price movements as a proxy for the price movements of the corresponding second-hand goods.

Wholesalers’ prices

11.199. Under this approach, the prices collected are wholesale prices and these are used as a proxy for consumer prices. Wholesalers are selected to be representative of the types of wholesalers who are likely to supply the retail outlets that are used by the reference population covered by the CPI, taking into account such things as geographical coverage and the type of retail outlet, including the income bracket of its customers. The product descriptions of the second-hand goods which are priced are normally more orientated to the wholesale rather than retail market in order to make sense to the wholesaler who has to complete the form. For example, the wholesaler may be asked to give the indicative prices, that is the current price he has been getting or expects to get for a “bale” of “average quality” t-shirts with designer logos. In this case “bales” are the standard quantity purchased wholesale, which will contain some good, average and low-quality t-shirts mounting to a bale being of “average quality” overall. It is then assumed that retail prices move in line with these wholesale prices. A copy of the type of questionnaire sent to wholesalers is given in Appendix B.

Prices of new goods
The use of new goods as a proxy for old should be kept regularly under review to identify anything that might challenge the historic price relationship, for instance, where new safety regulations or environmental laws reduce the value of second-hand cars compared with new ones.

If the price trend of the corresponding new good is used as a proxy then the expenditure weight used in compiling the index must, of course, reflect expenditure on both new and second-hand goods. One approach is to include the weight of the second-hand good with that of the new good. Another would be to keep the second-hand item separate with its own weight, compute an index and combine it with the price index for the new good. The latter approach is more transparent.

F. Own Account Production

1. Introduction

Households can engage in various kinds of productive activities that may be either aimed at the market or intended to produce goods or services for own consumption. When households engage in production for the market, the associated business transactions are all outside the scope of a CPI. Expenditure incurred for business purposes are excluded, even though they involve purchases of goods and services that might, instead, be used to satisfy the personal needs and wants of members of the household. In practice, households also produce goods and services directly for their own consumption and this can account for a significant proportion of a country's household consumption. For example, households grow vegetables, fruit, and flowers or other crops for their own use. Owner occupiers produce housing services for their own consumption. Goods and services produced by households for their own consumption are called own account production. According to the SNA, all services produced for own consumption are excluded from the production boundary, except services produced by employing paid domestic staff and the housing services produced by owner-occupiers. This means that only those services produced by employing paid domestic staff and the housing services produced by owner-occupiers would be included in the CPI. Excluded services produced for own consumption include the preparation of meals, the care of children, the sick or the elderly, the cleaning and maintenance of durables and dwellings, the transportation of household members, etc.

It can also be noted that many of the goods or services purchased by households do not provide utility directly but are used as inputs into the production of other goods and services that do provide utility: for example, raw foodstuffs, fertilizers, cleaning materials, paints, electricity, coal, oil, petrol, and so on.

For purchased final goods and services, the measurement of prices is not a problem as the price is determined at the time of purchase. However, for goods and services produced and consumed by households there is a problem because no purchases are involved and there are no direct prices to measure or associated expenditure for the construction of weights. Conceptually, the ingredients purchased for use in the preparation of a meal, for example, or the materials used to clean a house are, in principle, intermediate consumption whereas a CPI is based on final consumption. This is sometimes referred to as the own account
production dilemma. The CPI compiler has two options: measure output prices indirectly or measure some (but not all) input prices and use them as a proxy for the prices of goods and services consumed. The 2008 SNA recommends the indirect measurement. Although this seems a simple and conceptually acceptable solution to an otherwise intractable problem, exceptions may be made for one or two kinds of household production that are particularly important and whose outputs can readily be identified: most particularly, subsistence agriculture and housing services produced for own consumption.

11.205. This section considers the conceptual and practical measurement issues associated with own account production.

2. Background

11.206. How goods and services produced for own consumption are treated in the CPI depends on the scope and use of index. Let us assume for the purpose of illustration that in principle a CPI should cover final consumption by households (i.e., that it is not restricted to monetary expenditure). The scope and purpose of the index and implications for the treatment of own account production are considered in the next section (paragraphs 11.215 to 11.229). This section considers the conceptual and measurement issues.

11.207. A distinction can be made between.

- **Intermediate consumption.** In the context of own account production, this refers to the goods and services which households use in the process of producing other goods and services. They are not part of the final consumption of households.

- **Final consumption.** Correspondingly, this refers to goods and services produced for direct consumption where utility is derived by the household through the act of consumption.

1. Goods and services to be used repeatedly in production over extended periods (more than one year), provide benefits to the owner over the lifetime of the goods. These goods are called fixed assets (2008 SNA, paragraph 10.33), and in general are recorded as gross fixed capital formation. For example, a house will normally provide shelter for many years. Similarly, a stove may provide cooking services for decades. A house is treated as gross fixed capital formation in the SNA and is subject to special treatment depending on the different conceptual approach adopted (i.e., acquisition, use etc). However, other durable goods (such as stoves, washing machines, cars etc, which are commonly referred to as "consumer durables") are treated in both the CPI and the SNA as though they are fully consumed at the time they are purchased rather than being depreciated over time, so their price is included in the CPI in the period in which they are purchased. Services can only be intermediate or final consumption: they are consumed as they are produced.

2. In practice, in the context of own account production it can be difficult to draw a clear distinction between intermediate and final consumption, as the same goods and services may be used for either purpose. There are numerous examples. Basic constituents of foods, such as flour, cooking oils, raw meat and vegetables, may be processed into bread, cakes or meals, with the assistance of other inputs
including fuels, the services provided by consumer durables, such as fridges and cookers, and the labor services of members of the household. Inputs of materials, equipment and labor are used to clean, maintain and repair dwellings. Inputs of seeds, fertilizers, insecticides, equipment and labor are used to produce vegetables or flowers, and so on. Some of the production activities taking place within households’ activities, for example gardening or cooking, may provide satisfaction in themselves. Others, such as cleaning, may be regarded as chores that reduce utility. In any case, the goods or services used as inputs into these productive activities do not provide utility in themselves. Again, there are numerous examples of such inputs: raw foods that are unsuitable for eating without being cooked; cleaning materials; fuels such as coal, gas, electricity or petrol; fertilizers; the services of refrigerators and freezers; and so on.

3. Utility is derived from consuming the outputs from household production undertaken for own consumption. It is necessary, therefore, to decide whether a CPI should try to measure the changes in the prices of the outputs or the prices of the inputs. In principle, it seems desirable to measure the output prices, but there are serious objections to this procedure.

4. On a conceptual level, it is difficult to decide what are the real final outputs from many of the more different household production activities. It is particularly difficult to specify exactly what are the outputs from important service activities carried out within the household such as child care or care of the sick or elderly. Even if they could be satisfactorily identified conceptually, they would have to be measured and priced. There are no prices to be observed, as there are no monetary transactions. Prices would have to be imputed for them and such prices would be not only hypothetical but inevitably very speculative. Their use in CPIs is not a realistic possibility in general and almost certainly would not be acceptable to most users who are primarily interested in the market prices paid by households.

5. The practical alternative is to treat the goods and services acquired by households on the market for use as inputs into the various kinds of household production activities as if they were themselves final consumer goods and services. They provide utility indirectly on the assumption that they are used exclusively to produce goods and services that are directly consumed by households.

6. However, there are two important areas of own account production that warrant special consideration: subsistence agriculture and housing services produced for own consumption.

- In the national accounts, an attempt is made to record the value of subsistence agriculture, that is the agricultural output produced for own consumption (2008 SNA, paragraphs 24.47 to 24.49). In some countries, subsistence agriculture may account for a large part of the production and consumption of agricultural produce. The national accounts require such outputs to be valued at their market prices (2008 SNA, paragraph 6.124). It is doubtful whether it is appropriate to try to follow this procedure for CPI purposes. A CPI may record either the actual input prices or the imputed output prices, but not both. If the imputed output prices for subsistence agriculture are included in a CPI, the prices of the purchased inputs should be excluded. This could remove from
the index most of the market transactions made by such households. Expenditure on inputs may constitute the principal contact that the households have with the market and through which they experience the effects of inflation. It therefore seems preferable to record the actual prices of the inputs and not the imputed prices of the outputs in CPIs.

- The treatment of *owner-occupied housing* is particularly challenging as described above in paragraphs 11.102 – 11.161.

### 3. The scope and choice of index

11.208. While the general purpose of a CPI is to measure changes in the prices of consumption goods and services, the precise scope of a CPI in terms of the goods and services covered and the households to be covered should be determined by what is intended to be the main use of the index. Consider the household scope and the consumption scope of the CPI. Subsistence households generally have a weak connection to the monetary economy. A major part of their consumption is from their own or bartered production. However, indices designed for the indexing of wages or state benefits would exclude subsistence households from their scope. For simplicity of the following discussion, the latter indices will be referred to as “compensation indices”. Indices designed to measure price changes covering all monetary transactions will include monetary purchases by subsistence households but will not include subsistence consumption. These can be referred to as “monetary indices”. There is a third type of index which includes subsistence consumption within its scope. These can be referred to as “general consumption indices”.

11.209. For countries where subsistence consumption represents a major part of total consumption, the three types of index will behave differently when the prices of basic food, imported manufactured goods, and farm inputs diverge. In such circumstances, an index that excludes subsistence households will not be nationally representative as it is designed to be representative of the price experience of a more limited group of households. Similarly, the monetary transactions index and the general consumption index will give divergent results. Each index provides a different picture of what is happening within the economy. The first does not attempt to be nationally representative and the remaining two indices attempt to be nationally representative but in different ways.

11.210. To understand the differences in these indices, consider the following example. Assume drought affects a country with a high proportion of subsistence households. Assume non-subsistence households are included within the scope of the compensation index and have no subsistence consumption. These households are also affected by the drought but to a lesser extent. Assume that the price of basic foodstuffs increases sharply, that there is relatively little change in the prices of imported manufactured goods, and that the prices of farm inputs fall due to a sharp fall in demand from subsistence farmers\(^\text{19}\). In this example, the compensation index will rise because basic foodstuff prices cost more, but the rise will be moderated because the price of imported manufactured goods has not increased to the same extent. The rise in the

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\(^{19}\) Many different scenarios could be considered. This example is designed to show that all three index types are sensitive to the treatment of subsistence households and subsistence consumption. If there are changes in the relative prices of the selected product groups, the choice of index type will affect the outcome. Each index will tell a different story concerning the impact of the drought on households, particularly subsistence households.
monetary index will be moderated further because of the fall in the price of farm inputs. The general consumption index will show the greatest increase because the weight given to basic foodstuffs will be much higher, reflecting subsistence consumption, and no weight will be given to farm inputs.

11.211. Which index in this example is “correct”? If properly constructed, all three are “correct” in the sense that each addresses a user need. They are different simply because they serve different purposes and have different uses. The general consumption index would give the best picture of how the drought was affecting the whole of the country. The fact that the price of farm inputs had fallen would not reflect the problem faced by subsistence farmers who had to find ways of providing food for their families and were unable to benefit from the fall in farm input prices. The monetary index would give the most relevant measure, for the country as a whole, of the change in prices of goods exchanged within the market. For the purposes of monetary policy, the general consumption index would overstate the level of inflation but for the purposes of understanding the impact of the drought on the price of consumption it would not. The converse is true of the monetary index. The compensation index would not reflect the full impact of the drought on all households, but it would reflect the impact of the drought on indexation households. The general consumption index would overstate the impact of the drought on indexation households and the monetary index would understate the impact; both would be biased if used in the context of indexation.

11.212. Each country needs to make its own decision as to which of the three types of index is appropriate in its own circumstances. Countries with well-developed price statistics systems could consider compiling alternative indexes to meet different user needs. They would need to educate users about their respective uses. Most countries opt for one general purpose index. If the primary use of the index is to make monetary policy and serve as a macroeconomic measure of inflation, it is not appropriate to include production for own consumption. If the primary use of the index is to index wages and/or government payments, production for own consumption should be excluded. In both cases, only monetary expenditure should be included in the index.

11.213. A number of countries compile and disseminate a monetary index as the headline measure of price change, but will compile an alternative index that includes production for own consumption in the weights. Such an index would be for analytical purposes and would meet the needs of poverty economists.

Construction of a "general consumption" index

11.214. To include subsistence households and consumption in this index it is necessary to construct appropriate consumption weights and to decide how subsistence consumption will be priced. Both aspects are described in the following paragraphs.

11.215. The normal source for subsistence consumption weights will be a HBS or a survey of subsistence households. To measure subsistence consumption, households are asked to record the quantities consumed of own account produced goods. To obtain a value weight a “price” is applied to the product. Usually this will be the price of the product in a relevant market. Most countries with significant subsistence production will prepare estimates of the value of subsistence consumption classified by product. This will be prepared for use in poverty analysis and possibly also for use in compiling the national accounts. When preparing weights for a general consumption index these estimates of consumption should be combined with
estimates of purchases of the same products by non-subsistence households to obtain the total consumption weight for each product. It is important to exclude weights for any market purchases of items used as inputs into subsistence production, for example fertilizer, tools and herbicides. These products are excluded but only in respect of households for which subsistence production is estimated. For all other households they are included in the weights and classified within recreational expenditure (COICOP 09.3.1.)  

11.216. The price of basic foodstuffs may vary, particularly between urban and rural areas. This will reflect availability, demand, transport costs and other factors. The most appropriate price to apply to subsistence consumption would be the price in a market near to where the subsistence consumption takes place. Typically, this would include many rural areas. If a country collects basic foodstuff prices in both urban and rural areas, the most appropriate price would be an average of the rural prices weighted to reflect the distribution of subsistence agriculture. In practice, a simple average of rural prices might provide a reliable estimate, particularly if the selection of rural outlets is approximately self-weighted.

11.217. Similar pricing considerations apply to the prices used when compiling the results of a household survey to estimate subsistence consumption. Price statisticians can assist the household survey statisticians with these estimates. If the price statistician is producing a general consumption index, they should ensure that the prices used to value subsistence consumption are consistent with the prices used in construction of the price index.

Construction of a "monetary" index

11.218. One of the main challenges in including subsistence households in this index is to construct appropriate consumption weights. This is because this index uses purchases of inputs used in producing subsistence outputs as a proxy for subsistence consumption. Additional price information is only required for input items that are unique to subsistence households. If items are purchased by non-subsistence households and are already priced for CPI purposes, the latter price information can be used for the subsistence inputs component of the monetary index, such as spades, seeds, fertilizer etc

11.219. The normal source of weights for inputs into subsistence production will be a household survey, such as a general HBS or a survey of subsistence households. When preparing weights for a monetary index these estimates of consumption should be combined with estimates of purchases of the same products by non-subsistence households to obtain the total consumption weight for each product. It is important to exclude weights for subsistence consumption which may have been computed as part of the household survey. Subsistence consumption is excluded because the weight for inputs used in subsistence production is included in this index as a proxy for subsistence consumption and to include that consumption would involve double counting.

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20 For non-subsistence households, garden produce may be treated as a recreational output rather than the result of a production process, depending on the motivation and circumstances of production. Using this treatment, purchases such as tools or fertilizers are gardening or recreational expenses and not inputs into the production of food. For some households the line between subsistence production and recreational activity will be unclear. NSOs should adopt practical rules based on national circumstances for making this distinction. For example, urban food production for own consumption may be treated as recreational and rural food production for own consumption may be treated as subsistence production.
Construction of a "compensation" index

11.220. If it is decided to compile a ‘compensation index’ it is unnecessary to construct subsistence consumption weights and to decide how subsistence consumption should be priced because an index designed for the indexation of wages or benefits will generally exclude subsistence households, or more precisely subsistence consumption, from its scope.

Own account household services (excluding owner-occupier housing services)

11.221. Services produced by households include such things as the preparation of meals, the care of children, the sick and the elderly, the cleaning and maintenance of dwellings and the transport of household members. Housing services are provided by the stock of owner-occupied dwellings.

11.222. Following the preferred approach, goods used as inputs into services produced within the household (e.g., cleaning agents, fuels or cooking ingredients) should be treated as consumption. Consequently, inputs into these areas of household own account production, are within the scope of the CPI. Actual outputs are excluded from the scope of the CPI and no attempt should be made to impute expenditure to them. Home cooked meals are a service output produced within the household and it is recommended that there should be no imputation of expenditure in respect of the preparation of these meals. Similarly, it is recommended that there should be no imputation of expenditure to other services produced within the household such as when parents transport their children to school or care for a sick child. These treatments are consistent with the SNA. Although it may be conceptually more appropriate to regard the outputs of household production as consumption rather than the inputs, data in respect of the outputs of these areas of household production would require many assumptions and imputations and would be of little practical use and so are excluded from the CPI and the SNA production boundary as well.

11.223. It should be noted, however, that a long-term bias can result if households increase their purchases of services and decrease their production for own account consumption and this is not addressed in an updating of weights. For example, if households purchase more take-away or restaurant food instead of preparing food for their own consumption, over time the relative expenditure on take-away and restaurant food will increase and the relative expenditure on food ingredients will decrease. If long-term labor costs increase more rapidly than basic food prices, there will be a long-term downwards bias to the index (and conversely if they increase less rapidly) unless the impact of this change in behaviour is reflected in a revision of the weights both for own account production associated purchases and other household purchases. This is because labor costs have a greater impact on take-away and restaurant food prices than on food ingredient prices. Although the household contributes labor when producing household services, this is not included in the index because of the problem

21 The SNA includes all production of goods for own use within the production boundary, as the decision whether goods are to be sold or retained for own use can only be made after they have been produced. However, it excludes all production of services for own final consumption within households, except for the services produced by employing paid domestic staff and the own-account production of housing services by owner occupiers. The services are excluded because the decision to consume them within the household is made even before the service is provided (2008 SNA, paragraph 1.42).
of putting a price on household labor. Expenditure weights should be reviewed on a regular basis (for more information on weights, see Chapter 3).

G. Tariffs

11.224. A tariff is a list of prices for the purchase of a particular kind of good or service under different terms and conditions. For example, one price may be charged for electricity during the day time and another lower price may be charged at night time or a lower price may be charged the more electricity that is consumed. Similarly, a telephone company may charge a lower price for a call on weekends than in the rest of the week. Another example may be bus tickets sold at one price to ordinary passengers and at a lower price to children and pensioners.

Construction of the corresponding price index should adhere to the core principles that price collection should be undertaken consistently over time and in a way that represents consumer purchasing patterns and that the selection of representative items, in this case the different tariffs charged, should represent consumer behaviour and be weighted by consumer spending patterns. It follows from the latter that it is appropriate to assign weights to the different tariffs or prices in order to calculate the price index for the elementary aggregate. This section provides advice on the measurement and inclusion of tariff prices in a CPI and gives illustrative examples of the more common types of tariffs.

1. Introduction

11.225. Tariffs cover a large and diverse range of pricing structures. The European Union definition states that “a tariff is a list of pre-established prices and conditions for the purchase and consumption of one and the same good or service, or of similar goods and services, that has been centrally fixed by the supplier, by the government, or by agreement to exert influence on the consumption patterns by means of appropriately differentiated prices and conditions according to characteristics of consumers, the level, the structure or the timing of the consumption.”. The article goes on to define a tariff price, which is “a price within a tariff that applies to a component element or unit of consumption of the good or service in question.” At its most basic, a tariff consists of a list of prices based on detailed specifications of the services that are priced individually but can only be bought as part of the package.

11.226. Added complications can exist where service providers adopt a range of strategies to differentiate their services in order to attract and retain customers. For example, to appeal directly to different types of customers, suppliers of telecommunication services may bundle services together in different ways as well as adopt tariff pricing. This is often accompanied by regular changes in the contracts offered to potential customers as a means of encouraging the take-up of services. Such contracts are often fixed-term with prices fixed for the period of the contract and a penalty clause if the contract is terminated early. A more detailed discussion of tariff pricing in the telecommunications sector is the following section of this chapter.

11.227. Economic theory recognises different types of price-discriminating behaviour on the part of sellers. Consequently, there may exist in the market many tariff pricing schemes. Some of the more common variants that are present in the market and which will be discussed in this section are as follows.
• **Peak-load pricing** (also known as “congestion” pricing). This occurs when producers charge higher fees during periods of greater demand, usually because of the higher costs of production caused by capacity constraints. Peak-load pricing thus helps in balancing capacity usage over a period, which decreases the need for firms to invest in costly infrastructure expansions. Such pricing practices are often found in the areas of toll roads and bridges, ferry services, electricity, long distance telephone calls and home delivery of purchased goods.

• **Two-part tariffs.** These occur when consumers are charged both an entry (or lump-sum) fee and a per unit charge. In other words, a fee is charged up front for the right to use (or buy) the product and an additional fee is charged for each unit that the household consumes. Examples where two-part tariff pricing is often applied are:

  o Amusement parks that charge an entry fee in addition to a fee for each ride;
  
  o “Membership” discount schemes or shopping clubs that require the purchase of a membership card to access the point-of-sale and then the consumer pays for his or her purchases at a lower than otherwise price;
  
  o Landline telephone services where there is sometimes a fee to use the service ('line rental') and also a fee per call. The line rental covers the cost of providing the service and the “per minute” or metered charge, covers the cost of placing the call on the network;
  
  o Taxi fares where a variable fare based on distanced travelled is added to the base “fixed” initial charge which is not dependent on mileage.

• **Block pricing** is when prices vary according to the volume consumed. Electric utilities, for example, often charge a per KWh price up to X units consumed and then charge a different price for the remaining units.

• **Special group discounts.** This is where members of certain segments of the population such as students and seniors may be charged a lower price for the good or service compared to the general population. Bus fares and haircuts are good examples of services where these group discounts are applied.

11.228. In some countries, private and public firms have come to rely increasingly on tariff-type pricing as a tool for generating additional revenues or for public policy purposes. For example, publicly administered electric or water utilities may charge a lower tariff for the first units of electricity consumed up to a certain level (the first block), followed by a higher tariff for subsequent units consumed (the second block). It is argued that such an increasing block tariff strategy is often used to promote better and greater access by lower-income households to what is considered a vital service. Equally, other companies charge more for the first block than the second as an encouragement to increase usage. More generally, private sellers can often increase their profits by charging a higher price for a product to some consumers and a lower price to others if it can successfully segment its customer-base.

11.229. Clearly, tariff-type pricing schemes can be applied to a wide range of products. The extent of the practice will vary according to the country. In cases such as electricity, the weight of the component can be relatively high so it is important to measure accurately the price change for such commodities. The index compiler will need to have at their disposal the tariff prices and weights which reflect the structure of the consumption of the good or service.
according to the characteristics of the consumers, the level, the structure or the timing of the consumption.

2. **Main measurement issues**

11.230. Tariff-type pricing schemes are used particularly for services and as such suffer from a number of price-index problems associated with services. These include:

- Charges for services can be subject to such complex pricing schedules that it is difficult to select the appropriate prices for inclusion in the construction of the price index.

- Identification or specification of individual products or units of consumption themselves can be difficult, particularly when they are offered as bundled packages consisting of several types of micro-expenditure that may be priced separately but are typically only available as a part of a package.

- Services are often provided under long term contractual arrangements and these may include different types of “customer loyalty” rebates, clauses for the minimum duration of contracts, surcharges for the provision of services not foreseen in the contract, etc. Note that loyalty rebates or coupons are usually ignored due to difficulties of measurement (see Chapter 5).

- There are often difficulties in accounting for substitution between different providers of the same type of service, and in accounting for quality differences in the services provided.

- There can also be difficulties in accounting for customers moving under their own volition from one tariff to another under the same service provider. For instance, when a mobile telephone company offers a number of different pricing packages targeted at different patterns of usage, current customers may undertake periodic reviews during which they may decide to move to a more advantageous tariff for their level of usage whilst staying with the same provider.

3. **Price measurement methods**

11.231. There are four basic approaches to tariff pricing - matched samples, unit values, consumer profiles, and the sample of bills approach. The starting point in terms of minimum information requirements should be all tariff prices and weights which reflect the structure of the consumption of the good or service according to the characteristics of the consumers, the level, the structure or the timing of the consumption.

**Matched Samples**

11.232. *Matched samples* are where a full tariff list or an element of the tariff structure is treated as a “product specification” and re-priced in subsequent periods. This mirrors the traditional CPI methodology of matched pairs. The simplest form of traditional matching methodology would be to take the tariff price lists of some major companies and follow the changes in the entire pricing scheme, preferably with accurate weighting information for the different elements of the price list. This option may be feasible in markets of limited competition where the pricing structures should be quite stable. There are practical challenges associated with ensuring that exactly the same product specification is priced each month, (i.e.,
that the matched pairs methodology is adhered to). There is usually limited data about the customer base. In practice the service to be priced using a full price list usually also has to be priced in a rather simple manner without too much differentiation on the basis of customers’ characteristics, and for the sake of simplicity some variations in tariff are sometimes ignored.

11.233. Another version of matching methodology is to select some elements of a tariff as “representative items” and re-price them in subsequent periods. For each representative item, detailed specifications combined with information supplied by the provider, are constructed. For instance, for air fares this could be for each airline carrier, a non-refundable and non-changeable airline fare from one pre-specified location to another, with pre-determined outbound and inbound dates chosen by time of day and day of week, including all surcharges.

11.234. The representative tariff element has the advantage that it can be applied to different service providers, at least in principle. It becomes possible to incorporate new service providers into the index without significant difficulties. However, the choice of only a few items as representative may limit the validity of the approach. Neither of the matching approaches is suitable for situations where there are major changes in the structures of tariffs. The matched sample methodology cannot usually be applied where the structures of tariffs regularly change.

Unit Values

11.235. The *unit-value approach*, where the overall average price of one unit, of electricity for example, for customers of a particular supplier is used for monitoring prices, instead of following individual elements of the tariff. The unit value approach can be used when contents of the tariff-based service are homogeneous (e.g., KwH of electricity) and the method should be used only in such cases. The unit value is calculated using overall revenue and quantity data at a higher level that does not distinguish between different tariffs or customers. It attributes all the differences between different packages to price alone, that is quality differences between different pricing approaches are assumed to be zero or insignificant. This may not be the case where, for example, the reliability of continuity of supply varies between suppliers. Advantages of this approach are that it can be easier to compute; the unit value more fully reflects changes in customer profiles and usage; and the unit value better reflects changes in discounts and promotions.

Consumer Profiles

11.236. *Pre-specified consumer profiles*. The idea of consumer profiles is to define the product independently of a single producer’s or supplier’s tariff structure. Instead, a more general formulation of the consumer’s behaviour is constructed based on information (for example, sales information provided by the industry as a whole) which can be used to define a range of typical consumers, irrespective of supplier. Different suppliers’ services are priced through these typical consumers. A unit value price is calculated for each consumer profile and then this unit value is recalculated over time. The advantage of this approach is that it does not require an actual sample of bills, only the details of the different tariffs and some information on usage by “typical” customers. Also, the price statistician could potentially define consumer profiles by class of household, for example, prices for the poor versus the well-off could be computed.

Sample of Bills Approach
11.237. The sample of bills approach. This is a more refined version of the consumer profile approach where a level of service activity from an actual sample of customers is priced each month rather than defining profiles representative of the average monthly activities of a range of customers (see above). This can be done, for example, by selecting a sample of customers from each category of customer, the latter being chosen to reflect the structures of the tariffs of the corresponding service providers. For instance, a sample of customers and their bills might be drawn from low, medium and high-volume consumers of the product. The resulting index measures the cost of the current billing period’s consumption (normally over a month or a quarter) at prices charged in the index period compared with prices charged in the base period. The sample of bills approach has a number of differences compared with the consumer profile approach, most particularly:

- It takes into account in-year variations in consumption, for example, a greater volume of international telephone calls during public holidays and festivals;
- It reflects actual customer behaviour by reference to bills;
- It detects price changes not associated with tariff changes, such as reduced unit charges when a minimum threshold of consumption is reached.

11.238. It should be noted that there can be an inherent time-lag due to bills being issued after the index for the relevant time period has been compiled.

11.239. In each of the above approaches the resulting calculation should be based on prices and weights which reflect the structure of the consumption of the goods or services according to the pre-determined characteristics of the consumers and the level, the structure or the timing of the consumption. The corresponding checklist of price-relevant characteristics for tariff-based expenditure may include:

- The time-pattern of use of the service. The patterns of use may be measured over one day, one week or even one year;
- The volume of use of the service, for example where pricing schemes differentiate between small and large customers;
- The past behaviour of the customer. Particularly in insurance services where previous claims or medical histories may impact on the price paid;
- The expected future behaviour of a group of customers, leading to price differentiation between, for example, males and females or for different socio-economic groups. This again is particularly prevalent in insurance services where companies analyse claims information by personal characteristics;
- Income-dependent prices, most prevalent in public-sector tariff structures.

11.240. The bundling of different services, where a supplier might provide, for example, a mobile telephone plus free calls at certain off-peak times, or telephone and online computer services, needs to be taken into account in sampling procedures where such practices are common.

11.241. Clearly, there are numerous combinations of the above factors that can be used to create different tariff structures and the structure of tariffs can undergo regular change. The
price statistician will need to thoroughly research the topic and monitor the market to ensure that all relevant price differentials are picked up.

4. Illustrative examples

11.242. Illustrative examples of the different methods of incorporating tariff prices in a CPI follow. Note that the issue of quality adjustment is dealt with separately in paragraphs 11.257 to 11.268.

Matched samples

11.243. The illustrative example given below is based on telecommunications services. The reader is referred to the separate section for an elaboration of the specific issues relating to telecommunications services.

11.244. The simplest form of matched models methodology is to take the tariff price lists of some major companies and follow the changes in the entire pricing scheme, incorporating weighting information for the different tariff elements. Where there are many service providers or many tariff elements it may be more feasible to select some elements of a tariff as “representative items” and re-price these items in subsequent periods although care will need to be taken to ensure that a representative sample is drawn. For illustrative purposes, in the following example (Table 11.5), there is just one service provider for national calls and three for international calls. It is assumed that in the base period the overall unit price is 1.9200.

Table 11.5 Matched Models: Landline Telephones

<table>
<thead>
<tr>
<th></th>
<th>Expenditure weights</th>
<th>Quantity weights</th>
<th>Tariff (unit price $): base period</th>
<th>Tariff (unit price $): period t</th>
<th>Change in unit tariff price (% in brackets)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National calls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak</td>
<td>30</td>
<td>33.53</td>
<td>1.20</td>
<td>1.30</td>
<td>+0.10 (8.3%)</td>
</tr>
<tr>
<td>Off-peak</td>
<td>20</td>
<td>33.53</td>
<td>0.80</td>
<td>0.80</td>
<td>0.0 (0.0%)</td>
</tr>
<tr>
<td><strong>Long-distance</strong></td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak</td>
<td>5</td>
<td>3.19</td>
<td>2.10</td>
<td>2.50</td>
<td>+0.40 (19.0%)</td>
</tr>
<tr>
<td>Off-peak</td>
<td>15</td>
<td>22.37</td>
<td>0.90</td>
<td>1.10</td>
<td>+0.20 (22.2%)</td>
</tr>
<tr>
<td><strong>International calls</strong></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To Cape Town (service provider A)</td>
<td>10</td>
<td>3.84</td>
<td>3.50</td>
<td>3.50</td>
<td>0.0 (0.0%)</td>
</tr>
<tr>
<td>To Singapore (service provider B)</td>
<td>10</td>
<td>3.19</td>
<td>4.20</td>
<td>4.40</td>
<td>+0.20 (4.8%)</td>
</tr>
<tr>
<td>To Washington (service provider C)</td>
<td>10</td>
<td>0.35</td>
<td>3.90</td>
<td>5.10</td>
<td>+1.20 (30.8%)</td>
</tr>
</tbody>
</table>
The above table illustrates a number of issues pertinent to the different approaches to the measurement of tariff prices and the need to apply due diligence when applying calculations. For example, if the overall weighted average price is used to calculate the index then the average fixed-weight price increase from the base to current period is 9.4% if revenue weights are applied (the use of revenue weights is incorrect) and 8.2% if, correctly, quantity weights are applied. It is also worth noting that the fixed weight increase is 10.4% if the weighted average of the price relatives is used, i.e., if a Carli index, which is known for its upward bias, is computed. This provides a good example of why a Carli index should not be used in the computation of the CPI. If a geometric mean (i.e., a Jevons index) is applied the increase is 9.8%. It also illustrates the importance of analysing tariffs at a detailed level given the fact that different elements of the tariff can be subject to very different price changes. Thus, the use of overall unit values, without some form of stratification, and where weights are contemporary and not fixed could result in volatile average unit value/price changes.

**Unit-values**

Where the quality of the service is homogeneous between providers, the unit value approach can be applied instead of matched models with the advantage that it is generally less resource intensive. The unit value is calculated using revenue and quantity data at a higher level. For example, in telecommunications services the unit price for national long-distance calls is derived as the total revenue received from such calls, divided by the number of call-minutes. The advantage of the unit value approach is that since there is no sampling, the coverage of the services is complete and there is no need to specify representative items or different user categories. On the other hand, compilation of unit values typically requires close collaboration with the service providers. The price statistician will need to persuade the latter of the importance of providing this commercially sensitive information on a confidential basis. Assurances will need to be given that the information will only be used for compiling the CPI, will be kept secure and will not be disclosed to a third party. Note that stratification continues to be important, for instance by whether a call is local or long-distance and made off-peak or at peak times. Effective stratification is particularly critical in the compilation process if the effect of mixing quality and quantity is to be minimised.

**Consumer profiles**

For marketing purposes, companies often classify their customers on the basis of their consumption habits. The following example (Table 11.6) shows a typical range of representative consumer profiles for mobile telephones. Information on different consumer profiles may be obtained from service providers that use consumer profiling when planning their product pricing strategies. This type of information should generally be more readily available as it is less sensitive than actual revenue data. It can provide data for the unit value
approach or for detailed weights in the matching methodology. National regulatory authorities may also be able to provide detailed customer use profiles on a confidential basis.

11.248. The use of consumer profiles is quite straightforward in principle. Once the profiles have been identified, each service plan selected for pricing is priced and re-priced based on the (fictional) bills that these virtual customers would receive. Costs to each customer group can be estimated with reference to several plans using sales information to determine the relative importance of the different plans on offer and the corresponding consumer groups being targeted. The overall index is then derived in the usual way by weighting together the average unit costs for these user profiles according to the relative importance of each consumer profile (representing a category of consumer) in expenditure terms.

Table 11.6 Consumer Profiles: Mobile Telephones

<table>
<thead>
<tr>
<th>Specification</th>
<th>Unit</th>
<th>Low usage customer</th>
<th>Medium usage customer</th>
<th>High usage customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total usage (per billing period) excluding text messages</td>
<td>Minutes</td>
<td>14</td>
<td>24</td>
<td>59</td>
</tr>
</tbody>
</table>

**Calls**

*Within same mobile network*

<table>
<thead>
<tr>
<th>Peak</th>
<th>Number*</th>
<th>5 (35)</th>
<th>10 (35)</th>
<th>15 (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak</td>
<td>Number*</td>
<td>10 (55)</td>
<td>10 (65)</td>
<td>20 (80)</td>
</tr>
</tbody>
</table>

*To different mobile network*

<table>
<thead>
<tr>
<th>Peak</th>
<th>Number*</th>
<th>0 (0)</th>
<th>5 (20)</th>
<th>15 (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak</td>
<td>Number*</td>
<td>5 (20)</td>
<td>10 (30)</td>
<td>20 (40)</td>
</tr>
</tbody>
</table>

*To landline*

<table>
<thead>
<tr>
<th>Peak</th>
<th>Number*</th>
<th>0 (0)</th>
<th>0 (0)</th>
<th>5 (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak</td>
<td>Number*</td>
<td>5 (3)</td>
<td>5 (8)</td>
<td>5 (13)</td>
</tr>
</tbody>
</table>

**Other services**

<table>
<thead>
<tr>
<th>Text messages</th>
<th>Number</th>
<th>5</th>
<th>10</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>Mb</td>
<td>500Mb</td>
<td>2GB</td>
<td>10GB</td>
</tr>
</tbody>
</table>

* in brackets, average call length in seconds

11.249. A potential problem with this method is that if a new plan is introduced in the following year that is different and cheaper, but the old plan continues to be priced, then the fall in unit value prices will not be reflected in the index. A new plan could offer higher or lower average prices and the CPI would miss the price change going from year one to year two.
This problem could be addressed by updating the weights used when introducing the new plan. Also, the consumer profile approach is sometimes based on the plan that would be cheapest for the consumer. This assumes consumers minimize their costs and have full knowledge of the options and are able to move to the cheaper plan without any barriers such as a contract that ties the customer into a particular tariff for a minimum length of time.

**The sample of bills approach**

*11.250.* This is in principle very similar to the consumer profiles approach but may be more difficult to apply in practice given the fact that it is more data intensive, requiring access to more detailed personal and commercially sensitive information.

**5. Quality adjustment**

*11.251.* Dealing with changes in quality can be a challenge. The practical options to account for quality change and new products are different for different tariff strategies.

**Matched samples**

*11.252.* The detection of quality changes depends on the degree of detail in the product specifications at the lowest level of the index. This is because the matched sample method will not take account of price changes outside the specifications, for example, those related to the total volume of the service used. In the matched sample approach, the quality change situation can be thought of as similar to the situation confronted by a disappearing product (i.e., that some pre-specified element of the tariff is no longer available for pricing). A replacement should be selected for the disappearing element of the tariff and the elements compared directly (where applicable) or treated as entirely new products. An illustrative example follows for public transport bus fares.

*Public bus transport in City X*

- Old tariff element. Bus fare from city centre X to Suburb Y, on a Saturday, 10.30 pm. (night tariff, last connection)
- New tariff element. Bus fare from city centre X to Suburb Y, on a Saturday, 9:30 pm. (night tariff, last connection).

The basis for the direct comparison is the index compiler’s judgement, that from the consumers’ point of view the change in timing is not a significant change.

*11.253.* The price statistician could also reason that the quality of the service has changed and an allowance for that should be made in the index. But in drawing this conclusion and making a quality adjustment the CPI statistician should not use their subjective judgement or personal view. In this particular example some travellers may consider this change in tariff and timetabling as a reduction in quality of service if last shows at cinemas finish at 9:45 pm mean that a bus journey is replaced by an expensive taxi journey home, but it could well be that other users of the bus actually welcome the earlier timing because most restaurants close at 9:15 pm and they can now avoid waiting for a bus, in the cold, until 10:30 pm. So for them it is a quality improvement. If possible, the price statistician should canvass the views of users for an indication of whether the change is considered to be for the better or for the worse. An indication of subsequent changes in passenger numbers may confirm whether the initial assessment was correct but even this involves some judgement. The decision to use direct
comparison, without quality adjustment, is always to a certain extent judgemental and should therefore be based on explicit lines of reasoning so that it is transparent and can be justified.

**Unit values**

11.254. The unit value approach regards quality differences related to different pricing schemes as implicit price differences. The detection of quality change depends on the degree of detail in the specification of “the unit of consumption”. Unit values perform best when there is a high degree of homogeneity among the items within a product category. To prevent quality differences from affecting the price index, the specifications of the “units of consumption” should be as detailed as the available data permit to maximise homogeneity.

11.255. In the example below (Table 11.7), relating to bus fares for juveniles, the previous tariff categories have to be ‘transformed’ into the new ones. For customers aged from 12 to 16 there was a price rise of 60 percent (from $5 to $8) while for 16-year olds there was a price decrease of 20 percent (from $10 to $8). The proportion of customers falling in these categories, (i.e., the previous consumption patterns), should be used to calculate the average price change, or in the absence of such information the price statistician might assume about the proportions based on the available information, including revenue information from the bus company.

Table 11.7 Bus fares: old and new tariffs

<table>
<thead>
<tr>
<th>Current ticket prices ($)</th>
<th>New ticket Prices ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>5-11 years</td>
</tr>
<tr>
<td>5-15 years</td>
<td>$5</td>
</tr>
<tr>
<td>Teenagers</td>
<td>12-16 years</td>
</tr>
<tr>
<td>= $5</td>
<td>$8</td>
</tr>
<tr>
<td>Adults</td>
<td>16 and above</td>
</tr>
<tr>
<td>= $10</td>
<td>17 and above</td>
</tr>
<tr>
<td></td>
<td>= $10</td>
</tr>
</tbody>
</table>

**Consumer profiles**

11.256. The key issue when dealing with quality changes in the context of consumer profiles is the choice of which consumer profiles should be priced through the period of tariff change and/or change in service provider. The example of a profile given below is based on a situation where broadband internet service providers increase their download speeds substantially (i.e., an increase in quality), while keeping prices constant. Note that a situation may even present itself in which an increase in download speed can also be accompanied by a price reduction. In this example it is assumed that the differentiating factors of an internet-provided broadband connection is limited to the download speed and that this is reflected by different tariffs (see Table 11.8). It therefore follows that the increase in speed is a quality enhancement – in the market place this feature is clearly a price-determining characteristic. As a result of the increased speed, page loading times will be faster and consumers will typically experience improved streaming services such as videos and movies. Note that most times, only under more intensive applications (e.g., downloading large files such as movies) will the
difference in bandwidth be more noticeable for consumers. But this case may not hold in the future with improvements to the internet infrastructure.

11.257. The assumption may be made that the product versions provided are also, in effect, descriptions of consumer profiles so essentially making the consumer profile approach, in this case, equivalent to the unit value (or unit price) approach. This applies as long as usage is such that the average price paid equals the unit price in both periods. This assumption should be tested.

11.258. The key point is that a unit price for the ‘volume of use’ is calculated for each class of consumer, in essence, a form of stratification is applied. Implicit in the unit value approach is a specific form of quality adjustment - namely, a quantity adjustment.

Table 11.8 Internet services

<table>
<thead>
<tr>
<th>Service level (slow, medium or fast speed)</th>
<th>Current speed in Kbit/s (down/up)</th>
<th>New speed in Kbit/s (down/up)</th>
<th>Difference in speed (%) (down/up)</th>
<th>Current Price ($)</th>
<th>New Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow</td>
<td>256/64</td>
<td>384/96</td>
<td>50/50</td>
<td>34.90</td>
<td>34.90</td>
</tr>
<tr>
<td>Medium</td>
<td>768/128</td>
<td>1024/160</td>
<td>33/25</td>
<td>52.25</td>
<td>52.25</td>
</tr>
<tr>
<td>Fast</td>
<td>1536/256</td>
<td>2048/320</td>
<td>33/25</td>
<td>86.10</td>
<td>79.95</td>
</tr>
</tbody>
</table>

11.259. Table 11.9 below presents a simplified example where there are just two speeds - low and high - and where only the download speeds, expressed in Megabits per second (Mbs), change. Treating the two speeds as separate elementary aggregates, the price per Mbs in $ both in the base period and in the next period can be calculated. In the final column these unit values (prices) are expressed in terms of indexes with the base period equalling 100. Using standard index methodology (i.e., a Laspeyres-type price index formula) we then take an expenditure weighted average of each elementary aggregate index to obtain the overall index for internet services. Note that the expenditure weights are respectively 0.75 and 0.25 for low- and high-speed services. Although these weights are likely not available from the HBS, they could be obtained from administrative sources such as the regulators, the service providers or from market-based intelligence. The quality-adjusted index so derived in the next period is 76.7, what corresponds to a price fall of 23.3%. Note again, that if we had wrongly taken the average of the price relatives (the Carli index), the fall in the index would have been predictably greater at 26.5%. Interestingly, had no quality (or quantity) adjustment been applied, then the price index for internet services in the next period would have been 105.4, which is obtained by using only the observed package prices in the calculation of the index (in period 1: 55.95, 74.95, and in period 2: 60.00 and 74.95). By using the unit value as the price when computing the index, the improvement in the internet service which consumers now have access to is accounted for in the index, which is the proper treatment in this case.

Table 11.9 Changes in the tariff for internet prices

<table>
<thead>
<tr>
<th>Share of expenditure</th>
<th>Download speed in Mbs</th>
<th>Transfer allowance in GB</th>
<th>Price for package in $</th>
<th>Price per MbS in $</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE PERIOD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Low Speed</td>
<td>0.75</td>
<td>30</td>
<td>150</td>
<td>55.95 (100)</td>
<td>1.865</td>
</tr>
<tr>
<td>High Speed</td>
<td>0.25</td>
<td>120</td>
<td>Unlimited</td>
<td>74.95 (100)</td>
<td>0.625</td>
</tr>
<tr>
<td>Weighted average price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.55 (100.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEXT PERIOD</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Speed</td>
<td>0.75</td>
<td>45</td>
<td>150</td>
<td>60.00 (107.239)</td>
<td>1.333</td>
</tr>
<tr>
<td>High Speed</td>
<td>0.25</td>
<td>130</td>
<td>Unlimited</td>
<td>74.95 (100)</td>
<td>0.577</td>
</tr>
<tr>
<td>Weighted average price</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.14 (73.548)</td>
</tr>
</tbody>
</table>

Expenditure weighted average of the two elementary aggregates | 76.686 |

New service providers and new products

11.260. From the consumer’s point of view many tariff-priced services are relatively uniform. Electricity delivered to the consumer is almost homogeneous by definition, the main difference in service level being reliability of supply. The same may hold true for other services, like telephone services or internet services, despite the service-provider’s attempts to differentiate their products and make their pricing structures more and more opaque. Therefore, different suppliers of tariff-priced services could be considered as providing the same type of service and treated as substitutes for each other.

11.261. Changes in the market mix of a clearly homogeneous product from different tariff structures and suppliers should be incorporated in the index. Index construction will require information about the market share of different producers and the various service plans. As a general principle, for homogeneous services the price impact of a new service provider should be shown in the index, that is, the target price measure for homogeneous services is the unit price in the overall market for the service, quality adjusted as necessary.

11.262. In some tariff-priced parts of the retail market new service elements are frequently introduced (for example, multimedia messages or e-mail on mobile telephones). These should be introduced into the pricing schemes or consumer profiles by chaining, once they have significant market share.

6. Classifications

11.263. COICOP, as well as other national classification systems, are not constructed with a stratification structure that is sufficiently detailed to reflect the various tariffs for those products that are subject to such pricing practices. For example, electricity under the COICOP hierarchy appears as a product Class (5-digit COICOP) in its own right (04.5.1.0) and according to its official description includes: associated expenditure such as hire of meters, reading of...
meters, standing charges, etc. A finer breakdown is not given in COICOP. However, when sellers of a product, such as electricity, use tariff pricing, the accuracy of the CPI can be improved if the price index for this product is constructed in a way that reflects as accurately as possible the market realities. In other words, a class-level price index should be comprised of a number of sub-indexes, each one corresponding to its particular tariff price. This may require the use of a specially designed classification for the purpose of stratification within an elementary aggregate.

H. Telecommunications

1. Introduction

11.264. Telecommunications is a specific case of tariff pricing (for more information on tariffs, see section on tariffs above), but the tariffs tend to be less transparent, more complex, and dynamic with frequent updates of the tariff structures and prices.

11.265. The global telecommunications sector is subject to rapid change. Technological innovation has led to a proliferation of new services which has resulted in suppliers adopting a range of new strategies to differentiate their services in order to attract and retain customers.

11.266. Characteristics of significance to CPI compilers include:

- Fewer linear pricing schedules and the adoption of different pricing structures across providers;
- The increasing tendency to offer contracts that bundle services together in different ways to appeal to different types of consumers; and
- Rapid changes in the contracts offered to consumers as an effective means of encouraging the take-up of the ever-increasing range of services.

11.267. Increasingly, telecommunication companies offer services via plans that require customers to enter into longer-term contractual arrangements with the providers. Two broad types of plans are typically offered. The first has no fixed duration and makes allowance for the provider to change pricing structures with advance notice to the consumer. The second, and increasingly more popular, type provides a fixed term contract (generally of one to two years) with prices fixed for the duration of the contract, with scope for annual updates by an agreed measure of inflation, which should be accounted for in the price index. The type of contract can influence the approach to measurement. For instance, experience suggests that a consumer profile approach can work best for computing a price index for customers on a pre-paid tariff subject to the relevant information being available, otherwise an alternative could be a matched sample. Similarly, where customers are on a fixed term contract other approaches may be adopted. One such method selects for pricing the appropriate package from each service provider and assumes a rational consumer who has perfect market knowledge and uses this to purchase an appropriate package at the lowest price. To facilitate this, the concept of a "rational" consumer is sometimes used as the basis for monthly comparisons. Each user profile is assumed to switch freely between packages, picking up the cheapest available each month but constrained by the reality that customers are generally unable to move service providers without financial penalty. Thus, assuming an annual contract, then each month only a twelfth of customers have the opportunity to move service provider. In some cases, moving to a
different tariff offered by the same service provider prior to the end of contract also is subject to a penalty. It is often desirable to compute separate indices for the different types of tariffs and combine these using sales weights.

11.268. If NSOs follow traditional sampling approaches for fixed term contracts and select price schedules according to some base period set of plans, and follow them until they expire, no price changes will be observed (likewise if plans expire and replacements are linked to show no change). The marketplace reality, by contrast, is that average prices for telecommunication services have declined significantly in many countries in recent years. Thus, perhaps the biggest challenge is the issue of quality adjustment when there is a change of service provider. For instance, where one service provider is more reliable than another. This is generally ignored as being unmeasurable.

11.269. The lack of a harmonized method across NSOs demonstrates the complexities of this sector. It is recognized that current best practice approaches have difficulty in accounting for substitutions across providers and in adequately accounting for changes in the quality of the services provided.

11.270. With the telecommunications sector under continual change, statistical practices should be constantly reviewed. NSOs that are considering the construction of telecommunications indices for the first time, or are reviewing their current practices, are advised to seek out the most recent research in this field. Notwithstanding this, this chapter seeks to provide a general description of four approaches that are currently used by NSOs to measure changes in the prices of telecommunication services. The approaches are:

- representative items – matched samples;
- representative items – unit values;
- customer profiles;
- sample of bills.

11.271. Each approach is briefly described, and the potential advantages and deficiencies noted. The choice of approach will depend largely on the market conditions prevailing in individual countries, the sophistication of the index compilation system in use, and the extent of access to accurate and timely telecommunication services data. Depending on these factors, it may be appropriate to use different approaches for different telecommunication services, or even for the different services of specific providers.

2. Matched samples - representative items

11.272. Matched samples are where a full tariff list or an element of the tariff structure is treated as a product specification and re-priced in subsequent periods. The use of matched samples mirrors traditional techniques adopted elsewhere in the CPI. Total expenditure of reference group households on telecommunication services in the weighting base period is derived from sources such as HBSs. A sample of service providers is approached to obtain

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22 For more information see Costing mobile telephone calls: the use of constrained user profiles. Adrian Ball and David Fenwick, Ottawa Group, Helsinki, 2004.
information on revenue by types of services (such as line rental, local calls, international calls, handset sales or rentals, connection fees, voicemail services, internet charges and so on) and a number of these are selected as representative items of the different tariff elements, or all are taken, with weights derived from the revenue data.

11.273. For each representative item, a sample of detailed specifications (such as a telephone call from location A to location B, at time X, of duration Y minutes) is drawn up to sufficiently represent the range of specific services purchased by consumers within each representative item or tariff element. This sample of specifications is held constant from period to period, and movements in the indices for representative items are computed, based on the movements in the prices of this matched sample of specifications. Table 11.10 below illustrates the approach. The detailed application will depend on the tariff structure. For instance, in some countries there will be a regional dimension.

<table>
<thead>
<tr>
<th>Table 11.10 An illustrative index structure for telecommunication services (representative item approach)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed line services</strong></td>
</tr>
<tr>
<td>Telephone connection costs</td>
</tr>
<tr>
<td>Telephone line rental</td>
</tr>
<tr>
<td>Local calls - peak</td>
</tr>
<tr>
<td>- off peak</td>
</tr>
<tr>
<td>Long distance national calls - peak</td>
</tr>
<tr>
<td>- off peak</td>
</tr>
<tr>
<td>International calls - peak</td>
</tr>
<tr>
<td>- off peak</td>
</tr>
<tr>
<td><strong>Mobile telephones</strong></td>
</tr>
<tr>
<td>Connection costs</td>
</tr>
<tr>
<td>Handset purchase or rental</td>
</tr>
<tr>
<td>National calls</td>
</tr>
<tr>
<td>International calls</td>
</tr>
<tr>
<td><strong>Payphones</strong></td>
</tr>
<tr>
<td>Local calls</td>
</tr>
<tr>
<td><strong>Internet services</strong></td>
</tr>
<tr>
<td>Connection fees</td>
</tr>
<tr>
<td>Usage fees</td>
</tr>
</tbody>
</table>

Note: peak and off-peak are defined times. For example, Peak may be between the hours of 9 a.m. and 6 p.m. on weekdays and Off-peak any other time.

11.274. The list of representative items (the lowest level in the structure) should be sufficient to be representative of price behavior as a whole, taking account the published tariffs. As with other parts of the CPI basket, expenditure on those services not selected for pricing should be distributed over the other services within that general class for deriving weights. For example, the expenditure on any fixed line services not selected for pricing should be distributed over those fixed line services selected.

11.275. Compared to suppliers of goods, service providers have an almost infinite capacity to tailor both the services and the prices they charge, for example based on the time at
which the service is provided. A five-minute telephone call at 9 a.m. can be regarded as a different product to an equivalent call made at 9 p.m., and service providers are able to charge different prices for these calls. Representative items therefore need to be described in sufficient detail to capture all the price-determining characteristics.

11.277. Furthermore, given the ease with which providers can adjust the differential aspects of their pricing schedules (such as the time span designated as peak and the duration of a call before a different rate applies), it is necessary to use a sufficient number of varied specifications to capture these aspects reliably. It is not sufficient to simply describe a call as peak or off-peak, or from zone 1 to zone 2 without defining the call in more detail. Illustrative examples of the types of specifications that may be applicable for two representative items – international calls (fixed line) and usage fees (internet services) – are provided in Table 11.11.

<table>
<thead>
<tr>
<th>Representative item</th>
<th>Examples of specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>International calls (fixed line)</td>
<td>Peak: Plan A: Call to Athens at 8 a.m. on a Friday, duration 10 minutes</td>
</tr>
<tr>
<td></td>
<td>Off-peak: Plan B: Call to London at 9 p.m. on a Saturday, duration 5 minutes</td>
</tr>
<tr>
<td></td>
<td>Peak: Plan A: Call to New York at 11 a.m. on a Wednesday, duration 20 minutes</td>
</tr>
<tr>
<td></td>
<td>Off-peak: Plan B: Call to Paris at 7 p.m. on a Sunday, duration 15 minutes</td>
</tr>
<tr>
<td>Usage fees (internet)</td>
<td>Plan A: Broadband connection, unlimited downloads, speed 38Mb</td>
</tr>
<tr>
<td></td>
<td>Plan B: Fibre broadband, unlimited downloads, speed 300Mb</td>
</tr>
<tr>
<td></td>
<td>Plan C: Mobile broadband, 24-month contract, 32GB per month</td>
</tr>
</tbody>
</table>

Note: peak and off-peak are defined times. For example, Peak may be between the hours of 9am and 6pm on weekdays and Off-peak any other time.

11.278. It is assumed that the origin of both the telephone calls and internet access is also identified. All minutes consumed are domestic. It should also be noted that the nature of internet access generally precludes pricing on the basis of access, and hence the timing of access cannot be as tightly defined as for international telephone calls: instead, all specifications are for total monthly usage.

11.279. The most challenging aspect of this approach is obtaining the data required to establish the representative items and to identify suitable specifications, as this will require detailed information from service providers. Once implemented, most price information should be readily available from published fee schedules, minimizing the burden on respondents between reviews of the specifications. However, much reliance will be placed on the service provider to supply the corresponding expenditure information.

11.280. The dynamic nature of the telecommunication sector and the common use of the pricing mechanism to change consumer behavior are likely to require that the specifications
be updated frequently. A major practical challenge associated with the matched samples
approach is ensuring that exactly the same product specification is priced each month and that
the matched samples methodology is adhered to. When a specification disappears (i.e., a
specific plan is no longer offered), all efforts must be made to find a suitable comparison
specification. Where specifications are replaced, it is possible to argue that, because different
plans involve different conditions of sale, they are fundamentally different products. It is
equally reasonable to question whether the whole of the price difference between plans is due
to quality differences, particularly in light of the evidence of ever-increasing volumes and
reductions in unit values. The difficulty lies in quantifying the quality differences.

3. Unit values - representative items

11.281. The unit value approach is where the overall price or, more precisely, the
revenue generated by one unit (for example a long-distance telephone call for customers of a
specific supplier) is used to monitor prices. Unlike the matched samples approach individual
specifications are not priced. The unit value approach can be applied instead of the matched
samples approach when the quality of the service is homogeneous between providers with the
advantage that is less resource intensive. The indicative price for each representative item is
calculated from revenue and quantity data collected from the service provider. For example,
the price for national long-distance calls can be derived as the total revenue received from such
calls divided by the number of call-minutes. Similarly, in the case of monthly line rental fees,
the price can be calculated as the total revenue from line rental divided by the total number of
subscribers.

11.282. Compared to the matched samples approach, the unit value approach attributes
all the difference between plans, and time and duration of calls to price (i.e., the quality
difference is assumed to be zero). The unit value approach is also seen as providing a method
for accounting for price change when the items are subject to a proliferation of discount
schemes or promotions (e.g., $2 to call anywhere for as long as you like for the next week).
While the approach avoids some of the customer sampling choices inherent in some other
methodologies, compilation does rest on analysis of aggregate company data and so is likely
to be less timely than methodologies based on pre-published prices. However, care needs to be
exercised with this approach to ensure that the measure is not affected by undesirable
compositional changes. A unit value index should only be constructed for truly homogeneous
items. This points to a requirement for defining the representative items at a relatively fine
level of disaggregation. For example, international calls may need to be further subdivided by
destination to avoid changes in unit values arising purely from shifts in the numbers of calls
made to different destinations. Thus, unit values need to be calculated at a sufficient level of
detail to minimize the effect of changes in customer usage being reflected in the index (see
next paragraph).

11.283. Although this approach appears to address at least some of the known
deficiencies of the matched sample approach, it is likely to exhibit period-to-period volatility
because of compositional shifts, if only because of seasonal variations in usage patterns. There
are also several respondent and data quality aspects that need to be considered. The unit value
approach imposes a greater data burden on service providers, who often regard revenue and
quantity data as highly sensitive. To be effective, the service providers also need to be able to
furnish data relating only to households (i.e., they have to be able to separate out revenue and
quantities relating to businesses) and the revenue information needs to conform to the requirements of the index. For example, some service providers may record certain discounts as a marketing expense, rather than a reduction in revenue as is required for the unit value index.

4. Customer profiles

11.284. For marketing purposes, telecommunication companies often classify their customers according to their volume of service use. Although the number of categories can vary, a common approach is to use a three-way classification: low-volume, medium-volume and high-volume customers. Service providers analyze customer usage patterns by category when developing new plans targeted specifically at each group. National regulatory authorities may also be in a position to provide detailed customer use profiles on a confidential basis.

11.285. NSOs can take a similar approach for the construction of price indices by devising profiles which reflect the average usage patterns for each category of consumer. Costs faced by these average consumers in each period can then be estimated by reference to the rates set out in that plan that is currently most commonly applicable to each customer category. Variations on this general theme include estimation of costs based on the plan that would deliver the cheapest overall cost, individually, to each of the representative consumer profiles (based on the simplifying assumption of cost-minimizing consumer behavior with perfect knowledge). This has the advantage of providing a clear basis for choosing a comparable replacement should an existing package cease to be available. Alternatively, costs to each customer group may be estimated with reference to several plans, where sales information indicates that this is a closer approximation to reality. The overall index is derived by weighting together the results from these user profiles according to information about the relative importance of each category of consumer.

11.286. In constructing the aggregate index, these calculations are likely to be made for a representative sample of service providers, exploiting information on their overall market share for sampling or weighting purposes, if available. However, this opens up the possibility of fully exploiting all the possible relevant permutations of profiles and companies. Information on the distribution of customer profiles by service provider may not be available or at least may be very costly to obtain. Table 11.12 gives an example of a profile for mobile telephone calls. This approach can be extended to include internet usage.

Table 11.12 Example of a user profile for mobile phone services

<table>
<thead>
<tr>
<th>Specification</th>
<th>Unit</th>
<th>Low usage customer</th>
<th>Medium usage customer</th>
<th>High usage customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total usage (per billing period)</td>
<td>Minutes</td>
<td>14</td>
<td>24</td>
<td>59</td>
</tr>
<tr>
<td>excluding text messages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Calls
Within same mobile network

<table>
<thead>
<tr>
<th></th>
<th>Peak Number*</th>
<th>5 (35)</th>
<th>10 (35)</th>
<th>15 (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak Number*</td>
<td>10 (55)</td>
<td>10 (65)</td>
<td>20 (80)</td>
<td></td>
</tr>
</tbody>
</table>

To different mobile network

<table>
<thead>
<tr>
<th></th>
<th>Peak Number*</th>
<th>0 (0)</th>
<th>5 (20)</th>
<th>15 (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak Number*</td>
<td>5 (20)</td>
<td>10 (30)</td>
<td>20 (40)</td>
<td></td>
</tr>
</tbody>
</table>

To landline

<table>
<thead>
<tr>
<th></th>
<th>Peak Number*</th>
<th>0 (0)</th>
<th>0 (0)</th>
<th>5 (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-peak Number*</td>
<td>5 (3)</td>
<td>5 (8)</td>
<td>5 (13)</td>
<td></td>
</tr>
</tbody>
</table>

Other services

<table>
<thead>
<tr>
<th></th>
<th>Text messages Number*</th>
<th>5 (20)</th>
<th>10 (25)</th>
<th>30 (35)</th>
</tr>
</thead>
</table>

* in brackets, average call length in seconds

11.287. Consistent with the fixed basket approach, the activity of consumers (in terms of numbers and types of calls, numbers of texts and amount of internet data used) is held constant between comparison periods. Prices may, of course, change when not fixed by contract or when plans are replaced. Index compilers may also allow rates to change in response to a changing mix of plans within customer categories. This approach assumes that tariff changes fundamentally represent price change rather than quality change, but eliminates the cruder compositional effects associated with the unit value approach, which does not take account of customer profiles.

11.288. The success of this approach is determined by the degree to which the profiles truly reflect consumer behavior and therefore a great deal of thought needs to be put into their development. The construction of the customer profiles will require a high degree of cooperation from service providers or regulators and, given the known volume changes, they will require updating at regular intervals, possibly more frequently than other items in the CPI basket. Data on plan usage by customer category for each index compilation period (a month or quarter) may also be required if compilers decide to allow for such effects.

5. Sample of bills

11.289. This method can be seen as a more refined application of the customer profile approach. A fixed level of service activity from an actual sample of customers is priced each month rather than defining profiles representative of the average monthly activities of customers. A sample of customers should be selected from each category of customer (low, medium and high-volume customers) and, ideally, the bills (or activity statements) should cover a full year’s activity.
The perceived advantages of this approach compared to the customer profile approach are:

- It is able to take account of any within-year variations in customer behavior (e.g., a higher incidence of international calls associated with religious or cultural events of significance). But it can be argued that this contravenes the principle of the fixed basket.
- It better reflects the diversity of consumer behavior by identifying actual activities (i.e., calls actually made by a sample of consumers) and potentially captures out of contract activity charges (e.g., exceeding allowances).
- It accommodates within each bill any instances of annual charges.
- It allows for the detection and recording of other sources of price change associated with customers’ overall relationship with the service provider (e.g., where overall discounts are provided when aggregate monthly spending exceeds certain values, or where an aggregate discount is provided if customers acquire bundles of services from a single provider, such as landline phone plus internet).

Calculation of the index still requires monthly information on the relative significance of various plans by customer category. With the sample of bills re-priced each period, the resulting index measures the cost of a full year’s consumption at the prices prevailing in each index period compared to the same cost at base prices. This assumes that the quality difference between old and new plans is zero for households changing plans. Because of the generally larger number of bills (compared with the number of available profiles), price changes can be reflected more gradually, as the proportion of bills priced using each plan can better mirror the changing population distribution.

As with the profile approach, it is important that the sample of bills is updated regularly to reflect changes in consumption patterns and the take-up of new services such as call-waiting, voicemail and text messaging. Although, with adequate sampling, the bill approach is likely to provide a better measure of the aggregate rate of price change for telecommunication services as a whole, it may not be best suited to the calculation of separate indices for the components of those services (depending on whether overall or bottom-line discounts are offered). The approach is also data intensive, requiring a large number of calculations each period and thus a relatively advanced data processing system capable of handling and manipulating large amounts of data. It can also suffer from lack of timeliness.

I. Transport Services

1. Introduction

Transport services cover a wide range of modes of transport from aeroplanes, trains, buses and ferries, to taxis and motorbike taxis, and to private cars. The example given in later paragraphs focus on air travel.

Transport, as defined by COICOP Division 07 covers the purchase of vehicles (COICOP 7.1), the operation of personal transport equipment (COICOP 7.2), passenger transport services (COICOP 7.3), and transport services of goods (COICOP 7.4).
The current chapter does not cover the purchase of vehicles or the operation of personal transport equipment (COICOP 7.1 and 7.2), rather it relates to transport services provided by and purchased from third parties as defined by COICOP 7.3 and 7.4. The latter includes bus and train fares, taxi fares and the purchase of air and ferry tickets.

Note that there are common elements between this section and the one on tariffs. Most particularly, the section on tariffs uses examples of tariffs relating to public buses to illustrate the application of the matched samples and unit value approaches. These should be referred to when computing indices relating to transport services.

Note also that some public transport services may be paid for in full or in part by government or non-profit institutions and are provided free or at a nominal price to households. The subsidies are social transfers in kind in the SNA. The standard convention is that the price entering the CPI should be the subsidised price.

2. Public Transportation

Elementary aggregates should differentiate between different modes of transport as reflected in the structure of COICOP (purchases of transport services are generally classified by mode of transport in COICOP). The computation of prices should reflect the different tickets available for purchase from different channels. In the case of airlines, in particular, different prices may apply to online bookings compared with bookings made through an agent and to advanced non-refundable purchases compared with, say, a fully flexible fare purchase close to or on the day of travel.

Let $P$ be the total cost of providing a trip from $A$ to $B$ and let $Q$ be the number of trips carried by the transport system from $A$ to $B$ during the period under consideration. Suppose the household sector pays only $sP$ of this price then the household price is $sP$ and the quantity is $Q$. Obtaining the prices for inclusion in the elementary aggregate normally requires a method of sampling which takes account of complex fare structures.

The index for airline and other public transport services should use the prices of a sample of specific trips rather than revenue per kilometre or per passenger-kilometre. If the CPI has strata for different geographic areas, which is typical in large countries, points of origin - airports, train stations, motor coach stops, etc. - should be chosen in each area and trips selected within origins or destinations in those areas. There are generally multiple classes of service. In addition, transport fares may vary by day of the week, time of day and time of year in response to variations in demand, and to how long in advance the ticket is purchased. The selected trips should reflect this variety but hold these variables constant.

For airfares, the sample should be stratified by domestic, short-haul and long-haul flights as scheduling and service providers between these categories can vary widely.

Once chosen in the base period, the route, the departure and arrival times and the ticket type and class of travel should remain the same throughout the year. While some flexibility should be allowed to accommodate changing schedules for specific routes, if specifications stray too far from that selected in the base period, the replacement ticket should be considered non-comparable and a new base price imputed based on the movement of prices for routes in the same category. This is the standard form of implicit quality adjustment.
11.303. For sample selection of routes and providers and for weighting between routes and travel sub-categories (long-haul, domestic, etc), expenditure data from appropriate surveys or administrative sources should be used. Where this is unavailable, passenger numbers and average prices can be used to calculate expenditure data. Note that the coverage of routes depends on whether the CPI covers the national or domestic concept (as defined in Chapter 2) and, if purchased online, the location of the transaction and service delivery. For instance, if a ticket is purchased online from a foreign carrier it can be argued that the purchase should be attributed to the country where the consumption first commences. This is because the consumer needs to be present at the location of the service provider for consumption to commence, and the place of consumption normally determines where the sales tax, such as VAT, is actually paid. If this reasoning is followed, then such transactions for the booking of flights totally outside the country of residence will be excluded from a CPI following the domestic concept. But there is no international consensus on this and different situations can arise. For instance, it can be argued that if a ticket for a journey originating in the home country is purchased online sitting at a computer in the home country and from a website located overseas then the purchase should be allocated to the country where the website is located. A more detailed discussion of these issues can be found in the section on internet purchases.

11.304. Providers of transport services often practise some form of price discrimination so that different groups of travellers will be charged different fares or prices for essentially the same service. Examples are special discount fares for students or retired people, or trips booked for weekend departure or return, and a 30-day advance booking. Since these can change frequently, CPIs usually ignore minor changes in the requirements for a discount fare.

11.305. The recommended approach to differential and complex fare structures that is most likely to ensure like-for-like comparisons is to price the cost of a journey on a specific day of the month (e.g., the fourth Tuesday) between two points, pricing a ticket for transportation purchased at a fixed time in advance and with fixed terms and conditions. This should be done for various fare classes, for example a full economy fare (if purchased in significant quantities for personal travel) and a typical discounted economy fare, which may include travel restrictions such as for a stated date and time and not being refundable. Sometimes prices can be downloaded by staff at head office from reservation systems available on the internet, although sometimes the full cost is not shown without going through the procedures for purchase.

11.306. How far in advance of the date of travel a ticket price is collected should also be taken into consideration when selecting a sample. In airfares, for example, ticket prices can increase the closer the booking is made to the departure time, because the number of available seats for a specific route becomes limited. However, in other cases there can be last minute discounts to fill empty seats. Further stratification of the sample should be considered to

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23 However, for goods purchased over the internet such as books and clothing or a car it can be argued that both the expenditure and the price should be allocated to the location where the good is delivered. The rationale for this is because consumption can only take place after delivery. Also, the final purchase price for the good itself and the associated delivery costs can only be determined after a delivery address has been supplied. Usually this also corresponds to the country where the VAT is actually paid by purchasers. The country of delivery is normally the country in which the purchaser resides. Thus, if this reasoning is followed such purchases of goods will be included in a CPI following the domestic concept.
account for this. For example, by collecting prices for the same departure time and date but collecting separate prices for booking the ticket so many months, weeks or days in advance, depending on the nature of transport service being priced. Again, taking airfares as an example, once the routes, ticket types and departure date have been selected, price collection for this sample could be repeated six, three and one month in advance to capture the changing price as the departure date approaches.

11.307. Changes in schedules can cause price changes. For example, an airline might cancel its noon flight, forcing passengers to take the evening flight, which is priced higher because that is a time of peak demand, unless a competitor airline can be found that offers a noon flight. If the CPI was following the price of the noon flight, it must now price the evening flight if the customer has no choice but to use it, or price a noon flight available from an alternative “comparable” airline if available. The replacement journey should be treated as comparable and the full price change should be reflected in the index if it is assumed that there has been no change in the quality of the service being provided. But the latter might be a bold assumption. For instance, if an evening flight is inconvenient because it means travelling the day before and staying in a hotel in order to attend a morning appointment the following day. In the latter case, the noon flight might best be treated as a missing item or the evening flight selected as a non-comparable replacement and a new base price calculated for it.

11.308. Data challenges can be encountered when selecting representative items, estimating weights, and pricing selected flights especially with the emergence of online booking. The HBS apart, in the case of civil aviation the main data sources for both sampling and weights estimation are: airports; the airlines; and national civil aviation authorities, which often collect detailed data covering the entire country. There may also be market research companies and trade organisations which collect data. The data most likely to be available for the sampling of flights will generally relate to the total number of passenger flights taken and is likely to include business travellers. Nonetheless, such data will be better than using a subjective approach and assumptions can be made, such as all Business Class bookings and all First Class bookings are for business purposes. Normally, expenditure data on last minute deals can be gathered either through the HBS or, more likely, through an ad-hoc survey of travel service providers if not available from other sources.

11.309. Transport ticket prices should feed into the index at the time of travel, not at the time they were booked. For example, a ticket price for a December flight should feed into the December index even if the price relates to a purchase in the previous October.

11.310. An example of index calculation for bus fares is given in the section on tariffs.

J. Health, education and social protection services

1. Introduction

11.311. Health, education, and social protection cover a wide range of services. The COICOP coverage and classification is given in Appendix C.

11.312. Transactions that involve an expenditure by a household in the health, education, and social protection services fields are in scope and should be covered by the CPI if the latter is to be consistent with the concept of household final consumption expenditure.
But it should be noted that in many countries, various government units or non-profit institutions serving households (NPISH) will finance and pay for the full or partial provision of a significant proportion of goods and services in the health, education, and social protection sectors.

11.313. The overall position regarding treatment in the CPI is as follows:

- Only expenditure by households that is a direct result of purchase of individual goods or services is within the scope of CPI. These prices should be net of direct reimbursements. Reimbursements refer to payments to households by government units, social security administrations or NPISHs that are made as direct consequences of purchases of individually specified goods and services, initially paid for by households.

- Obligatory payments are excluded from the scope of the index (for example, employee’s contributions to social security schemes). These are collected to finance social security schemes and these payments do not directly relate to provision of goods or services. Reimbursements that do not directly relate to goods or services are also not in scope.

- Other payments or rebates to households by government units, social security administrations or NPISHs in the form of assistance to reduce household expenditure, such as housing allowances to tenants or payments due to sickness, disability, the care of elderly relatives or scholarships to students, are considered as social benefits in cash. They are treated as income transfers to households and do not constitute reimbursements.

11.314. It should be noted that, in compiling a CPI, a number of situations may be encountered. For example, with child-care systems where the government partially subsidises the full cost of providing the service, it is the net (or purchaser) price paid by the household that is covered by the CPI and should be included under the proper elementary aggregate (or elementary product group) entry in the classification system. This is regardless of whether the child-care service is privately or publically run. But if these services are provided by the households, themselves, they are regarded as own consumption as there is no monetary transaction is involved even though government might give the household money in the form of a social security payment. This approach is consistent with the conceptual basis of the national accounts.

11.315. For the background we need to go back to national accounts conventions. Goods and services acquired by households and for which the government or NPISH provides a subsidy either through a full or partial reimbursement should be measured net of direct

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24 Non-profit institutions serving households (NPISH) make up an institutional sector in the context of national accounts consisting of non-profit institutions which are not mainly financed and controlled by government and which provide goods or services to households for free or at prices that are not economically significant (2008 SNA, paragraph 4.93). NPISH are private, non-market producers which are separate legal entities. Their main resources, apart from those derived from occasional sales, are derived from voluntary contributions in cash or in kind from households in their capacity as consumers, from payments made by general governments, and from property income.
reimbursements. For example, individuals that are part of a particular socio-economic group may be eligible for a full or partial refund for dental care: if the refund covers the full cost of the dental service, then the expenditure weight would be zero and no prices would need to be monitored for the purpose of the CPI.

11.316. Where individual goods and services are provided at no charge to individual households by governments or non-profit institutions, the subsidies are regarded as social transfers in kind and costs are included in government or NPISH expenditure. Where individual goods and services are provided at subsidised prices the subsidy is out-of-scope of the CPI. Examples could include any of the following: food stamps; subsidised housing; prescription drugs; and job training programs. Clearly, these full or partial social transfers “in kind” can contribute substantially to the standard of living of the individual households that receive them.

11.317. Depending on a particular country’s circumstances, it could be that the public authorities have decided to partly or fully finance the provision of certain goods and services. Regardless of the practice, those expenditure incurred by government or non-profit institutions to finance social transfers in kind are unambiguously outside the scope of a CPI (although it can be argued that it is desirable to take them into account when estimating a comprehensive COLI extending beyond purchases by the household sector). However, when the consumer pays part of the cost associated with the provision of such goods and services, then this element is within scope of the CPI: although subsidised, this expenditure may account for a large part of a household’s final consumption expenditure. Take, for example, a subsidised rental unit for which the monthly cost of providing the rental service is $800 and where, after the government subsidy, the actual rent paid by the tenant is $500. While the $300 subsidy is excluded from the scope of the CPI, the rent of $500 paid by the tenant is a legitimate consumer expenditure that should be included in the CPI.

11.318. Users’ expenditure on all relevant goods and services should be included in order to properly reflect changes in prices and to support the addition of related services in cases where governments and non-profit institutions introduce charges for services that were previously provided at no charge, or vice versa.

11.319. The reality is that there can be many possible combinations of payment and reimbursement systems and there can be a complex mixture of publicly financed social security schemes, employee or worker financed social security schemes and social security schemes financed by individuals. The compiler of the CPI should investigate such schemes in sufficient depth to facilitate a well-informed decision on their treatment in the CPI.

11.320. Thus, the subsidised nature of the health, education and social protection sectors is a challenge for price index compilation. The national index methodologies need to be built around the national social insurance system.

25 Looking at it another way, services provided free as social transfers could, in principle, be regarded as part of household final consumption expenditure but with a zero price. Social transfers in kind consist of individual goods and services provided as transfers in kind to individual households by government units (including social security funds) and NPISHs (2008 SNA, paragraph 8.141), whether purchased on the market or produced as non-market output by government units or NPISHs. The items included are: social security benefits, reimbursements; other social security benefits in kind; social assistance benefits in kind; transfers of individual non-market goods or services.
11.321. Note that the procedures used in the treatment of tariffs, as described in the section on that topic, are often applicable for pricing schemes encountered in health, education and social protection services.

11.322. Finally, it should be noted that detailed in-depth research will need to be undertaken to identify and measure newly introduced significant charges. Note that some of the goods and services in health, education and social protection are difficult to measure at constant quality. The social security systems can also cause complications. The CPI compiler is advised to keep in close contact with their policy colleagues to obtain the information which is necessary to make informed decisions about which charges should be included in the index and how they should be measured, and to gain access to relevant sources of data and advanced notice of any changes (e.g., in the application of subsidies).

2. Health services (doctors and dentists)

11.323. How to handle health services in the compilation of individual countries’ CPIs will depend on the institutional arrangements for providing them. Government-provided free medical care is out of scope, but many countries adhere to some form of two-tier health care system whereby some health care services are provided, often for a fee, by a private system that co-exists with the public system or where medical services are subsidised partially by the government but the consumer pays part. In both cases, fees paid by the users are in scope. Employer-provided medical care is beyond the scope of the CPI - a transaction does not take place and it is treated in the national accounts as remuneration in kind.

11.324. Although health is a broad term, for the construction of an elementary aggregate in a CPI it generally refers to medical care provided by medical professionals, para-professionals or medical institutions.

11.325. COICOP divides the health care sector into classes according to type of medical care provider - doctors, hospitals, etc. This facilitates sampling, price collection and index construction.

11.326. The weights are the amounts consumers spend on each type of provider. In countries where the government does provide a substantial portion of medical care free of charge, the relative importance of medical care in the CPI is less than its expenditure share, as measured by the national accounts.

11.327. Some commentators have noted that the COICOP categories are activity classes — not classes according to consumers’ purposes. These critics state a preference for categorisation by types of medical condition and are of the view that the CPI should measure the cost of treating a disease or of obtaining a fixed outcome after treatment rather than the medical service or treatment itself, which, in their terms, is an input. But it should be noted that this “medical condition approach,” which would define elementary aggregates for categories of medical conditions, is not sufficiently developed to be recommended at this time. The recommended procedures are as follows.

Sampling

11.328. The general CPI approach is to select samples of providers within each COICOP category (doctors in Medical Services, dentists in Dental Services, etc.), and then choose one or more representative service items for each sampled provider. The principle of “loose
specification when sampling and tight specification when pricing” is followed. When first visiting a doctor or other medical provider, the price collector should find out what services are provided or what medical procedures are performed and select a representative sample with guidance from the provider. The price collector should describe them as completely as possible, and then continue pricing them for as long as possible or until they are no longer part of the sample which constitutes the CPI basket. One approach to the initial sample selection of services or medical procedures is for the price collector to ask the medical practitioner or dentist what was provided recently to a “typical” patient with a representative medical condition or to ask the respondent to describe a simple service they recently performed. When returning to obtain future prices, the price collector should collect the price for that identical service, even if the doctor or dentist has not performed it recently. If, however, the respondent has not performed it for example for a year, or indicates that he or she will no longer perform that particular procedure, the price collector should find a replacement procedure, preferably for the same medical purpose. The head office should then judge if it can be treated as a comparable item (see figure 11.2 below). There is less necessity to price many types of medical services from the same doctor, when it is known that price movements among various medical services move more or less closely together.

Figure 11.2 Loose Specification Sampling and Tight Specification Pricing

<table>
<thead>
<tr>
<th>Sampling</th>
<th>Collection</th>
<th>Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree service to be priced with medical practitioner (e.g., prosthetic replacement of hip joint).</td>
<td>Collect price of that exact service across months.</td>
<td>Identify replacement procedure if original service no longer provided (e.g., prosthetic replacement of knee joint).</td>
</tr>
</tbody>
</table>

Pricing

11.329. There are two approaches to pricing which align with the view taken on whether an input or medical condition approach is followed (see earlier paragraph). The traditional input approach treats medical items as just consumption items, without regard to their effectiveness in preventing, curing or ameliorating an illness or injury. The approach prices a selection of medical items, such as an annual check-up by a doctor, or a particular surgical procedure, such as an operation in a hospital or clinic, and follows the cost over time.

11.330. The alternative approach, the treatment approach, is a partial response to increasing criticism that the input approach ignores medical advances and that it also loses sight of the fact that the patient, unarmed with medical knowledge, generally looks to buy a cure to a medical condition rather than a specific course of treatment. Under the treatment approach, the price statistician or price collector first selects a specific medical problem by selecting a disease or injury for which a patient recently received treatment and then follows the price of treating that disease or injury regardless of medical procedures or medicines used. For example, if treating the disease or injury initially requires five visits to the doctor, the CPI price is the cost of five visits. However, if subsequently the doctor reports that he or she is now
using a new way of treating the condition that requires only two visits, then from that point the
cost of two visits is included in the CPI.

11.331. Only expenditure by households that is a direct result of purchase of individual
goods or services is within the scope of CPI. It follows that the prices entering the index,
whether subsidised or not, should be net of direct reimbursements. Obligatory payments, such
as employees’ contributions to social security schemes, are out of the scope of a CPI. These
are collected to finance social security schemes and do not directly relate to provision of goods
or services. Reimbursements that do not directly relate to goods or services (i.e., arrangements
where the recipient can spend the money on something unrelated to the treatment which is the
subject of the reimbursement), are also excluded.

11.332. Both approaches – the input approach and the treatment approach – may involve
“quality adjusting” the prices where a change of treatment or course of medication results in a
change in outcome. For instance, if in the above example the reduction to two visits to the
doctor is associated with a shorter course of treatment and with the patient being in less pain
and suffering fewer adverse side-effects, then the “quality” adjusted price should see a steeper
price reduction due to the better treatment. As quantifying this change in quality is generally
far from straight-forward, implicit methods of quality adjustment are usually applied.

**Coverage of Medical Insurance**

11.333. The existence of medical insurance confuses the situation further and there is a
lack of consensus regarding measurement in a CPI. Some consumers buy medical care directly
from medical care providers, while others buy medical insurance that pays for some or all their
medical care. It is, perhaps, useful to review exactly what kind of product the consumer is
buying. Medical insurance may be considered a way of prepaying for likely future medical
expenses, a way of reducing the risk of catastrophic expenses (i.e., giving peace of mind), and
a way of reducing the total expected cost of medical care due to insurance companies having
market power in determining prices that individual consumers lack. The view taken about what
is being purchased, which clearly may be a mixture of the above, has implications for
measurement. For example, the use of net premiums for weights (see below) fits better,
conceptually, with insurance being purchased for peace of mind.

11.334. As already mentioned in connection with the provision of health services by
doctors and dentists, in many countries the government provides health insurance either for
free or through compulsory or voluntary contributions. This is generally out of scope for the
CPI regardless of how the government funds it and is excluded from the CPI weights and
pricing samples. Compulsory or voluntary contributions to public health insurance are not
covered in household final consumption expenditure as these are categorised as social
contributions which are treated as transfers and are thus not included in final consumption.
Health care that is covered by private insurance (or not covered by any health insurance at all)
is part of the coverage of a CPI.

11.335. Only the cost of insurance paid directly by the consumer is in scope of the CPI.

11.336. In constructing expenditure weights, care should be taken to avoid the double
counting of expenditure. Consumers may pay insurance premiums and then the patient either
pays the costs (i.e., the medical bills) which the insurance company then reimburses either in
full or partially, or the insurance company directly reimburses the providers (e.g., the doctor or the hospital).

11.337. In the manual's discussion of property insurance services in the section on financial services three plausible alternative treatments of insurance are identified, which can similarly be applied to health insurance:

- Gross insurance premiums/net (medical) expenditure;
- Net insurance premiums/gross (medical) expenditure;
- Gross premiums/gross expenditure.

11.338. If applied to health insurance, the first of these alternatives results in a relatively large weight for medical insurance and small weights for medical care categories. The second reverses this. The third double counts consumer spending and should not be used.

11.339. The gross premiums method is out of favour with many CPI experts but is supported by a number of economists. Under this method there is an elementary aggregate for health insurance with a weight that is based on consumers’ total expenditure on health insurance premiums during the reference period. The expenditure weights of the other medical care elementary aggregates (those for doctors, hospitals, etc.) must be reduced by the amount of insurance payments consumers received in the same period. These elementary aggregates represent what consumers pay “out of their own pocket” for medical care. The total expenditure weight is the same regardless of whether the insurer reimburses the provider or if the consumer pays the provider and is later reimbursed. The CPI prices for these elementary aggregates are what providers receive from consumers - not from insurance companies. It can be argued that, compared with the net premium approach, the use of gross premiums is more consistent with the concept of pre-paying for likely future medical expenses and is therefore better able to cope with a situation where some consumers purchase medical services directly and others purchase the same medical services through an insurance company.

11.340. The primary difficulty with this method is constructing a price relative for gross premiums, which ideally would be a measure of the change in the premiums of a sample of constant-quality insurance policies. However, in practice, insurance companies change the detail of their policies from year to year, with new rules and requirements and changes in what they cover; some of this is in response to the appearance of new medical techniques. It is extremely difficult to track and adjust for these changes, but without doing so a premiums index is likely to be biased upward.

11.341. For the reason stated above, the “net” premiums method is the most common approach implemented in a CPI. In this case, the CPI weight of the insurance elementary aggregate is gross premiums paid minus reimbursements paid out by insurers. The CPI weight comprises the insurance companies’ operating expenses and their profit, which will be very much smaller than the gross turnover. The net approach distributes part of the expenditure for health insurance premiums that consumers report in the HBS to the other medical care elementary aggregates such as doctors, dentists, or pharmaceutical products. This is usually done using insurance industry data on the insurance companies’ income received from premiums and the companies’ payments to doctors, hospitals, clinics, drug stores and any other providers. To do this, the index compiler computes the share of payments to each type of provider and allocates medical insurance premiums to other medical care elementary
aggregates in proportion to these shares. Health insurance companies retain a small portion of the premiums not paid out as benefits to cover overheads and profits. The CPI can treat this as a separate elementary aggregate for health insurance to purchase "peace of mind" or just allocate it to the medical care categories using the same proportions. Some consider this option as being conceptually more appropriate. See Table 11.8 for the calculation of weights.

11.342. The CPI price movement over time can be the same as in the direct approach. Under the assumption that there is proper control for changes in quality of insurance plans and average utilization and patient risk are kept constant then over a long period, the change in the premiums of a sample of insurance policies can be used as a proxy for a measure of the change in the insurance companies’ overheads and profit per capita, i.e., the change in the cost of providing the insurance service.

11.343. The price relative for the net insurance premiums aggregate can be developed in the same way as under the gross premiums method, using a sample of insurance policies. The problem of holding the policies constant over time remains, of course, but this is less troublesome because the weight is much smaller. Alternatively, a measure of the change in the insurance companies’ net earnings (premiums less payouts) can be used. This may be volatile and net earnings could be negative in some years, and so NSOs who use this approach often take an average figure over a number of years. In addition, such a measure requires data that insurance companies may be reluctant to make available and it takes no account of any change in the volume of insurance services provided. For example, earnings may rise because the insurance companies are taking new business and not because either individual gross or net premiums are rising.

Weights

11.344. In the first row of the example in Table 11.13 below, the HBS reports that consumers spent on average (from their own pockets - government-provided benefits are not in scope) a total of $1800 on medical care, which includes $1000 on insurance and the rest on direct payments to medical providers. Under a gross premiums approach, these are the weights for insurance and medical care categories, that is standard CPI weights: expenditure reported in the HBS of what consumers paid out of their own pockets.

11.345. To obtain weights for a “net premiums” approach more data are required. The second row has the insurance industry’s spending on medical care - the insurance companies spent $900 in benefits and retained $100 to cover their costs and their profits. Using this industry data to construct CPI weights yields a small aggregate for net insurance premiums, as shown in the third row.

Table 11.13 CPI Weights: medical insurance and medical care elementary aggregates

<table>
<thead>
<tr>
<th>total</th>
<th>Health Insurance premiums</th>
<th>Hospitals</th>
<th>Doctors</th>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBS data</td>
<td>1800</td>
<td>1000</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Insurance industry data</td>
<td>900</td>
<td>500</td>
<td>300</td>
<td>100</td>
</tr>
<tr>
<td>CPI weights with net insurance</td>
<td>1800</td>
<td>100</td>
<td>800</td>
<td>600</td>
</tr>
</tbody>
</table>
11.346. The scope of the CPI is limited to payments actually made by consumers. Consequently, fully publicly-funded education is out of scope of the CPI. However, there can be some minor ancillary fees for materials or services, such as pens and paper, and sports activities that students must pay for and these should be included in the index. Out-of-pocket educational expenses for tuition and related costs also are treated as standard consumption items. The main issue is determining the main expenditure category for their inclusion.

11.347. The goods and services included in the Education category (COICOP category 10) cover educational services only and the main channels of education. This includes:

- Education by radio or television broadcasting or over the internet.
- Educational programmes, generally for adults, which do not require any special prior knowledge or instruction. This can include vocational training and cultural development.
- Literacy programmes for students too old for primary school including out-of-school secondary education for adults and young people and out-of-school post-secondary non-tertiary education for adults and young people.

11.348. COICOP category 10 does not include:

- Expenditure on educational materials, such as books (09.7.1) and stationery (09.7.4), or education support services, such as health care services (06), transport services (07.3), catering services (11.1.2) and accommodation services (11.2.0).
- Driving lessons (07.2.4); recreational training courses such as sport or bridge lessons given by independent teachers (09.4.6.1).

11.349. In many countries, the government partially subsidises education, particularly higher education, and students pay a portion of the cost of their education and this portion is in the CPI’s scope. The tuition fees faced by students are not always the full cost of education, and in these cases the CPI weight should not and does not represent the full cost of providing education to the population, just the cost to the individual of acquiring an education. Changes to the amount of the government subsidy can lead to changes in the tuition charged to students and the index should reflect any resulting change in the fees. If a student goes to a private school, where there is no subsidy, the total advertised price \( P \) for fees should be reflected in the CPI weights and in the price paid, as this is what it costs the household to educate the student. In the case of a government subsidy, let \( s \) be the share of this total advertised price which is borne by the household (i.e., the household is presented with a bill showing a net price of \( sP \)), then the appropriate price for the CPI and for the construction of weights is \( sP \). In this way, the proportion of the cost borne by the household will feed through into the calculation of the CPI, that is, the CPI will reflect the actual fees paid by the household which, in this case, will be less than the basic advertised price.

11.350. Weights for educational services can be difficult to obtain. Information from the HBS can be unreliable since sample sizes and relatively low response can result in large sampling errors. Additionally, national accounts principles may only allocate the costs incurred by households as a part of a reasonably broad category within household final consumption expenditure. The level of detail in accounting is often varied and may not allow the division of the costs to the level of detail required for index compilation, for example separating out
university tuition fees from other education costs or breaking university tuition fees down into sub-categories by type of course (e.g., postgraduate or undergraduate). Therefore, a better source of detailed weighting information may be the public institutions in charge of the educational schemes, for example administrative data from government departments or regulatory bodies.

**Pricing**

11.351. The typical item to be priced will be the cost of a term or semester at a sample of schools. A school term is usually longer than one month, which is the calculation frequency for most CPIs. Standard practice in this case is to collect prices only in months when the terms begin, and to use that same price in the intervening months. The pricing months can vary depending on the country or the school. For example, if a school has two semesters, one starting in September and the other in January, then tuition fees should be priced in these months only. In other months, the price is “carried forward” and the same price is used for the remaining months of the term. The index and the associated inflation rate may display step changes, changing only in the months when the terms begin.

11.352. The recommended approach is to use “student profiles” to price the cost of education for a selection of typical students who are chosen to reflect different levels of fees and base-weighted to reflect their distribution in the particular educational institute which is being priced. These profiles should aim to reflect the range of courses on offer, for example, covering full-time and part-time undergraduate courses in arts, sciences and medicine; postgraduate research and teacher training courses. Where the fee structure is straightforward, it may be sufficient to simply collect prices for the posted or advertised tuition fees directly from the institution or its website. In practice, any discounted tuition fees can be ignored where it is known or can be assumed that they change at the same rate as the full fees and that the proportion of students benefiting from them remains constant over time. However, any assumptions would need to be checked on a regular basis as there are inherent dangers of introducing an element of bias in the index if differential changes in fee structures or changes in the student population are missed. The approach should be used with care. Similarly, the use of average revenue (total tuition fees divided by the number of students) is generally not an appropriate way to price tuition fees which include price differentials, as changes in the composition of the students attending the college and the courses they attend, can affect the average fee even when no price change takes place.

11.353. In some countries, it is common for students to travel outside the country for their higher education. In such cases, expenditure paid by nationals for tuition at foreign institutions may be deemed to be in scope for the national CPI depending on the geographical coverage of the index and whether expenditure was incurred in the domestic territory of the country of residence or abroad. Where such costs are included, changes in the education or tuition index from the destination countries can be used to construct the price relatives for the education component, adjusted to the national currency using the exchange rate applying in the reference month. The reader is referred to Chapter 2, on concepts and the scope of the CPI, for more guidance.

**Scholarships and other forms of discounting**
Schools and universities often reduce the tuition fees for some students. Tuition fee reductions offered in exchange for work (e.g., teaching assistants or that require participation in sports teams), should not be reflected in the index as they are a form of income.

The treatment in the CPI of scholarships awarded to particularly talented students or tuition assistance in the form of financial aid to students from certain socio-economic backgrounds, such as low-income households, depends on the method of payment:

- Those that are paid directly to students to assist them in bearing the cost of the full fee but which the students can use, if they wish, to finance something else, are transfer payments that should not be reflect in the CPI.
- Where the scholarship or subsidy results in students being subject to reduced fees, (i.e., they are billed for a reduced amount), it is the reduced fee which should be priced for the CPI.

**4. Social protection**

Social protection is a measure of the extent to which countries assume responsibility for supporting the standard of living of disadvantaged or vulnerable groups. Benefits may be targeted at low-income households, the elderly, disabled, sick, unemployed, or young persons. Social spending comprises of cash benefits, direct in-kind provision of goods and services, and tax breaks with social purposes. To be considered social, programmes need to involve either redistribution of resources across households or compulsory participation.

As with health and education, the purchaser price of goods and services in the social protection sector is the amount to be paid by consumers, “net of reimbursements”.

The following example of the treatment of social protection in a CPI is taken from the HICP.

Suppose that in Country A, the entity offering childcare services charged a price of £20 per hour at period t – 1; at period t, the price of the services increases to £21 per hour. Children typically spend 50 hours per month in the kindergarten so that the generated revenue for the entity for the service goes from £1000 per child to £1050. But in recognition of the greater financial burden on the household, the hourly price subsidy offered by the public authorities is increased from $8 at period t – 1 to $10 at period t. The net price paid by the household per hour falls from $12 to $11 (= £21 - £10).

In the case of country B, the exact same changes apply except that here the authorities provide an income tax transfer instead of a price subsidy. As a result of the increased price, the household now receives an increase in its childcare grant from $400 at period t – 1 to $500 at period t.

Note that regardless of the approach used for reducing the burden from the higher price of the service, the net cost to the household of consuming the childcare service - a drop from $600 to $550 - is the same for both countries. However, the impact on inflation as

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27 For country A, the immediate out-of-pocket expenditure is the net (after subsidy) price paid times the hours of the service which are consumed (€12 x 50 = €600 at period t - 1).
measured by the CPI differs depending on the approach used for subsidising childcare services. The index in country A falls by 8.33% whereas the corresponding index in country B increases by 5%. The reimbursement given in Country B is classified as a social transfer so there is no direct applicable price reduction. It should also be noted that the expenditure weights differ according to the approach used for reducing the burden. In country A, this value is $600 in year t-1 and in country B the equivalent value is $1000. These are the amounts that would be reported by a household in a HBS.

Table 11.14 The effects of a subsidy and tax credit on a CPI

<table>
<thead>
<tr>
<th></th>
<th>Country A</th>
<th>Country B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t - 1</td>
<td>t</td>
</tr>
<tr>
<td>Gross price for childcare services (€/hour)</td>
<td>20.00</td>
<td>21.00</td>
</tr>
<tr>
<td>Usage in hours per month</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Income for child care provider (€/month)</td>
<td>1000.00</td>
<td>1050.00</td>
</tr>
<tr>
<td>Government subsidy (€/hour)</td>
<td>8.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Income tax transfer per month (€/month)</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Net price paid by households (€/hour)</td>
<td>12.00</td>
<td>11.00</td>
</tr>
<tr>
<td>Net expenditure determining weight (€/month)</td>
<td>600.00</td>
<td>550.00</td>
</tr>
<tr>
<td>Net cost (€/month)</td>
<td>600.00</td>
<td>550.00</td>
</tr>
<tr>
<td>HICP (t - 1 = 100)</td>
<td>100.00</td>
<td>91.67</td>
</tr>
</tbody>
</table>

K. Financial Services

1. Introduction

11.362. The construction of price indices for financial services is by nature challenging, as there is no consensus about which financial services ought to be included in the CPI or how they should be measured. The discussion in this section attempts to present what might be regarded as a majority view based on what is practically feasible.

11.363. Common examples of financial services acquired by households include: financial advice; currency exchange; services associated with deposit and loan facilities; services provided by fund managers, life insurance offices and superannuation funds; stock-brokering services; and real estate agency services. The range of financial services appropriate
to be covered in a CPI, and the way to measure them, depends on the principal use of the CPI and hence on whether an acquisitions, use or payments approach is employed.

11.364. Financial services covered in this section come under COICOP 12.2. The latter covers: actual charges for the financial services of banks, post offices, saving banks, money changers and similar financial institutions; fees and service charges of brokers, investment counselors, tax consultants and the like; administrative charges of private pension funds and the like. Also included in COICOP 12.2 are financial intermediation services indirectly measured (FISIM) but in practice these are sometimes excluded from a CPI (see later discussion). Insurance is not covered under financial services as it comes under COICOP 12.1. The latter includes service charges for insurance as classified by type of insurance, namely: life insurance and non-life insurance (that is, insurance in connection with the dwelling, health, transport, etc.)28. See section on health, education and social protection services for a discussion on medical insurance. Mortgage arrangement and application fees often come under owner-occupied housing costs.

11.365. Where a payments approach is used, the gross interest payable on mortgages is often included as a cost of owner-occupied housing. For consistency, this might suggest that the CPI should also cover consumer credit charges, measured in a similar way to mortgage interest charges, as well as gross outlays on direct fees and charges paid in respect of other financial services. In practice, and as noted in the section on housing costs, the treatment of housing sometimes differs in concept from other interest charges in national CPIs, partly reflecting mixed objectives for the overall index combined with public perceptions of what should be included in a CPI and the importance of housing costs in household budgets. The specific requirements for a payments approach will not be discussed further here as the principles are either described elsewhere (e.g., under owner-occupied housing) or are relatively straightforward.

11.366. On the assumption that households acquire all of their financial services from the private sector, and that these services are not generally subsidized by government or provided by NPISH29, the acquisitions and use approaches take similar views of the measurement of financial services. In terms of coverage, however, some proponents of the use approach take a more restrictive view of which services should be included by limiting the scope to only those financial services that are acquired to directly facilitate current household consumption.

11.367. Under the more restrictive view of coverage, it is argued that the use of some financial services is more associated with capital or investment activity. This implies that such activities should be considered outside the scope of CPIs intended to measure changes in

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28 Life insurance are generally excluded from the coverage of a CPI as the premiums paid for life insurance (COICOP 12.1.1), including pension-funding services, are regarded as savings. Also, there are measurement issues associated with the difficulty of separately identifying the implicit service charge of the insurance element from the implicit service charge of the investment component.

29 As referred in the section on health, education and social protection services NPISHs consist of non-profit institutions which are not predominantly financed and controlled by government and which provide goods or services to households free or at prices that are not economically significant (2008 SNA, paragraph 4.93).
consumption prices. Proponents of this view often draw upon national accounts practices as the starting point. For example, the 2008 SNA classifies expenses associated with the transfer of real estate (real estate agents’ commissions, legal fees, and government taxes and charges) as part of gross fixed capital formation (2008 SNA, paragraphs 10.48 to 10.52). However, the CPI is not constrained to follow the practices adopted for national accounting; rather countries need to decide on the product coverage of the CPI that meets the requirements for their price index. For instance, a recognized practice is to include in a CPI the costs of buying and selling owner-occupied housing.

11.368. However, practices relating to financial services vary. In principle a CPI should include the prices of all goods and services included in household final consumption expenditure. Non-consumption expenditure such as financial transactions, transfers, and purchases of financial assets are excluded. According to the 2008 SNA all insurance services are within the scope of household final consumption expenditure and are to be included by the amount of the implicit service charge (2008 SNA, paragraph 9.64). However, the practice is more complicated, confounded by conceptual and measurement issues, as can be illustrated by the conventions followed by the EU HICP.

11.369. The HICP and the CPIs compiled in some countries, exclude life insurance services, basically for practical reasons but also because some life insurance services (notably those that are fixed term and with profit) can be a form of tax-efficient saving. The premiums paid for life insurance (COICOP 12.1.1), including pension-funding services, are partly to be regarded as savings. Life insurance services are thus excluded from the HICP, as it is not feasible in practice to separate out the implicit service charge from the investment component. In accordance with CPI conventions, non-life insurance services are, however, included in the HICP. Public insurance connected with health (ECOICOP 30 12.5.3.1) is generally considered outside the scope of a CPI, including the HICP, as compulsory contributions under social security schemes are not included in household final consumption expenditure.

11.370. The HICP also excludes FISIM (COICOP 12.2.1), which comprises those parts of financial services that are charged for by way of the interest margin of financial institutions. It is excluded on the basis that it is an imputed and difficult to measure (non-monetary) transaction. On the other hand, those financial services that attract explicit charges, for example annual charges for credit cards (excluding interest charges), bank charges for money transfers, and explicit currency exchange commissions, are included in the HICP. The HICP is here and above mentioned as just one example of how financial services are treated in a CPI.

11.371. One broad definition that could be adopted for the coverage of financial services within the CPI is all those services acquired by households in relation to the acquisition, holding and disposal of financial and real assets, including advisory services, except those acquired for business purposes. This definition serves two purposes: firstly, it distinguishes between the services facilitating the transfer and holding of assets and the assets themselves; secondly, it makes no distinction between whether the underlying asset is a real asset or a financial asset.

11.372. The degree of complexity involved in placing a value on financial services acquired by households and in constructing the companion price indices varies by service. The

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30 ECOICOP refers to the European Classification of Individual Consumption according to Purpose.
following examples, illustrate the issues. It should be noted in regard of the example on deposit and loan facilities that the complexity involved in measuring FISIM and an aversion to the over-use of imputed prices in a CPI have led to many compilers to follow the HICP example by not including these services in a CPI.

2. Currency exchange

11.373. For weighting purposes, the estimation of the base period expenditure incurred by households in exchanging domestic currency for currencies of other countries, is not entirely straightforward. As has been seen in practice, the amounts reported by HBSs can be biased downwards due to forgetful under-reporting of currency exchange transactions in questionnaires completed by households. The national accounts can often provide a more accurate source for weighting data.

11.374. Construction of the companion price index is in general more complex. The service for which a price is required is that of facilitating the exchange of domestic currency for that of another country (the acquisition of an asset – foreign currency). The price for the service is often specified as some percentage of the domestic currency value of the transaction plus a fixed per transaction charge. The percentage margins may change only rarely, with service providers relying on the nominal value of the transactions increasing over time to deliver increases in fee receipts. The price required for index construction purposes is the monetary value of the margin (i.e., the amount determined by applying the percentage rate to the value of the currency transaction) plus the fixed charge. To measure price change over time, the index compiler needs to form a view about the quantity underpinning the original transaction. Further feasible forms of charging, other than percentage plus fixed fees, occur for currency exchange services, such as fees following a step-function or a spread between service providers’ selling and buying rates (i.e., an implicit rather than an explicit fee). The following description pertains to the issues in the case of percentage fees (plus fixed fee) for currency exchange.

11.375. The purchase of foreign currency can be viewed as facilitating the purchase of some desired quantity of foreign goods and services (e.g., purchased during travelling abroad, or for the direct import of a product). The service price in comparison periods would be expressed as the amount payable on the conversion of a sum of domestic currency corresponding to that sum of foreign currency required to purchase the same quantities of foreign goods and services purchased in the base period. Thus, the fixed basket relates to the purchase of a fixed good or service in a foreign currency.

11.376. A practical translation implies that, in order to follow the principle of a fixed basket the original foreign currency amount should be indexed forward using changes in foreign prices, and then converted to domestic currency at the prevailing exchange rate, with the prevailing percentage margin applied to this new amount, plus any fixed charge, to produce the current price. This current price would be compared to the base price to derive the measure of price change. Although the ideal measure for indexing forward the foreign currency amount would be an index specifically targeting those foreign goods and services purchased by resident households, this is unlikely to be feasible. A practical alternative is to use the published aggregate CPI for the foreign countries. A further approximate simplification for the revaluation by indexing forward, is to use the CPI of the country of residence; this can be
defended as following potential expenditure for consumption forgone (see section below on stock broking).

11.377. If a single margin (percentage rate) does not apply to all transactions (e.g., different rates apply to different size transactions), then the price measure should be constructed by reference to a representative sample of base period transactions. The value margin for each transaction in the current period in the domestic currency should be determined by the current domestic currency value of each transaction and the current period percentage margin applying to each. This captures any price change resulting from the value of an underlying transaction moving from one price band to another.

3. Stock broking services

11.378. Consider the case of the purchase of a parcel of shares in a publicly listed company. In most countries, the purchase has to be arranged through a licensed stockbroker. Stockbrokers buy or sell shares or other securities on behalf of clients. The service provided consists of arranging for a transaction to take place on the conditions specified by the client, (i.e., a certain block of shares that is being bought or sold). The total amount paid by the purchaser generally comprises three elements: an amount for the shares (the asset); a fee for the brokerage service; and some form of transaction tax (stamp duty).

11.379. The tax should be considered part of the cost of acquiring the shares, as opposed to being part of the price of the security. The tax should be included along with the brokerage cost in the CPI. This is consistent with both the intention of the tax and the more commonly accepted basis for the valuation of the shares. It also aligns with the comparable treatment of taxes on banking services. Allowing for current tax schedules is feasible as they are publicly available.

11.380. Working from the premise that stockbrokers’ fees can likely follow a step function, as opposed to a linear function, a price measure would be constructed as follows. First, select a representative sample of transactions (domestic currency values) and calculate the fees and the tax payable according to the respective schedules. A representative unit of transaction should be the charge to be paid by consumers in exchange for trading a set basket of securities (defined in value terms) which are representative of the base or reference period. The fees and taxes payable in subsequent periods are calculated by first indexing forward the values of the sample transactions and then applying current fee and tax schedules to the revalued transactions. This method raises two main issues. First, what is the most appropriate index for revaluing the transactions and, second, how should the current schedule of fees be determined?

11.381. The quantity underlying share transactions can be regarded as forgone consumption, or the quantity of goods and services that could have been purchased instead. The value of a constant set of quantities of consumption forgone in successive comparison periods thus will vary with consumer prices. In this case, one choice for a revaluation index is the CPI itself, based on current month's or quarter's preliminary estimates, or the previous month's or quarter's published CPI. However, it could be argued that the use of a single period’s movement in the CPI has the potential to show the prices of stock broking services as moving in a way not reflecting reality. This could occur if the current or previous period’s CPI was influenced notably by some unusual price change, (e.g., an oil price shock, or change to health
care arrangements). As an alternative, a 12-month moving average CPI might be employed, itself consistent with a base period comprising a full year’s activity.

11.382. Hypothetically, it might be argued from a conceptual viewpoint that the set of shares could be revalued in subsequent periods in line with movements in equity prices themselves. According to this view, the price of equities would be seen as an important influence on the actual costs of storing forgone consumption in much the same way as fee and tax schedules specific to equity purchases are allowed to enter the calculations described above. The strong argument against this treatment is that it assumes that households have a desire to acquire equities per se, rather than using them as an advantageous vehicle to store forgone consumption. Moreover, the introduction of equity prices within the price indicator is likely to impart additional short-term irrelevant volatility to the CPI, although not significantly so given the relatively small weight for brokerage fees in a CPI.

11.383. Competition in the stock broking industry means that there is unlikely to be a common fee schedule. If individual brokers adhere reasonably closely to an in-house fee schedule, obtaining copies of these schedules should be a relatively simple matter. On the other hand, if no such fee schedules exist, then a survey of stockbrokers may be required to collect information on a sample of trades (value of trade and fee charged) and this information used to derive a current period fee schedule.

11.384. In the case of sales of shares, the underlying transaction represents the exchange of one asset for another (shares for cash). Quantities underlying sales can be viewed similarly to share purchases (i.e., some current period basket of consumption goods and services). In practice, households presumably review their investment strategies occasionally in order to “store” their deferred consumption in asset forms they may expect to offer security or prospect for growth. A symmetrical treatment of the purchase and sale of shares is a natural approach. Unless different fees or taxes apply to sales, there is no need to distinguish between the two in constructing the index.

4. Investment funds

11.385. Investment funds often apply an annual management charge (AMC) defined as a given percentage of the current asset value. For example, the charge can have the form that 1.50% of the asset value is deducted annually from the latter. This charge can be applied either instead of or in addition to charges applied to the buying or selling of fund shares. In the CPI, the annual management charge proportional to asset value can be treated in a similar way as a charge for currency exchange proportional to the transaction value. Funds can be discontinued from time to time and in the price collection they should then be replaced with similar funds to ensure that the index reflects actual price developments. The underlying transaction for AMCs can be defined as the annual management of fund shares worth a given amount in monetary terms in the base period. The underlying transaction is revalued periodically by the CPI. The use of the CPI here is motivated by the fact that the user functionality of the service deteriorates with inflation, which makes the monetary value of the assets handled less useful to the consumer. The updating with the CPI adjusts for this change in user functionality. A stock price index such the FTSE 100, DAX or Dow Jones indices should not be used as these do not keep the user functionality of the service constant. Namely, the more the investment is worth, the greater is the user functionality of the service managing it. Also, stock price indices follow
asset price values which can be volatile and asset price movements would dominate the modeling of the service charge.

5. Deposit and loan facilities

11.386. Accounting for the costs of services provided by financial intermediaries represents a step up in complexity. Even where a prior decision has been made to include such facilities within the scope of the CPI, the service being provided is challenging to visualize comprehensively, and the prices comprise elements that are not directly observable.

11.387. The 2008 SNA (6.163-6.169 and A4.33) recommends that the value of financial intermediation services output produced by an enterprise should be valued as the following sum:

- for financial assets involved in financial intermediation, such as loans, the value of services provided by the enterprise to the borrower per monetary unit on account, is the margin between the rate payable by the borrower and a reference rate; plus
- for financial liabilities involved in financial intermediation, such as deposits, the value of services provided by the enterprise to the lender or depositor per monetary unit on account, is the margin between the reference rate and the rate payable by the enterprise to the lender; plus
- the value of actual or explicit financial intermediation service charges levied.

11.388. The OECD has been instrumental in developments in the national account’s treatment in this area. In concept, the 2008 SNA describes the reference rate as the risk-free or pure interest rate. The value of the service provided to a borrower is the difference between the actual amount of interest paid by the borrower and the lower amount that would have been paid had the reference rate applied. The converse applies for depositors. In practice, it is difficult to effectively identify the reference rate, and in particular to avoid either volatility in or even negative measures of the value of such services (as would occur if the reference rate lay above the lending rate or below the deposit rate). As a matter of practical expediency, an average of borrowing and lending rates may be used, with preference for the mid-point. Given the complexities involved, expenditure on financial intermediation required for index

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31 Every financial asset has a corresponding liability, so, for example, a shareholder owns the asset, whilst the issuing company has the liability. The financial account shows how changes in assets and liabilities by sector account for the net lending/borrowing already identified. In practice, due to the use of different data sources, the net lending/borrowing figure in the financial account for each sector will be different from that identified within the capital account, although they are conceptually equal.

32 The SNA uses the concept of FISIM to put a value on financial services that are not explicitly priced. However, measurement is often narrowly defined around the traditional deposit/loan business, thereby leaving out other financial instruments that may be carriers of financial services with implicit prices. An extension of the notion of FISIM relates the use of output indirectly measured to obtain as complete as possible a measure of the services produced by financial corporations. Not doing so may under-estimate value added. Nevertheless, considerations have recognised current practice of computing FISIM on deposits and loans only as a workable and useful way of estimating the value of financial services, although these calculations are not necessarily an exhaustive measure of the value of indirectly-measured financial services. See, for example, the report of the OECD Task Force on Financial Services (Banking Services) in National Accounts, 2002, particularly Conclusion 5 of Section 14.2.
weighting purposes cannot be collected from households in expenditure surveys and thus have to be estimated by collecting data from financial institutions or a regulatory authority.

11.389. Concerns have been expressed about the use of a mid-point reference rate as a measure of the risk-free rate of interest. There are, however, some doubts about whether the conceptual ideal is for some “risk-free” interest rate, or whether a more appropriate concept might be the interest rate that would have been struck in the absence of financial intermediaries (i.e., the rate that would have been struck by depositors dealing directly with borrowers). Such a rate would have incorporated the lenders’ knowledge of risk. Taking the mid-point of the borrowing and lending rates would appear to be a good means of estimating this market-clearing rate.

11.390. In thinking about the construction of the index number, it is useful to start by considering the case of a traditional bank providing a single loan product and a single deposit product; the example will then be extended to a typical bank. Much of a bank’s income is derived through an interest margin on lending rates over deposit rates.

11.391. The base period weighting value of the financial service (and so household consumption of such services) therefore is estimated by applying a margin (the absolute difference between the reference rate and the rate of interest charged to borrowers or paid to depositors) to an aggregate balance (loan or deposit). In line with the suggested treatment of other financial transactions, the construction of accompanying price measures should allow for the indexation forward of base period balances, applying comparison period margins to calculate a money value. The price index is then calculated as the ratio of comparison period and base period money values.

11.392. Again, the issue of choosing an appropriate revaluation index needs to be addressed as with currency exchange. While the base period flows of deposits and withdrawals can readily be conceptualized as foregone consumption at base period prices, how should the balances (stocks) reflecting an accumulation of flows over a number of years, be viewed? If an age profile for balances were available, accumulated consumption forgone could be computed as a moving average of the CPI. The more practical alternative is to view base period balances as representing some set of quantities of consumption goods and services at base period prices, in which case the 12-month moving average CPI can be used. This is consistent with the idea that households review temporal consumption or investment decisions (and so accumulated financial balances) on a more or less regular basis, in this case annually.

11.393. The traditional bank has all but disappeared in some countries and generally financial institutions now derive income from a combination of implicit charges (margins) and explicit fees, with the trend having been for a move towards more use of explicit fees and relatively less use of margins. Here a challenge is to construct measures of price change that reflect the total price of the service and therefore capture any offsets between margins and direct fees. As with stock broking services, there may also be taxes levied on financial transactions or balances and these should also be included in the “price”. Frost (2001), for example, provides a description of practical aspects of constructing price indices for deposit and loan facilities.

11.394. Given the options for financial intermediaries to shift charges between the explicit or “direct” (fee), and implicit or “indirect” (margin) elements, there are risks in choosing measures of margins – i.e., FISIM as per national accounts – independently of direct
fees and taxes. Rather, the approach should be to construct price measures for specific relatively homogeneous products that can then be weighted together to provide a measure for deposit and loan facilities, in aggregate, and taking account of both the explicit and implicit elements in total price. This represents a similar strategy to that adopted throughout the CPI. For example, the index for motor vehicles is constructed by pricing a sample of individual vehicles and weighting these price measures to derive an aggregate, instead of, for example, attempting to directly construct an index for the supplier or producer of a range of vehicles.

### 11.395
A basic process is: first, to select a sample of representative products from each sampled institution; second, to select a sample of customers for each product; and third, to estimate the total base period value of the service for each product by element (margin, direct fees and taxes). These values can be viewed as being equivalent to prices for some quantity. Comparison period prices are derived by moving forward the base period value aggregates as follows:

- **Margin** – index forward the base period balance and apply the comparison period margin (the difference between the comparison period reference rate and the product yield). In practice, the “price” movement is given as the product of the indexation factor and the ratio of margins.

- **Fees** – index forward the transaction values for each sampled account (or profile) and apply the comparison period fee structure. The ratio of new aggregate fees to base fees is used to move the fee value aggregate. The aggregate fees in the base and comparison periods can be constructed as either arithmetic or geometric averages of the fees calculated for the individual customers.

- **Taxes** – as for fees but use tax schedules instead of fee schedules.

### 11.396
Appendix D contains a worked example of the calculation of a price index for a single deposit product.

### 11.397
Since step function pricing and taxing schedules (for example, fees that are only payable after some number of transactions or if balances fall below some level) are prevalent in financial services, samples of detailed customer accounts with all the necessary charging variables identified will be required. These samples should cover a full year’s activity. If it is not possible to sample actual accounts, customer profiles may be developed as a fallback option.

### 11.398
To minimize problems associated with non-response and changing industry structures, a separate reference rate should be constructed for each sampled service provider. The reference rate should be calculated in respect of all loans and deposits (including those to businesses). Further, to avoid problems that may arise in the timing of accounting entries (e.g., revisions, or interest income on credit cards), monthly yields, reference rates and margins should be constructed by reference to three-month moving averages of the reported underlying balances and interest flows.

#### 6. Credit and debit card fees when abroad

### 11.399
The use of credit and debit cards while abroad to purchase goods and services, or to withdraw cash, is usually subject to explicit fees and charges. The fees levied on the use of the card abroad are not part of the price of the good or service purchased as consumers have
the option of paying in cash. However, ideally it should be considered that as the fees that consumers are charged for using their cards abroad are levied by the service provider (bank or credit card company) in the country of residence and not in the country where the purchase occurred, these charges should be allocated to the country of residence. By contrast the situation is different for purchases made over the internet as the latter credit or debit card charges are unavoidable as paying by cash is not an option, thus being part of the price for the good or service bought on the internet.

11.400. The underlying transactions for using credit and debit cards abroad typically include:

- The service fee charged to the consumer’s account for using an automated teller machine (ATM) outside the country of residence to withdraw an amount of local currency equivalent of a given amount in the currency of the consumer’s residence, in the price reference period.

- The service fee charged to the consumer’s account when purchasing abroad a good or service of a given value in the currency of the consumer’s residence, in the price reference period. Note the elements of currency exchange as per the approach to money exchange. The value in real terms of the underlying transactions should be kept constant by monthly price updating using the CPI for revaluation, until the next annual basket update. It may be noted that keeping the real value of the reference transaction constant implies that the value in nominal terms varies.

- Pre-paid cards for, for instance, toll charges for bridges and motorways are allocated to the COICOP Division of the good or service being purchased. The transaction price is the corresponding cost of, say, one crossing of the bridge.

7. Real estate agency services

11.401. The services provided by real estate agencies in the acquisition and disposal of properties can be treated in various ways. If the CPI is constructed as an economic cost of use index, these services can be considered out of scope as forming part of the input costs of the notional landlords (2008 SNA also assigns all transfer costs on dwellings to gross fixed capital formation). The transfer costs involved in the acquisition of a dwelling (legal fees, real estate agency fees and taxes) can be included in both a payments CPI and an acquisitions CPI. They can be classified as either a cost of home ownership or as a distinctly separate financial service. Although all transfer costs should be included in such measures, the discussion below focuses on real estate agents’ fees for simplicity. Price measures for the other elements are calculated using similar procedures. In all cases, the general approach is to estimate the current cost of the various services relative to, and as they would apply to, some fixed basket of activity in the base period. Consistent with some of the areas already discussed, this involves indexing forward the base period expenditure on which the fees are charged (to preserve the underlying quantity) via some appropriate price index, and then estimating the fees payable in the comparison period.

11.402. Real estate agents typically state their fees as some percentage of the price settled for the dwelling. In common with other services for which charges are determined as a margin, this needs to be converted to a domestic currency price in cases where the sale price is stated in a foreign currency. If the percentage margin is known, the agents’ price for any given
transaction (sale/purchase of a dwelling for a known price) can be computed by multiplying the value of the dwelling by the percentage margin, and the index can be constructed on the basis of estimates of both components.

11.403. The method chosen for estimating the percentage margin will depend on an assessment of the variation in margins across and within individual agencies. In the most straightforward case, firms may operate with a single percentage margin applicable to all transactions regardless of value. In other words, at any point in time the percentage margins charged may vary by agency, but not by value of transaction within agency. In this case, what is required is an estimate, in each comparison period, of the average percentage margin charged by agencies. This can be achieved by collecting the percentage margins, exclusive of any taxes levied on agents’ fees such as VAT or GST, from a sample of agencies and deriving an average.

11.404. Percentage margins charged by individual agencies sometimes vary with transaction price (typically declining with higher prices of dwellings). Where tariffs do vary within agencies, a more sophisticated estimation procedure may be needed. Using data from a sample of transactions from a sample of agents, the relationship between the value of transaction and the percentage margin can be derived through econometric analysis. Empirical analysis may be useful to determine the functional form for this relationship. In one country, for example, research has shown that ordinary least squares regression can be used to estimate this relationship and that the following functional form can be adequate:

\[ R = a + b_1(1/p) + b_2(1/p)^2 \]

where: \( R \) denotes the commission rate, \( p \) denotes the house price, \( a \) is a constant, and \( b_1 \) and \( b_2 \) are parameters to be estimated.

11.405. Estimation of the current period value of transactions to which the percentage margin applies depends on whether real estate agency fees are classified as (i) a cost of housing or as (ii) a separate financial service. In the former case, the value of the current period transaction, relative to the value of the base period transaction, would follow changes in house prices. In the latter case, the purchase of a dwelling is regarded as forgone consumption, and the current period value would follow changes in the CPI itself.

11.406. If a single percentage margin is assumed to operate, then only a single current period transaction value is needed, namely, an estimate of the average value of base period transactions at comparison period prices. For example, if real estate agency fees are classified as a housing cost, then the base period price is calculated by applying the average base period percentage margin to the average house price in the base period, with any VAT or GST then added. The comparison period price is calculated by re-valuing the average base period house price by indexing forward, and then applying the average comparison period percentage margin and adding GST or VAT.

11.407. If a single percentage margin is not assumed to operate, then a sample of representative base period transactions is needed. The monetary value of the margin on each representative transaction is then calculated from published tariffs or from an estimated functional relationship, such as that described above. Comparison period prices are likewise estimated by first re-valuing by indexing forward for each of the base period representative transactions, and then applying the same model.
8. Property insurance services

11.408. The construction of reliable price indices for insurance can be challenging. This section is restricted to a discussion of property insurance, as this type of insurance can be assumed to operate in similar ways across countries. It provides only an illustration of the issues to be met, with each sector raising specific conceptual and measurement difficulties. For example, in the case of life insurance, insurance policies are often bundled with a long-term investment service yielding a financial payout when insured persons survive the policy term. As mentioned in the introduction to this section, the separation of the service charges relating to the insurance and investment elements within a single premium, poses particular problems.

11.409. For the purposes of the discussion below, property insurance is defined to include:

- Dwelling insurance;
- Household contents insurance;
- Motor vehicle insurance.

11.410. The common feature of these types of insurance policies is that for a fee (premium), households receive financial compensation if a nominated event results in damage to, or loss of, specified property. The alternative to purchasing insurance is for the household to self-insure. For households, the service received relieves the risk of financial loss. The appropriate treatment of property insurance with respect to scope, weighting structure and pricing in the CPI partly depends on whether the CPI is constructed to follow the acquisitions, use or payments approach.

Payments approach

11.411. Under the payments approach, each of the above policy types is in scope. In thinking about how this property insurance should be included in the CPI, it is appropriate to consider both the gross premiums payable and the claims receivable by households, for inclusion in weights. The definitions of gross premiums payable and claims receivable are straightforward. It is possible, however, to treat claims receivable in various ways, which will have an impact on either the weight assigned to insurance or the weight assigned to consumer products insured. Spending on insurance can be weighted on either a gross basis (i.e., valued using gross premiums payable) or on a net basis (i.e., valued using gross premiums payable less claims receivable). Similarly, damage to property insured may also be weighted gross or net (in the latter case, excluding purchases explicitly financed by insurance claims receivable). Taken together, this suggests three basically plausible alternative treatments in the weighting structure:

- Gross premiums, net expenditure;
- Net premiums, gross expenditure;
- Gross premiums, gross expenditure.

11.412. With respect to gross premiums, net expenditure, it may be argued that calculating expenditure net of purchases financed by insurance claims avoids double counting of that portion of gross premiums which funds the claims. But there are some problems with this approach. First, it is assumed that all proceeds from insurance claims are used to purchase
replacement products or to repair damaged property. Second, in some cases, claims receivable may be to compensate for damage to the property of agents beyond the scope of the index (e.g., businesses, government or even other households where the CPI reference group covers only some subset of households). Households may also choose to use the proceeds for entirely different purposes. Thus, the estimation of the net expenditure weights is likely to involve some partly arbitrary choices. More generally, because money is fungible, (i.e., one sum of money can be replaced by another as money can be used to purchase a variety of goods and services), attempts to restrict coverage only to those expenditure made from selected sources of funds are questionable. Finally, the potential distortion of weights for the products concerned might possibly reduce the usefulness of sub-indices for other purposes.

11.413. Considering the second option, *net premiums, gross expenditure*, within a payments index, this approach is based on the view that claims receivable should be regarded as negative expenditure on insurance. This may be viewed as an attempt to avoid a double counting of expenditure on products financed by claims receivable and already included in gross expenditure on other consumer products elsewhere in the index. The net premiums approach is in some way less problematic than the net expenditure approach, as the impact is restricted to the weights for insurance and not affecting weights for replacement product expenditure financed out of claims. It may, however, be argued that the net premiums approach is inconsistent with approaches adopted for other products in a payments index - in particular, with mortgage interest and consumer credit charges, where weights are based on gross payments. Any allowance for interest receipts would yield negative weights when households are net savers overall.

11.414. The net premiums approach effectively measures the value of the insurance service and can be appropriate for indices constructed according to both the acquisitions and use approaches, as well as for a payments-based index considered here. It also tends to be favored for medical insurance although with such finely balanced arguments it is difficult to be prescriptive.

11.415. The use of *gross premiums, gross expenditure* is based on the view that the claims receivable by households represent one of the sources of funds from which expenditure are made. This is the main justification for using gross expenditure. The *gross premiums, gross expenditure* method is the most appealing approach for a payments index, as it recognizes the fungible nature of money for purchasing goods and services and provides a consistent means of identifying both the product coverage of the index and the relative weights by reference only to the actual outlays of households.

**Use approach**

11.416. Under the *use approach*, dwelling insurance can be seen as out of scope as conceptually it is an input cost of the notional landlord, which is reflected in the imputed rent. The weights should relate to the value of the insurance service consumed by households. This is defined as being equal to: gross insurance premiums payable by households, plus premium supplements, less provisions for claims, less changes in actuarial reserves.

11.417. It is not possible to estimate the nominal value of the net insurance service from HBSs alone. For weighting purposes, a feasible approach is to obtain data from a sample of insurance providers, or from a regulatory authority, facilitating estimation of the ratio of net insurance services to gross premiums, and to apply this ratio to the estimated value of gross
premiums obtained, for example, from the HBSs. However, it has not been possible to devise a corresponding price measure that is conceptually sound and can be accurately observed frequently enough from insurance companies’ accounts. For this reason, those countries that have adopted the net concept for weighting purposes are using movements in gross insurance premiums as a proxy price measure.

Acquisitions approach

11.418. Under the acquisitions approach, all three policy types (as listed earlier) are in scope. Because the objective is to measure price inflation for the household sector, the expenditure required for weighting purposes should reflect the insurance companies’ contribution to the inflationary process, which equates to the value of the insurance service as per the use approach.

Pricing gross insurance premiums

11.419. The gross insurance premium payable by households in any one period is determined by the conditions of the policy, the administration costs and profit objectives of the insurance provider, the risk of a claim being made and any relevant taxes. For any single policy, the principal quality-determining characteristics (generally specified in the conditions of the policy) can be summarized as being:

- The type of property being covered (dwelling, motor vehicle, etc.);
- The type of cover provided (physical damage, liability, etc.);
- The nature of the compensation (replacement cost, current market value, etc.);
- Any limits on the amount claimable;
- The location of the property;
- Amount of any excess payable by the insured;
- Risks (or events) covered.

11.420. Whilst it is clear that pricing to constant quality requires these conditions to be held fixed, there is also a question about whether the risk of a claim being made should be held constant. In other words, if the incidence of, say, vehicle theft increases, should an increase in the premium paid be regarded as a quality improvement or a price change? If, on the one hand, it is argued that as the consumers’ decision to insure is based on their assessment of the likelihood of suffering a loss compared to the premium charged, the risk factors should be held constant. On the other hand, it may be argued that, once insured, the consumer expects to be compensated for any loss irrespective of changes in risk. From the perspective of the consumer, any increase in risk represents an increase in the insurer’s cost base (which may or may not be passed on to the consumer by way of a price change). Obtaining data of sufficient reliability to make quality adjustments in response to changes in risk is problematic, so in practice most indices reflect changes in risk as a price change.

11.421. In pricing insurance policies, the approach should be to select a sample of policies representative of those policies held in the base period and to re-price these in subsequent periods. Taking dwelling insurance as an example, base period insurance policies would be taken out to insure dwellings of various values and types (e.g., detached versus terraced house; timber or brick built) in different locations. The price samples should therefore
consist of specifications that aim to cover, in aggregate, as many combinations of these variables as is reasonable. While the conditions of the policy, the dwelling type and location should be held constant over time, the value of the dwelling should be updated each period to reflect changes in house prices and in re-building costs (i.e., the underlying real quantity needs to be preserved). It is important to note that, as the premiums will be related in some way to the value of the insured property, the price index for insurance can change without there being any change in premium schedules.

11.422. Efforts should be made to identify any changes in the conditions applying to selected policies in order to facilitate appropriate quality adjustments. Examples would include cessation of coverage for specific conditions and changing the excess (or deductible) paid by the consumer when a claim is made. Estimates of the value of such changes may be based on the insurance company’s own assessments of their likely impact on the value of total claims payable. If it is assumed that the change in the aggregate value of claims can be equated to the change in service to the consumer (compared to the service that would have been provided prior to policy renewal), then an appropriate adjustment can be made to the premium to provide a (quality-adjusted) movement in price. For example, consider the case where the excess on a policy is doubled and advice from the company is that this will result in a 3 percent drop in the aggregate value of claims payable. This could be considered as equivalent to a 3 percent increase in price.

11.423. In some cases, clients reap the benefits of a "no claims" bonus where the premium is lower if no insurance claim has been made over a period of years. Measuring the cost of a fixed basket of goods and services implies that the price relatives should follow the price evolution of identical products, that is, the product specification should remain constant. The price changes recorded should reflect pure price changes, that is, the specifications of the insurance premiums should be held constant whilst reflecting in the base period the presence of "no claims" bonuses.

11.424. A combination of, for example, motor insurance and dwellings insurance or health and travel insurance may be offered as a package at a cheaper price than separate purchases. Bundled products are generally required, if feasible in practice, to be separated and classified under the appropriate COICOP sub-classes or classes within the same or different COICOP groups or divisions. However, COICOP, while showing its awareness of the problem of bundling (see below), does not normally provide clear guidance on their classification. Outlays covering two or more purposes are dealt with on a case-by-case basis with the aim of obtaining a purpose breakdown that is as precise as possible and consistent with practical considerations of data availability.

**Using gross premiums as a proxy for the net insurance service**

11.425. The net insurance service charge captures the administration costs and profits of the insurance provider along with any taxes and represents the amount paid for "peace of mind". A problem arises from the fact that taxes on insurance are normally levied on the gross premiums. Namely, if the gross insurance premiums are subject to a high rate of tax, then the taxes will account for an even higher proportion of the net insurance service charge. Using the gross insurance premium inclusive of taxes as the price measure understates the effect, in relation to the service charge, of any increase in tax rates. This can be illustrated by the following example.
For the sake of simplicity, assume that there are no premium supplements and no actuarial reserves. Then the insurance service charge is given by gross premiums less provisions for claims. Suppose the only change between two periods is a change in the tax rate, from 5 to 20 percent of gross premiums. Then the values in the table below are likely to be observed. Under this scenario it turns out that the insurance service charge has increased from $45 to $60 (an increase of 33.3 percent), yet gross premiums have only increased by 14.3 percent.

Table 11.15 Illustration of the impact of taxes on measures of insurance services ($)

<table>
<thead>
<tr>
<th>Period</th>
<th>Premiums before tax</th>
<th>Tax</th>
<th>Gross premiums</th>
<th>Claims</th>
<th>Insurance service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>5</td>
<td>105</td>
<td>60</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>20</td>
<td>120</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

Given that changes in the tax rates on gross insurance premiums are often subject to significant variation, this can result in a volatile index. It is not a trivial problem. A practical solution is to decompose insurance service into two components: insurance service before tax (or net of tax) and tax on insurance services. The price measure for the first is constructed by reference to movements in gross premiums net of tax, and the price measure for the second is given by changes in taxes on gross premiums.
## Appendix A: Example of Price Collection Checklist for Second-Hand Clothing

<table>
<thead>
<tr>
<th>Category: Second-hand Clothing</th>
</tr>
</thead>
</table>

**Product Name:** Men’s Branded T-Shirt  
**Product Code:** 123.321

<table>
<thead>
<tr>
<th>Preferred Quantity and Unit of Measurement:</th>
<th>1 Unit</th>
</tr>
</thead>
</table>

**Product Description:**
- Product Presentation: No Package
- Quantity: 1 Unit
- Fiber Type: Cotton 100%
- Units per package: One
- Type: T-Shirt
- Sleeve Length: Short sleeve
- Fabric design: Single color
- Neck style: Round neck

**Collector:** .................................................................  
**Date:** ...........................................................................  
**Market:** ...........................................................................

**Product Detail (✓ or specify as appropriate):**

<table>
<thead>
<tr>
<th>Brand:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality:</td>
</tr>
<tr>
<td>Minor Wear and Tear (e.g., some fraying at edges)</td>
</tr>
<tr>
<td>Major Wear and Tear (e.g., some holes or major repairs)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fabric design:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small logo</td>
</tr>
<tr>
<td>Large printed design</td>
</tr>
<tr>
<td>Multi-colored fabric (e.g., stripes)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neck Style:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round</td>
</tr>
<tr>
<td>V-neck</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outlet Type:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensed outlet</td>
</tr>
<tr>
<td>Temporary stall</td>
</tr>
<tr>
<td>Street vendor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
Appendix B: Example Price Collection Letter to Retailer

Bureau of Statistics
P.O Box 1

Date XX/XX/XX

Mr. B Graham
Dealer, Second-Hand Clothes
Market A

SECONDHAND CLOTHING PRICE INDEX

Every month the Bureau of Statistics collects clothing prices for the purpose of constructing a Second-hand Clothing Price Index and for this purpose we would request you to advise us on the following prices as at XXXX.

We would remind you that it is important for you to let us know if the size of the bundles or the quality of the content has changed from the previous month. Any such changes should be recorded in the remarks’ column.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TYPE</th>
<th>TOUS PRICE PER BALE</th>
<th>RENT PRICE PER BALE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Shirt</td>
<td>Brand 1</td>
<td>300</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>International logo)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brand 2</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>National brand)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. T-Shirt</td>
<td>Brand 1</td>
<td>210</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>International logo)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brand 2</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>National brand)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>men’s Dress (Cotton)</td>
<td>Brand 1</td>
<td>400</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brand 2</td>
<td>425</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1’s Trousers (Cotton)</td>
<td>Brand 1</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brand 2</td>
<td>350</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix C: A Coverage of health, education, and social protection services (COICOP classification)

06 HEALTH

Includes:
Health services purchased from school and university health centres.

06.1 Medical products, appliances and equipment
   06.1.1 Pharmaceutical products
      06.1.1.0 Pharmaceutical products
   06.1.2 Other medical products
      06.1.2.1 Pregnancy tests and mechanical contraceptive devices
      06.1.2.9 Other medical products n.e.c.
   06.1.3 Therapeutic appliances and equipment
      06.1.3.1 Corrective eye-glasses and contact lenses
      06.1.3.2 Hearing aids
      06.1.3.3 Repair of therapeutic appliances and equipment
      06.1.3.9 Other therapeutic appliances and equipment

06.2 Out-patient services
   06.2.1 Medical services
      06.2.1.1 General practice
      06.2.1.2 Specialist practice
   06.2.2 Dental services
      06.2.2.0 Dental services
   06.2.3 Paramedical services
      06.2.3.1 Services of medical analysis laboratories and X-ray centres
      06.2.3.2 Thermal-baths, corrective-gymnastic therapy, ambulance services and hire of therapeutic equipment
      06.2.3.9 Other paramedical services

06.3 Hospital services
   06.3.0 Hospital services
      06.3.0.0 Hospital services

10 EDUCATION

10.1 Pre-primary and primary education
10.1.0 Pre-primary and primary education
   10.1.0.1 Pre-primary education
   10.1.0.2 Primary education

10.2 Secondary education
   10.2.0 Secondary education
   10.2.0.0 Secondary education

10.3 Post-secondary non-tertiary education
   10.3.0 Post secondary non-tertiary education
   10.3.0.0 Post secondary non-tertiary education

10.4 Tertiary education
   10.4.0 Tertiary education
   10.4.0.0 Tertiary education

10.5 Education not definable by level
   10.5.0 Education not definable by level
   10.5.0.0 Education not definable by level

12.4 SOCIAL PROTECTION
12.4.0 Social protection
   12.4.0.1 Child-care services
   12.4.0.2 Retirement homes for elderly persons and residences for disabled persons
   12.4.0.3 Services to maintain people in their private homes
   12.4.0.4 Counselling
### Appendix D: Calculation of a price index for a deposit product

**(a) Base period sample account.** Only a single month’s data is used in this example. In practice, many accounts would be sampled with each account containing data for a full year.

<table>
<thead>
<tr>
<th>Date</th>
<th>Debit (D) or Credit (C)</th>
<th>Transaction</th>
<th>Transaction value ($)</th>
<th>Tax ($)</th>
<th>Balance ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>107.05</td>
<td>0.70</td>
<td>348.48</td>
</tr>
<tr>
<td>12 Jan</td>
<td>C</td>
<td>Deposit</td>
<td>4 000.00</td>
<td>2.40</td>
<td>4 346.08</td>
</tr>
<tr>
<td>13 Jan</td>
<td>D</td>
<td>EFTPOS transaction</td>
<td>50.62</td>
<td>0.30</td>
<td>4 295.16</td>
</tr>
<tr>
<td>13 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>371.00</td>
<td>0.70</td>
<td>3 923.46</td>
</tr>
<tr>
<td>14 Jan</td>
<td>D</td>
<td>Own ATM cash</td>
<td>300.00</td>
<td>0.70</td>
<td>3 622.76</td>
</tr>
<tr>
<td>14 Jan</td>
<td>D</td>
<td>Own ATM cash</td>
<td>100.00</td>
<td>0.70</td>
<td>3 522.06</td>
</tr>
<tr>
<td>16 Jan</td>
<td>D</td>
<td>Own ATM cash</td>
<td>100.00</td>
<td>0.70</td>
<td>3 421.36</td>
</tr>
<tr>
<td>16 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>371.00</td>
<td>0.70</td>
<td>3 049.66</td>
</tr>
<tr>
<td>16 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>90.00</td>
<td>0.30</td>
<td>2 959.36</td>
</tr>
<tr>
<td>19 Jan</td>
<td>D</td>
<td>Own ATM cash</td>
<td>100.00</td>
<td>0.70</td>
<td>2 858.66</td>
</tr>
<tr>
<td>19 Jan</td>
<td>D</td>
<td>Own ATM cash</td>
<td>100.00</td>
<td>0.70</td>
<td>2 757.96</td>
</tr>
<tr>
<td>19 Jan</td>
<td>C</td>
<td>Deposit</td>
<td>4 000.00</td>
<td>2.40</td>
<td>6 755.56</td>
</tr>
<tr>
<td>19 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>740.00</td>
<td>1.50</td>
<td>6 014.06</td>
</tr>
<tr>
<td>20 Jan</td>
<td>D</td>
<td>EFTPOS transaction</td>
<td>76.42</td>
<td>0.30</td>
<td>5 937.34</td>
</tr>
<tr>
<td>21 Jan</td>
<td>D</td>
<td>Other ATM cash</td>
<td>20.00</td>
<td>0.30</td>
<td>5 917.04</td>
</tr>
<tr>
<td>21 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>100.00</td>
<td>0.70</td>
<td>5 816.34</td>
</tr>
<tr>
<td>22 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>43.40</td>
<td>0.30</td>
<td>5 772.64</td>
</tr>
<tr>
<td>22 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>302.00</td>
<td>0.70</td>
<td>5 469.94</td>
</tr>
<tr>
<td>22 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>37.00</td>
<td>0.30</td>
<td>5 432.64</td>
</tr>
<tr>
<td>23 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>371.00</td>
<td>0.70</td>
<td>5 060.94</td>
</tr>
<tr>
<td>23 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>72.00</td>
<td>0.30</td>
<td>4 988.64</td>
</tr>
<tr>
<td>27 Jan</td>
<td>D</td>
<td>Own ATM cash</td>
<td>150.00</td>
<td>0.70</td>
<td>4 837.94</td>
</tr>
<tr>
<td>27 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>73.50</td>
<td>0.30</td>
<td>4 764.14</td>
</tr>
<tr>
<td>27 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>260.00</td>
<td>0.70</td>
<td>4 503.44</td>
</tr>
<tr>
<td>27 Jan</td>
<td>D</td>
<td>EFTPOS transaction</td>
<td>51.45</td>
<td>0.30</td>
<td>4 451.69</td>
</tr>
<tr>
<td>28 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>19.95</td>
<td>0.30</td>
<td>4 431.44</td>
</tr>
<tr>
<td>28 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>150.00</td>
<td>0.70</td>
<td>4 280.74</td>
</tr>
<tr>
<td>29 Jan</td>
<td>D</td>
<td>Cheque</td>
<td>140.00</td>
<td>0.70</td>
<td>4 140.04</td>
</tr>
<tr>
<td>30 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>371.00</td>
<td>0.70</td>
<td>3 768.34</td>
</tr>
</tbody>
</table>
30 Jan   D Cheque    8.00  0.30  3 760.04
30 Jan   D Cheque    60.00  0.30  3 699.74

**Total taxes:** 21.10

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total No.</th>
<th>No. charged</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over the counter withdrawal</td>
<td>6</td>
<td>2</td>
<td>6.00</td>
</tr>
<tr>
<td>EFTPOS transaction</td>
<td>3</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Own ATM cash</td>
<td>6</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Own ATM cash</td>
<td>1</td>
<td>1</td>
<td>1.20</td>
</tr>
<tr>
<td>Cheque</td>
<td>13</td>
<td>3</td>
<td>3.00</td>
</tr>
<tr>
<td>Deposit</td>
<td>2</td>
<td>2</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Total fees** 10.20

Fees and taxes are calculated using data in tables (b) and (c), respectively.

1 EFTPOS (Electronic Funds Transfer Point Of Sale).
2 ATM (Automatic Teller Machine).

*Source: Woolford (2001)*

**Fee schedule.** The following table is a summary of the information typically available from financial institutions. For each period, the table includes the number of free transactions and the per transaction charge for additional transactions. A zero number of free transactions indicates that no transactions are free and a zero charge indicates that all transactions are free.

<table>
<thead>
<tr>
<th>Description</th>
<th>Base period</th>
<th>Current period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. free</td>
<td>Charge ($)</td>
</tr>
<tr>
<td>Over the counter withdrawal</td>
<td>4</td>
<td>3.00</td>
</tr>
<tr>
<td>EFTPOS transaction</td>
<td>10</td>
<td>0.50</td>
</tr>
<tr>
<td>Own ATM cash</td>
<td>10</td>
<td>0.50</td>
</tr>
<tr>
<td>Other ATM cash</td>
<td>0</td>
<td>1.20</td>
</tr>
<tr>
<td>Cheque</td>
<td>10</td>
<td>1.00</td>
</tr>
<tr>
<td>Deposit</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Source: Woolford (2001)*

(c) **Tax schedule.** The following is a table of taxes of types that used to apply in Australia. The debits tax is levied on all debit transactions to eligible accounts, with the amount charged being set for ranges of transaction values (i.e., using a step function). Financial institutions duty is levied on all deposits, the amount being determined as a percentage of the value of the deposit.

**Bank accounts debit tax**
(d) **Interest data.** The table presents, in summary form, the balances and annualized interest flows derived by taking moving averages of data reported by financial institutions. Interest rates and margins are calculated from the balances and flows.

<table>
<thead>
<tr>
<th>Deposit products</th>
<th>Base period</th>
<th>Current period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Balance ($ million)</td>
<td>Interest ($ million)</td>
</tr>
<tr>
<td>Personal</td>
<td>22 000</td>
<td>740</td>
</tr>
<tr>
<td>Current accounts</td>
<td>6 000</td>
<td>68</td>
</tr>
<tr>
<td>Other accounts</td>
<td>16 000</td>
<td>672</td>
</tr>
<tr>
<td>Business accounts</td>
<td>25 000</td>
<td>920</td>
</tr>
<tr>
<td>Total deposit accounts</td>
<td>47 000</td>
<td>1 660</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Loan products</th>
<th>Base period</th>
<th>Current period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Balance ($ million)</td>
<td>Interest ($ million)</td>
</tr>
<tr>
<td>Personal</td>
<td>42 000</td>
<td>3 188</td>
</tr>
<tr>
<td>Business</td>
<td>28 000</td>
<td>2 540</td>
</tr>
<tr>
<td>Total loan accounts</td>
<td>70 000</td>
<td>5 728</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference rate</th>
<th>Base period</th>
<th>Current period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.8574</td>
<td>5.6810</td>
</tr>
</tbody>
</table>

*Source: Woolford (2001).*

(e) **CPI data.** The table presents data required to derive the indexation factor. This example follows the Australian practice of a quarterly CPI. If a monthly CPI is produced, 12-term moving averages would be required.
<table>
<thead>
<tr>
<th>Date</th>
<th>Debit (D) or Credit (C)</th>
<th>Transaction</th>
<th>Value ($)</th>
<th>Tax ($)</th>
<th>Balance ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Jan</td>
<td>D</td>
<td>Over the counter withdrawal</td>
<td>109.59</td>
<td>0.70</td>
<td>356.75</td>
</tr>
<tr>
<td>12 Jan</td>
<td>C</td>
<td>Deposit</td>
<td>4094.75</td>
<td>2.46</td>
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<td>102.37</td>
<td>0.70</td>
<td>3502.50</td>
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<td>Over the counter withdrawal</td>
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<td>16 Jan</td>
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<td>Cheque</td>
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<td>3029.57</td>
</tr>
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<td>Own ATM cash</td>
<td>102.37</td>
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<td>19 Jan</td>
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<td>Own ATM cash</td>
<td>102.37</td>
<td>0.70</td>
<td>2823.44</td>
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<td>19 Jan</td>
<td>C</td>
<td>Deposit</td>
<td>4094.75</td>
<td>2.46</td>
<td>6915.73</td>
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<td>D</td>
<td>Cheque</td>
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<td>1.50</td>
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<td>Other ATM cash</td>
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<td>0.70</td>
<td>5954.33</td>
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<td>44.43</td>
<td>0.30</td>
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<td>5599.75</td>
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<td>5561.57</td>
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<td>Over the counter withdrawal</td>
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<td>5181.08</td>
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<td>EFTPOS transaction</td>
<td>52.67</td>
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<td>4557.46</td>
</tr>
</tbody>
</table>

**f** *Projected current period sample account.* The opening balance and transaction values are derived by applying the indexation factor to the base period amounts. The tax payable is determined by reference to the data in table (c). Fees payable are determined by reference to the data in table (b).

**Sources:** Woolford (2001)
28 Jan  D  Over the counter withdrawal  20.42  0.30  4 536.73
28 Jan  D  Cheque  153.55  0.70  4 382.48
29 Jan  D  Cheque  143.32  0.70  4 238.46
30 Jan  D  Over the counter withdrawal  379.79  0.70  3 857.98
30 Jan  D  Cheque  8.19  0.30  3 849.49
30 Jan  D  Cheque  61.42  0.30  3 787.77

**Total Taxes:**  21.21

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total No.</th>
<th>No. charged</th>
<th>Amount ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over the counter withdrawal</td>
<td>6</td>
<td>2</td>
<td>6.00</td>
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<tr>
<td>EFTPOS transaction</td>
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<td>Own ATM cash</td>
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<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Own ATM cash</td>
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</tr>
<tr>
<td>Cheque</td>
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<td>4</td>
<td>4.00</td>
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<tr>
<td>Deposit</td>
<td>2</td>
<td>2</td>
<td>0.00</td>
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</table>

**Total fees**  11.20


**(g) Indices for current accounts.** The following table brings the results together. The current period value aggregates are derived as follows. For margins – the base period aggregate is multiplied by the product of the indexation factor (e) and the ratio of the current and base period margins for current accounts (d). For fees – the base period aggregate is multiplied by the ratio of total fees payable on the sample account in the current period (f) and the base period (a). For taxes – the same procedure is followed as for fees.

<table>
<thead>
<tr>
<th>Component</th>
<th>Base period</th>
<th>Current period</th>
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<tr>
<td></td>
<td>Value aggregate ($)</td>
<td>Index</td>
</tr>
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<td>Margins</td>
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<tr>
<td>Fees</td>
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<td>100.0</td>
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<tr>
<td>Taxes</td>
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<td>100.0</td>
</tr>
<tr>
<td>Total</td>
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<td>100.0</td>
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</tbody>
</table>
