# SOME SPECIAL CASES 10

## Introduction

**10.1** This chapter focuses on a number of expenditure areas that pose particular problems for price index compilers, both in terms of identifying an agreed conceptual approach and also overcoming practical measurement difficulties. Six areas have been selected for discussion, mainly from the service sector. They are:

– owner-occupied housing;
– clothing;
– telecommunication services;
– financial services;
– real estate agency services;
– property insurance services.

**10.2** This chapter is therefore structured into six sections, in turn dealing with the problem areas listed above. Under each section, any necessary theoretical considerations are discussed and relevant measurement issues explored. Where appropriate, illustrative examples of alternative approaches to the measurement of weights or price changes are provided, and the advantages and disadvantages are outlined.

**10.3** It is important to note that the examples shown are neither definitive nor prescriptive, but rather provide broad guidance as to how the problem areas can be approached. User requirements, data availability and the statistical resources available are important factors that need to be taken into consideration in choosing an appropriate methodology. Market conditions and product market regulations, which can differ widely between countries, also have a critical impact on the choice of method.

## Owner-occupied housing

**10.4** The treatment of owner-occupied housing in consumer price indices (CPIs) is arguably the most difficult issue 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, at least, short-term measures of price change.

**10.5** Ideally, the approach chosen should align with the conceptual basis that best satisfies the principal purpose of the CPI. However, the data requirements for some (or even all) of these options may be such that it is not feasible to adopt the preferred treatment. Equally important, it may be difficult to identify a single principal purpose for the CPI. In particular, the dual use of CPIs as both macroeconomic indicators and also for indexation purposes can lead to clear tensions in designing an appropriate treatment for owner-occupied housing costs. 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. In some countries, the difficulties in resolving such tensions have led to the omission of owner-occupied housing from the CPI altogether or the publication of more than one index.

**10.6** The remainder of this section discusses the conceptual basis and data requirements for the *use*, *payments* and *acquisitions* approaches in turn.

### Use

**10.7** 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 broader headings: user cost or rental equivalence.

**10.8** 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, opportunity cost can be viewed as an average of interest rates on mortgages and alternative assets, weighted by the proportion of the purchase price borrowed and paid outright, respectively.

**10.9** Estimation of the base period weight for recurring actual costs such as expenditures on repairs and maintenance is relatively straightforward and generally obtainable from household expenditure surveys. Similarly, the construction of price measures for these items presents few difficulties.

**10.10** Estimation of the base period weight for opportunity costs is more complicated and will require modelling. One 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) 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 (see Chapter 23 for a more complete discussion) 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 return available on alternative assets, respectively. $D$ is depreciation, $RC$ other recurring costs and $K$ capital gains.

**10.11** No national statistical office 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 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 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).

**10.12** 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, below.

**10.13** 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 expenditures (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.

**10.14** 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 also to 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 *SNA 1993* for measuring household consumption and is also used in constructing international comparisons of living standards.

**10.15** 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 household expenditure survey. 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.

**10.16** 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. In addition, 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.

**10.17** In those countries where the reference population for the CPI corresponds to all resident households, the estimation problem is identical to that faced by the national accountants and a collaborative approach would be beneficial.

**10.18** The corresponding price series for owner-occupiers' rent 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 particular 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). The price measures for the different strata can then be given different weights when calculating the actual rents and the owners' equivalent rent series, respectively.

**10.19** 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 this often presents landlords with an opportunity to refurbish properties and increase rents, the practice of regarding the whole of all such price changes as arising from quality change should be avoided. Furthermore, the rent series may need to be quality-adjusted to take account of ongoing depreciation to housing structures.

This question is discussed in Chapter 23, paragraphs 23.69 to 23.78.

## Payments

**10.20** 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. The set of outlays peculiar 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.

**10.21** While it is conceivable to include all of 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 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 expenditures 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.

**10.22** The remaining items can be regarded as current expenditures 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, it is clear that the aggregate payments equal a household's source of funds which comprise 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.

**10.23** Estimation of gross expenditures on these items in the weighting base period is readily achievable via a household expenditure survey, 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. 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.

**10.24** 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 and an illustrative methodology 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.

**10.25** 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.

**10.26** 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.

**10.27** 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).

**10.28** In order 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 also 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.

**10.29** To illustrate, suppose a base period household purchased a dwelling five years earlier for $100,000 and financed 50 per cent by mortgage. If, between the time of purchase and the base period, the household repaid 20 per cent of this debt, then the outstanding debt on which base period interest charges were calculated would have been $40,000. Now move to some subsequent

comparison period and suppose 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. The equivalent amount of outstanding debt in the comparison period would be calculated by first taking 50 per cent of the revalued house price (of $200,000) to give $100,000, and then reducing this by the principal repayment rate (of 20 per cent) to give $80,000.

**10.30** 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.

**10.31** Now suppose that all mortgages are of the variable rate type, and that average nominal interest rates rose from 5 per cent in the base period to 7.5 per cent 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 in order to determine a monetary price.

**10.32** 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 reference population as a whole. 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 revaluing 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 household expenditure surveys, 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 and is generally reliable.

**10.33** Table 10.1 illustrates how an aggregate debt price index can be constructed. For the purpose of illustrating the methodology, some simplifying assumptions have been made:

- The index is assumed to be quarterly rather than monthly.
- The oldest age of mortgage debt is assumed to be between three and four years (in practice, it is normally the case that debt older than eight years is insignificant).
- Each annual cohort of debt is assumed to be distributed evenly across the year.
- A quarterly index of dwelling prices (new and second-hand dwellings, including land) is available.

**10.34** Column (1) of Table 10.1(a) contains index numbers for dwelling prices extending back four years prior to the base period for the debt series (quarter 1 of year 0). Column (2) contains a four-quarter moving average of the first series – this is required to reflect "yearly" prices to correspond with the debt cohorts, which are only available in yearly age groups in this example (if quarterly cohorts were available it would not be necessary to calculate the moving average series).

**10.35** Columns (1) to (4) of Table 10.1(b) contain the calculated debt indices for each cohort re-referenced to Y0 Q1 = 100. These series are simple transformations of the series in column (2) of Table 10.1(a), each with a different starting point. For example, the debt series for that cohort contracted for between three and four years ago has as a starting point the index number from Y−4 Q4 (i.e. 113.9) in column (2), and the series for debt aged between two and three years starts from Y−3 Q4 (i.e. 118.7) and so on. Column (5) of Table 10.1(b) contains the aggregate debt index which is derived by weighting together the indices for the four age cohorts. The weights are derived from data from financial institutions on debt outstanding by age, revalued to period Y0 Q1 prices.

**10.36** 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 10.2.

**10.37** The construction of equivalent indices for fixed interest mortgages is more complicated in so far as an interest charges index has 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.

**10.38** The construction of the index for mortgage interest payments is predicated on the assumption that

Table 10.1 Calculation of a mortgage debt series

*(a) Dwelling price index*

| Year | Quarter | Original house price index (1) | Four-quarter moving average of (1) (2) |
|---|---|---|---|
| Y−4 | Q1 | 111.9 | |
| | Q2 | 112.8 | |
| | Q3 | 114.7 | |
| | Q4 | 116.2 | 113.9 |
| Y−3 | Q1 | 117.6 | 115.3 |
| | Q2 | 118.5 | 116.8 |
| | Q3 | 119.0 | 117.8 |
| | Q4 | 119.8 | 118.7 |
| Y−2 | Q1 | 120.1 | 119.4 |
| | Q2 | 120.3 | 119.8 |
| | Q3 | 120.5 | 120.2 |
| | Q4 | 122.0 | 120.7 |
| Y−1 | Q1 | 122.3 | 121.3 |
| | Q2 | 123.8 | 122.2 |
| | Q3 | 124.5 | 123.2 |
| | Q4 | 125.2 | 124.0 |
| Y0 | Q1 | 125.9 | 124.9 |
| | Q2 | 126.1 | 125.4 |
| | Q3 | 127.3 | 126.1 |
| | Q4 | 129.2 | 127.1 |

*(b) Debt index*

| Year | Quarter | Age of debt | | | | |
|---|---|---|---|---|---|---|
| | | 3–4 years Wt = 10% (1) | 2–3 years Wt = 20% (2) | 1–2 years Wt = 30% (3) | 0–1 year Wt = 40% (4) | Weighted average (5) |
| Y0 | Q1 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | Q2 | 101.2 | 100.6 | 100.7 | 100.7 | 100.7 |
| | Q3 | 102.5 | 100.9 | 101.6 | 101.1 | 101.4 |
| | Q4 | 103.4 | 101.3 | 102.2 | 101.7 | 101.9 |

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.

Table 10.2 Calculation of a mortgage interest charges series

| Year | Quarter | Debt index (1) | Nominal interest rates index (2) | Mortgage interest charges index (1) × (2)/100 (3) |
|---|---|---|---|---|
| Y0 | Q1 | 100.0 | 100.0 | 100.0 |
| | Q2 | 100.7 | 98.5 | 99.2 |
| | Q3 | 101.4 | 100.8 | 102.2 |
| | Q4 | 101.9 | 101.5 | 103.4 |

## Acquisitions

**10.39** The item domain for an acquisitions index is defined as all those consumer goods and services acquired by households. 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 household sector as a whole. 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. That is, consumer goods and services provided at no cost to households by governments and non-profit institutions serving households are excluded.

**10.40** The expenditures 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.

**10.41** The construction of price indices for real estate agency fees and insurance is discussed later in this chapter. 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 a discussion of the issues involved in constructing measures for dwelling purchase, construction, and alterations and additions. An advantage of the acquisitions approach is that, consistent with the treatment of most other goods and services in the CPI, the owner-occupied housing index will reflect the full price paid for housing. Moreover, it is not affected by methods of financing for house purchase.

**10.42** 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.

**10.43** Economists regard all housing as fixed capital and hence would exclude purchases of dwellings from household consumption. While this is unambiguously the case for housing purchased for rental, the case is less clear-cut when it comes to housing for owner-occupation. 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 can lead to a loss of confidence in the CPI by the population at large. Particularly in those countries where rental sectors are relatively small, with limited opportunities for substitution between owner-occupation and renting, it might be argued that the consumption element dominates.

**10.44** The problem confronting compilers of CPIs is how to separate the two elements so as to include only the consumption element 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 remains at constant quality for all time (except under extremely unusual circumstances). 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. (Measures of asset price inflation are, of course, useful in their own right.)

**10.45** Derivation of weighting base period expenditures on the net acquisition of dwellings (excluding land), the construction of new dwellings, and alterations and additions to existing dwellings poses some problems. Although household expenditure surveys may yield reliable estimates of the amounts households spend on alterations and additions, and construction of dwellings, it is unlikely that they will provide reliable estimates of net expenditures on existing dwellings exclusive of the value of the land.

**10.46** 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 subset of the total population.

**10.47** The price index is required to measure the change 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, labour costs and producers' 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 labour 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.

**10.48** The type of dwelling constructed in individual countries will significantly influence the complexity and cost of constructing appropriate price measures. If each newly constructed dwelling is essentially unique (i.e. designed to meet site or other requirements) it will be

necessary to adopt "model pricing". This requires selection of a sample of building firms, identifying samples of recently constructed dwellings and collecting 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.

**10.49** In a number of 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 redeveloped 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 (again, priced net of any site preparation costs). 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.

**10.50** 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 has 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 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 so it is acceptable to classify the full change in price as pure price movement (even though there may be some discernible change in quality).

## Clothing

**10.51** Clothing is a semi-durable good and its treatment is not affected by the conceptual basis chosen for the CPI (acquisitions, use or payments). Particular features of the clothing market do, however, create problems for price index compilers. Although clothing is purchased throughout the year, many types of clothing are only available in particular seasons and, unlike seasonal fruit and vegetables, the specific items on sale in one season (say summer) may not return the following year. In addition to seasonal availability, the physical characteristics of some items of clothing can also change as a result of changing fashions.

**10.52** The remainder of this section seeks to provide a general description of the clothing market applicable to most countries, discusses the most significant problems faced by index compilers and looks at some options for overcoming or at least minimizing these.

### The clothing market

**10.53** Most countries experience at least some climatic variation throughout the year. The number of discrete "seasons" may range from two ("wet" and "dry", summer and winter) up to the four experienced in most regions (winter, spring, summer and autumn). Items of clothing tend to fall into two categories: those that are available in one season only, and those that are available all year round.

**10.54** Clothing (whether seasonal or not) is also subject to changes in fashion. The fashion for trousers can change from straight legged to flared; jackets from single-breasted to double-breasted; shirts from button-down collar to not; skirts from long length to short length, and so on.

**10.55** Even within categories of garments which are not unduly affected by seasonal influences or general changes in fashions, the garments that are available for pricing from one period to the next can vary greatly. Retailers change suppliers in order to seek the best prices or to maintain an image of a constantly changing range in order to attract shoppers. Many producers will also frequently change product lines in order to maintain buyer appeal. The practice of single producers using different and changing brands as a marketing tool is also common. Isolated countries that rely predominantly on imported clothing also face the additional problem of discontinuities in supply because of shipping failures or even the whim of importers.

**10.56** The often short life cycles of specific items, and whole categories of items in the case of seasonal items, mean that retailers have to pay particular attention to inventory control, since they cannot afford to be left with large volumes of stock that they cannot sell. This is most commonly handled by progressively discounting or marking down prices throughout the estimated life cycle of an item.

**10.57** The fragmented and changing nature of the clothing market invariably means that price index compilers have to strike a balance between the ideal requirements for index purposes and the cost of data collection (of both prices and characteristics that may be required to make quality adjustments).

### Approaches to constructing indices for non-seasonal clothing

**10.58** Even where seasonality is not a problem, the construction of a price index for clothing is not a simple task. The range of available items can differ significantly

across outlets, making central determination and detailed specification of items to be priced ineffective. The brands and styles of particular garment types can also vary significantly over time in individual outlets, requiring close attention to procedures for replacing items and making quality adjustments.

**10.59** Although it is virtually impossible to set out specific procedures that will be applicable in all countries, it is possible to develop a set of guidelines to help avoid the most significant pitfalls. In developing these guidelines, the key objective is to maximize the number of usable price quotations (for a given collection cost) in any month, and to minimize the incidence of measures of price change being affected by changes in quality.

**10.60** In some circumstances, it may be possible to identify ''national'' specifications to be priced at each outlet (e.g. brand X, model Y jeans). The use of these types of specifications can help minimize the effort that needs to be put into quality adjustment, and movements in prices of these items can provide a useful benchmark against which to assess the movements of other items. Reliable identification of such items necessitates ongoing relationships with the buyers for large chains, or large domestic producers or importers. These sources need to be contacted on a regular basis to identify the current range of items, the extent of their availability across the country and any planned changes (including changes in style and quality as well as deletions from and additions to the range). This information may be used proactively to update specifications or descriptions of items to be priced in the field, so minimizing the incidence of price collectors attempting to price items that are no longer available. It can also be used to assist in the quantification of any quality changes.

**10.61** For some items where availability by brand varies, it may be possible to identify a number of brands which are assessed as being of equal quality (e.g. different brands of T-shirts). In these cases, price collectors could be provided with the list of equivalent brands and instructed to price the cheapest one of these available at each outlet without having to ensure that the same brand is priced this time as on the last visit. The argument for this practice is that, if the brands are truly equivalent, discerning shoppers will purchase the cheapest at the time of purchase, and to reflect this in the CPI will result in an index that more closely follows the experience of households. Clearly, the success or otherwise of this technique depends vitally on the assessment of the ''equality'' of brands which, while largely a matter of judgement, may be assisted by an analysis of past price behaviour. In general, brand equality might be indicated by narrow longer-term price dispersion and a tendency for brands to swap prices over time or outlets.

**10.62** In other cases it might be appropriate to restrict sampled items to a subset of brands without regarding the brands as equivalent. For example, a number of brands of jeans might together dominate the market but with the availability of the individual brands varying by outlet. In these cases, price collectors could be provided with a list of acceptable brands and instructed to price the most representative of these brands at each outlet. Once the initial selection has been made, price collectors should be instructed to record the specific brand and model priced at each outlet, and should continue to price that specification on subsequent visits until such time as it ceases to be stocked (or it becomes clear that it is no longer representative of the sales of that particular outlet).

**10.63** The clothing market has become so diverse that it is not always possible to specify centrally either the item to be priced or even the brand (or brands). In these cases, it is necessary to give price collectors much greater discretion when it comes to selecting the individual items for pricing. To avoid the selection of inappropriate items, it is important for price collectors to be provided with guidelines to assist in this process. At the very least, they should be instructed to select the brand and model that the retailer advises is both representative and is expected to be stocked for some time (little advantage is to be gained from selecting an item which, while popular, has been purchased by the retailer on a one-off basis and is thus unlikely to be available for pricing in subsequent periods).

**10.64** More sophisticated guidelines can incorporate a checklist of features that the selected item should match as closely as possible. These features should be ranked from most to least important, and it should be clear which features the selected item possesses and which it does not (either from the detailed description recorded by the price collector or through the completion of a separate feature pro-forma). In addition to brand (or acceptable brands), where possible, the list might include features such as:

– fabric type (e.g. cotton, wool, linen);
– weight of the fabric (e.g. heavy, medium, light);
– existence of a lining;
– number of buttons;
– type of stitching (e.g. single, double).

**10.65** It is recognized that high fashion items pose particular difficulties in terms of quality adjustment. There is certainly clear potential for such items to bias the CPI towards the end of their life cycle when prices may be heavily discounted and sales volumes are low. For example, compilers need to guard against the danger that items leave the index at a heavily discounted price to be replaced by items that are on sale at the full price (which for a highly fashionable item may be at a premium). More generally, any decision on the inclusion of high fashion items ought certainly to reflect the intended reference population of the index, for example where this excludes households at the upper end of the income distribution.

## Replacement of items and quality change

**10.66** Even for garment types that are available all year round, there remains a strong need to replace items or to otherwise recognize changes in item characteristics. It is therefore important to ensure that procedures are established to minimize any bias resulting from changes in the quality of items priced.

**10.67** The appropriate conceptual basis for assessing changes in the quality of garments is from the perspective of value to the consumer. In other words, a garment can be said to be of different quality to another garment if it is valued differently by the consumer. The difficulty confronted by index compilers is that quality differences are only observable in terms of changes in the physical characteristics of garments (including brand), some of which will have an impact on customer value and some of which will not. The problem is how to distinguish between them.

**10.68** To assist in this task it is important to develop guidelines for selecting replacement items, with the general objective of minimizing the quality difference between the old and new items. For most items, research has shown that brand is an important price- and quality-determining characteristic (particularly for items that have a significant fashion element) and so, in the first instance, an effort should be made to select a replacement from the same brand (but noting the danger that as brands go out of fashion they become less representative). As this will not always be possible, it is useful to enlist experts in the trade to assist in drawing up a list that classifies brands into quality groups along the following lines:

– exclusive brands, usually international brands, mostly sold in exclusive stores;
– higher-quality brands, well-known brands at the national level (which may also include international brands);
– average quality brands;
– other or unknown brands.

**10.69** If it is not possible to select a replacement from the same brand, the fallback should be to select a replacement from a brand in the same quality group. Similarity of price should never be the guiding objective when a substitute variety has to be chosen.

**10.70** Once a replacement item has been selected, a detailed description of the new item needs to be recorded. The physical differences between the old and new items should be described in as much detail as possible to enable the index compiler to assess whether the replacement item is comparable (i.e. of equal quality) to the old item or not. As a general guide, changes such as single rows of stitching replacing double rows, of lighter-weight fabrics replacing heavier-weight ones, reductions in the number of buttons on shirts, reductions in the length of shirt tails, disappearance of linings and so on should be regarded as changes in quality. Changes in physical characteristics attributable solely to changes in fashion (e.g. straight leg to flared leg trousers) should not be regarded as quality changes.

**10.71** Where an item is assessed as not being comparable, action will need to be taken to remove the impact of the quality change from the index. There are a number of approaches that may be taken to value the quality difference:

- Industry experts may be asked to place a cash value on the differences.
- The statistical office may arrange for some index compilers to receive additional training to become commodity experts able to estimate the value of such changes themselves.
- Hedonic methods may be employed if resources permit. Descriptions of hedonic techniques for clothing can be found in Liegey (1992) and Norberg (1999).

**10.72** Each of these methods requires that the changes in the quality-determining characteristics (such as quality of material and standard of manufacture) are quantifiable. If such information is not available, implicit quality adjustment methods may have to be used. In this case, it is important that the price for the outgoing specification is returned to a normal price before it is removed from index calculation.

## Approaches to including seasonal clothing in the consumer price index

**10.73** The practices adopted by statistical agencies for handling seasonal clothing in CPIs vary widely, ranging from complete exclusion of such items to various methods of imputation of prices of items that are unavailable at a particular time of year, or to systems of weights that vary throughout the year. In some respects, the treatment of seasonal clothing raises similar issues to those found in dealing with fashion items, in particular reflecting the short life cycles of products and the likelihood of price-discounting during those cycles.

**10.74** This section describes some practical alternatives for indices constructed using the traditional annual basket approach to produce a monthly CPI (i.e. systems of explicitly changing weights are not explored, nor is the use of year-on-year changes as proposed in Chapter 22). Further, the examples will be restricted to the so-called multiple basket approach because of the inherent difficulty of making quality adjustments between seasons in the so-called single basket approach. (The single basket approach takes the view that, say, summer and winter seasonal items are different varieties of the same article, whereas the multiple basket approach takes the view that they are completely different articles.)

**10.75** CPI compilers may choose to exclude seasonal clothing from the CPI altogether. While this might simplify the job of compiling the index, it clearly reduces the representativeness of the basket. This might be considered as the option of last resort and will cause presentational difficulties from the point of view of external users, particularly where relative expenditure on seasonal clothing is high. Including seasonal items makes the basket more representative of consumption patterns but complicates the process of compiling the index. In reaching a decision, it will be necessary to strike a balance between representativeness and complexity (cost). Where seasonal items are excluded, their expenditure weight should be distributed among non-seasonal counterparts.

**10.76** Six possible approaches to constructing aggregate clothing price indices in the presence of seasonal items are described below. A synthetic set of prices is used (see Table 10.3) to illustrate the various options. For simplicity, it is assumed that there are only three categories of clothing: those available all year (non-seasonal); and two seasonal categories (labelled summer and winter here). The two seasons are assumed to be

Table 10.3 Synthetic price data to illustrate approaches to constructing clothing price indices

| Month | Year Y − 1 | | | Year Y | | | Year Y + 1 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Non-seasonal | Summer seasonal | Winter seasonal | Non-seasonal | Summer seasonal | Winter seasonal | Non-seasonal | Summer seasonal | Winter seasonal |
| 1 | 100 | 100 | | 113 | 110 | | 127 | 125 | |
| 2 | 101 | 80 | | 114 | 90 | | 128 | 100 | |
| 3 | 102 | 60 | | 115 | 70 | | 130 | 80 | |
| 4 | 103 | | | 116 | | | 131 | | |
| 5 | 104 | | | 117 | | | 132 | | |
| 6 | 105 | | | 118 | | | 133 | | |
| 7 | 106 | | 100 | 120 | | 110 | 135 | | 125 |
| 8 | 107 | | 80 | 121 | | 90 | 136 | | 100 |
| 9 | 108 | | 60 | 122 | | 70 | 137 | | 80 |
| 10 | 109 | | | 123 | | | 139 | | |
| 11 | 110 | | | 124 | | | 140 | | |
| 12 | 112 | | | 126 | | | 142 | | |

non-overlapping and the prices of the seasonal varieties are contrived to show progressive discounting over the course of each season. The prices of the non-seasonal items show a steady rate of growth. Within each category, prices are assumed to be for items of identical physical characteristics (or alternatively, to have been adjusted to remove the effects of changes in physical characteristics).

**10.77** The price indices have been compiled with a base period of month 1 in year 0 and extend for 24 months (prices are provided for year Y−1 in order to impute base period prices for the winter seasonal item). For the purpose of weighting, it is assumed that each of the seasonal categories accounts for 25 per cent of expenditure, while non-seasonal items account for the remaining 50 per cent. For ease of computation, imputation is based on the simple arithmetic average of the price movements of the available series (including movements from imputed to real prices), though in practice these imputations would be based on weighted averages. Tables 10.4 to 10.6 present the calculated indices and monthly percentage changes for summer seasonal, winter seasonal and total clothing, respectively, based on the alternative methodologies described below.

**10.78** *Exclude seasonal items*. This is the simplest option from an index construction point of view, but suffers from a lack of representativeness, which may be a cause of concern to some users. In this example, only 50 per cent of expenditures would be directly represented in the index. Clearly, the greater the relative expenditure on seasonal items, the more users are likely to be concerned about the lack of representativeness of the index. The results for this index are shown in column (1) of Table 10.6 and may be used as a benchmark against which the following options can be assessed.

**10.79** *Impute only on items available all year*. This approach is one of the targeted imputation approaches. In this case, the out of season prices for both summer and winter items are imputed based only on the movement in the prices of those items available all year round. The results for the summer and winter items are shown in column (1) of Tables 10.4 and 10.5, respectively, while the total clothing index is shown in column (2) of Table 10.6.

**10.80** *Impute on all available items*. This approach imputes all missing prices based on the movements in all available prices of related or similar items. This approach is similar in principle to the approach that would be taken in the case of a missing price observation. Prices for seasonal items are collected while they are observable, and when out of season are imputed based on items available all year round together with other seasonal items if available. The results are shown in column (2) in Tables 10.4 and 10.5, and in column (3) of Table 10.6.

**10.81** *Carry forward of last observed price*. This simpler variant of the methods described above involves the carry forward of the last observed prices for seasonal items during the months when such prices are unavailable. This approach would not normally be recommended in the general case where prices are not available for non-seasonal items, on the grounds that the likely downward bias imparted could easily be avoided by observing the price of some similar item that is available. But where a whole class of goods is unavailable and hence unobservable, and particularly where price movements are not strongly correlated with other items, carry forward of prices may be seen as an acceptable approach. The results are shown in column (3) in Tables 10.4 and 10.5, and in column (4) of Table 10.6.

**10.82** Under this approach, it is preferable to determine in advance during which months seasonal prices will be collected. This helps prevent distortion of the index through collection of possibly atypical prices for seasonal items unexpectedly available outside those periods when they would normally be available. Such decisions should be subject to regular review on the basis of market developments.

**10.83** *Return to normal, then impute*. This approach requires the index compiler to estimate the ''normal'' price for the item during the first month when it is unavailable (out of season). This estimated normal price is then imputed forward until such time as the item becomes available again. Compared to the methods discussed so far, this approach is designed to avoid artificial depression of the aggregate index beyond the end of season, following progressive discounts over the item's short life cycle.

Table 10.4 Alternative price indices for summer seasonal clothing

| Month | Impute only on items available all year (1) | Impute on all available items (2) | Carry forward of last observed price (3) | Return to normal, then impute (4) | Include first seasonal observation, then impute (5) |
|---|---|---|---|---|---|
| | | | *Index numbers* | | |
| 1 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2 | 81.8 | 81.8 | 81.8 | 81.8 | 100.9 |
| 3 | 63.6 | 63.6 | 63.6 | 63.6 | 101.8 |
| 4 | 64.2 | 64.2 | 63.6 | 100.0 | 102.7 |
| 5 | 64.7 | 64.7 | 63.6 | 100.9 | 103.5 |
| 6 | 65.3 | 65.3 | 63.6 | 101.7 | 104.4 |
| 7 | 66.4 | 77.0 | 63.6 | 102.9 | 105.4 |
| 8 | 67.0 | 70.3 | 63.6 | 94.0 | 106.3 |
| 9 | 67.5 | 62.8 | 63.6 | 83.9 | 107.1 |
| 10 | 68.1 | 63.3 | 63.6 | 108.3 | 108.0 |
| 11 | 68.6 | 63.8 | 63.6 | 109.2 | 108.9 |
| 12 | 69.7 | 64.9 | 63.6 | 110.9 | 110.7 |
| 13 | 113.6 | 113.6 | 113.6 | 113.6 | 113.6 |
| 14 | 90.9 | 90.9 | 90.9 | 90.9 | 114.5 |
| 15 | 72.7 | 72.7 | 72.7 | 72.7 | 116.3 |
| 16 | 73.3 | 73.3 | 72.7 | 113.6 | 117.2 |
| 17 | 73.8 | 73.8 | 72.7 | 114.5 | 118.1 |
| 18 | 74.4 | 74.4 | 72.7 | 115.4 | 119.0 |
| 19 | 75.5 | 93.3 | 72.7 | 117.4 | 120.8 |
| 20 | 76.1 | 84.3 | 72.7 | 106.1 | 121.7 |
| 21 | 76.6 | 76.2 | 72.7 | 95.8 | 122.6 |
| 22 | 77.8 | 77.3 | 72.7 | 123.5 | 124.4 |
| 23 | 78.3 | 77.9 | 72.7 | 124.4 | 125.3 |
| 24 | 79.4 | 79.0 | 72.7 | 126.2 | 127.1 |
| | | | *Monthly percentage changes* | | |
| 2 | −18.2 | −18.2 | −18.2 | −18.2 | 0.9 |
| 3 | −22.2 | −22.2 | −22.2 | −22.2 | 0.9 |
| 4 | 0.9 | 0.9 | 0.0 | 57.2 | 0.9 |
| 5 | 0.8 | 0.8 | 0.0 | 0.9 | 0.8 |
| 6 | 0.9 | 0.9 | 0.0 | 0.8 | 0.9 |
| 7 | 1.7 | 17.9 | 0.0 | 1.2 | 1.0 |
| 8 | 0.9 | −8.7 | 0.0 | −8.6 | 0.9 |
| 9 | 0.7 | −10.7 | 0.0 | −10.7 | 0.8 |
| 10 | 0.9 | 0.8 | 0.0 | 29.1 | 0.8 |
| 11 | 0.7 | 0.8 | 0.0 | 0.8 | 0.8 |
| 12 | 1.6 | 1.7 | 0.0 | 1.6 | 1.7 |
| 13 | 63.0 | 75.0 | 78.6 | 2.4 | 2.6 |
| 14 | −20.0 | −20.0 | −20.0 | −20.0 | 0.8 |
| 15 | −20.0 | −20.0 | −20.0 | −20.0 | 1.6 |
| 16 | 0.8 | 0.8 | 0.0 | 56.3 | 0.8 |
| 17 | 0.7 | 0.7 | 0.0 | 0.8 | 0.8 |
| 18 | 0.8 | 0.8 | 0.0 | 0.8 | 0.8 |
| 19 | 1.5 | 25.4 | 0.0 | 1.7 | 1.5 |
| 20 | 0.8 | −9.6 | 0.0 | −9.6 | 0.7 |
| 21 | 0.7 | −9.6 | 0.0 | −9.7 | 0.7 |
| 22 | 1.6 | 1.4 | 0.0 | 28.9 | 1.5 |
| 23 | 0.6 | 0.8 | 0.0 | 0.7 | 0.7 |
| 24 | 1.4 | 1.4 | 0.0 | 1.4 | 1.4 |

Table 10.5 Alternative price indices for winter seasonal clothing

| Month | Impute only on items available all year (1) | Impute on all available items (2) | Carry forward of last observed price (3) | Return to normal, then impute (4) | Include first seasonal observation, then impute (5) |
|---|---|---|---|---|---|
| | | | *Index numbers* | | |
| 1 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2 | 100.9 | 91.4 | 100.0 | 91.4 | 100.9 |
| 3 | 101.8 | 81.6 | 100.0 | 81.6 | 101.8 |
| 4 | 102.7 | 82.3 | 100.0 | 105.3 | 102.7 |
| 5 | 103.5 | 83.0 | 100.0 | 106.2 | 103.5 |
| 6 | 104.4 | 83.7 | 100.0 | 107.1 | 104.4 |
| 7 | 175.2 | 112.4 | 183.3 | 107.8 | 104.6 |
| 8 | 143.4 | 91.9 | 150.0 | 88.2 | 105.4 |
| 9 | 111.5 | 71.5 | 116.7 | 68.6 | 106.3 |
| 10 | 112.4 | 72.1 | 116.7 | 107.8 | 107.2 |
| 11 | 113.3 | 72.7 | 116.7 | 108.7 | 108.1 |
| 12 | 115.2 | 73.9 | 116.7 | 110.4 | 109.8 |
| 13 | 116.1 | 101.9 | 116.7 | 112.2 | 111.7 |
| 14 | 117.0 | 92.1 | 116.7 | 101.5 | 112.6 |
| 15 | 118.8 | 83.6 | 116.7 | 92.1 | 114.4 |
| 16 | 119.7 | 84.3 | 116.7 | 118.4 | 115.2 |
| 17 | 120.6 | 84.9 | 116.7 | 119.3 | 116.1 |
| 18 | 121.6 | 85.6 | 116.7 | 120.2 | 117.0 |
| 19 | 199.1 | 127.7 | 208.3 | 122.5 | 118.8 |
| 20 | 159.3 | 102.2 | 166.7 | 98.0 | 119.7 |
| 21 | 127.4 | 81.7 | 133.3 | 78.4 | 120.6 |
| 22 | 129.3 | 82.9 | 133.3 | 122.5 | 122.4 |
| 23 | 130.2 | 83.5 | 133.3 | 123.4 | 123.2 |
| 24 | 132.1 | 84.7 | 133.3 | 125.2 | 125.0 |
| | | | *Monthly percentage changes* | | |
| 2 | 0.9 | −8.6 | 0.0 | −8.6 | 0.9 |
| 3 | 0.9 | −10.7 | 0.0 | −10.7 | 0.9 |
| 4 | 0.9 | 0.9 | 0.0 | 29.0 | 0.9 |
| 5 | 0.8 | 0.9 | 0.0 | 0.9 | 0.8 |
| 6 | 0.9 | 0.8 | 0.0 | 0.8 | 0.9 |
| 7 | 67.8 | 34.3 | 83.3 | 0.7 | 0.2 |
| 8 | −18.2 | −18.2 | −18.2 | −18.2 | 0.8 |
| 9 | −22.2 | −22.2 | −22.2 | −22.2 | 0.9 |
| 10 | 0.8 | 0.8 | 0.0 | 57.1 | 0.8 |
| 11 | 0.8 | 0.8 | 0.0 | 0.8 | 0.8 |
| 12 | 1.7 | 1.7 | 0.0 | 1.6 | 1.6 |
| 13 | 0.8 | 37.9 | 0.0 | 1.6 | 1.7 |
| 14 | 0.8 | −9.6 | 0.0 | −9.5 | 0.8 |
| 15 | 1.5 | −9.2 | 0.0 | −9.3 | 1.6 |
| 16 | 0.8 | 0.8 | 0.0 | 28.6 | 0.7 |
| 17 | 0.8 | 0.7 | 0.0 | 0.8 | 0.8 |
| 18 | 0.8 | 0.8 | 0.0 | 0.8 | 0.8 |
| 19 | 63.7 | 49.2 | 78.6 | 1.9 | 1.5 |
| 20 | −20.0 | −20.0 | −20.0 | −20.0 | 0.8 |
| 21 | −20.0 | −20.1 | −20.0 | −20.0 | 0.8 |
| 22 | 1.5 | 1.5 | 0.0 | 56.3 | 1.5 |
| 23 | 0.7 | 0.7 | 0.0 | 0.7 | 0.7 |
| 24 | 1.5 | 1.4 | 0.0 | 1.5 | 1.5 |

**10.84** There are some problems with this procedure. Particularly during periods of high inflation, it will be difficult to determine what the normal price is. More generally, it can be argued that the procedure reduces the objectivity of the index. In the illustrative examples presented here, the normal price to which the item is returned is the price observed at the start of the season. Compared with the previous three approaches, it can be seen that this has the effect of shifting the price increase from the commencement of the next season to immediately after the current season, i.e. the index records a sharp price change when none is observable. The results are shown in column (4) in Tables 10.4 and 10.5, and in column (5) of Table 10.6.

**10.85** *Include only the first seasonal observation, then impute*. This approach requires that seasonal items be priced only once per season, when they first appear in the marketplace. This first observed price is then imputed forward until the item is priced again at the commencement of the next season. The rationale for this technique

Table 10.6 Alternative price indices for total clothing

| Month | Only items available all year round (1) | Impute only on items available all year (2) | Impute on all available items (3) | Carry forward of last observed price (4) | Return to normal, then impute (5) | Include first seasonal observation, then imput (6) |
|---|---|---|---|---|---|---|
| | | | *Index numbers* | | | |
| 1 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2 | 100.9 | 96.1 | 93.8 | 95.9 | 93.8 | 100.9 |
| 3 | 101.8 | 92.3 | 87.2 | 91.8 | 87.2 | 101.8 |
| 4 | 102.7 | 93.1 | 88.0 | 92.2 | 102.7 | 102.7 |
| 5 | 103.5 | 93.8 | 88.7 | 92.7 | 103.5 | 103.5 |
| 6 | 104.4 | 94.6 | 89.5 | 93.1 | 104.4 | 104.4 |
| 7 | 106.2 | 113.5 | 100.5 | 114.8 | 105.8 | 105.6 |
| 8 | 107.1 | 106.2 | 94.1 | 106.9 | 99.1 | 106.5 |
| 9 | 108.0 | 98.8 | 87.6 | 99.1 | 92.1 | 107.4 |
| 10 | 108.8 | 99.5 | 88.3 | 99.5 | 108.4 | 108.2 |
| 11 | 109.7 | 100.3 | 89.0 | 99.9 | 109.3 | 109.1 |
| 12 | 111.5 | 102.0 | 90.5 | 100.8 | 111.1 | 110.9 |
| 13 | 112.4 | 113.6 | 110.1 | 113.8 | 112.7 | 112.5 |
| 14 | 113.3 | 108.6 | 102.4 | 108.5 | 104.8 | 113.4 |
| 15 | 115.0 | 105.4 | 96.6 | 104.9 | 98.7 | 115.2 |
| 16 | 115.9 | 106.2 | 97.4 | 105.3 | 116.0 | 116.1 |
| 17 | 116.8 | 107.0 | 98.1 | 105.8 | 116.9 | 117.0 |
| 18 | 117.7 | 107.9 | 98.9 | 106.2 | 117.8 | 117.9 |
| 19 | 119.5 | 128.4 | 115.0 | 130.0 | 119.7 | 119.7 |
| 20 | 120.4 | 119.1 | 106.8 | 120.0 | 111.2 | 120.6 |
| 21 | 121.2 | 111.6 | 100.1 | 112.1 | 104.2 | 121.4 |
| 22 | 123.0 | 113.3 | 101.6 | 113.0 | 123.0 | 123.2 |
| 23 | 123.9 | 114.1 | 102.3 | 113.5 | 123.9 | 124.1 |
| 24 | 125.7 | 115.7 | 103.8 | 114.3 | 125.7 | 125.9 |
| | | | *Monthly percentage changes* | | | |
| 2 | 0.9 | −3.9 | −6.2 | −4.1 | −6.2 | 0.9 |
| 3 | 0.9 | −4.0 | −7.0 | −4.3 | −7.0 | 0.9 |
| 4 | 0.9 | 0.9 | 0.9 | 0.5 | 17.8 | 0.9 |
| 5 | 0.8 | 0.8 | 0.8 | 0.5 | 0.8 | 0.8 |
| 6 | 0.9 | 0.9 | 0.9 | 0.5 | 0.9 | 0.9 |
| 7 | 1.7 | 20.0 | 12.3 | 23.3 | 1.3 | 1.1 |
| 8 | 0.8 | −6.4 | −6.4 | −6.9 | −6.3 | 0.9 |
| 9 | 0.8 | −7.0 | −6.9 | −7.4 | −7.1 | 0.8 |
| 10 | 0.7 | 0.7 | 0.8 | 0.4 | 17.7 | 0.7 |
| 11 | 0.8 | 0.8 | 0.8 | 0.4 | 0.8 | 0.8 |
| 12 | 1.6 | 1.7 | 1.7 | 0.9 | 1.6 | 1.6 |
| 13 | 0.8 | 11.4 | 21.7 | 12.8 | 1.4 | 1.4 |
| 14 | 0.8 | −4.4 | −7.0 | −4.6 | −7.0 | 0.8 |
| 15 | 1.5 | −2.9 | −5.7 | −3.4 | −5.8 | 1.6 |
| 16 | 0.8 | 0.8 | 0.8 | 0.4 | 17.5 | 0.8 |
| 17 | 0.8 | 0.8 | 0.7 | 0.4 | 0.8 | 0.8 |
| 18 | 0.8 | 0.8 | 0.8 | 0.4 | 0.8 | 0.8 |
| 19 | 1.5 | 19.0 | 16.3 | 22.4 | 1.6 | 1.5 |
| 20 | 0.8 | −7.2 | −7.1 | −7.7 | −7.1 | 0.8 |
| 21 | 0.7 | −6.3 | −6.3 | −6.6 | −6.3 | 0.7 |
| 22 | 1.5 | 1.5 | 1.5 | 0.8 | 18.0 | 1.5 |
| 23 | 0.7 | 0.7 | 0.7 | 0.4 | 0.7 | 0.7 |
| 24 | 1.5 | 1.4 | 1.5 | 0.8 | 1.5 | 1.5 |

is that it is a means of adjusting for the quality degradation of seasonal items associated with the commonly observed feature of falling prices throughout the season. Further, if it is desirable that the index behave as if it were constructed as a moving year index (see Chapter 22), then this approach provides a cost-effective alternative that also accommodates changing seasons (e.g. when the items that were in season last March do not appear until April this year).

**10.86** On the downside, in fully discounting observable price movements through a seasonal item's life cycle, an implicit assumption is made that all such movements reflect quality changes with no change in underlying price. This is not likely to fully accord with user perceptions of price evolution and, unless similar techniques are employed for fashion items, it can be argued that the approach is inconsistent. The results are shown in column (5) in Tables 10.4 and 10.5, and column (6) in Table 10.6.

## Summary comments

**10.87** First, it is worth noting that the consequences of imputing price changes for baskets of seasonal items based

on the price movements for other items of clothing is equivalent to allocating the weight for seasonal items to other items when they are out of season, so avoiding the complexity involved in systems of explicitly changing weights. In these circumstances, some care needs to be taken in the presentation of estimates of the contribution of both seasonal and non-seasonal items to the change in the aggregate CPI. The standard practice of determining an item's contribution to the total change in the CPI is to multiply the item's previous period (price-updated) weight by its percentage change. Only those seasonal items for which prices are actually measured in the current period will contribute to the change in the aggregate index. Similarly, though only non-seasonal items will contribute to the change in the aggregate index when seasonal items are out of season, the standard measure of their contribution will be understated. This is mainly an issue of presentation, although some compilers might prefer to present assessments of contributions only down to the level that includes both the seasonal and non-seasonal baskets.

**10.88** There is likely to be a range of views across countries, and indeed users, concerning the appropriate treatment of seasonal items within a CPI. There is likely to be a particular diversity of views about whether the quality of seasonal items should be regarded as diminishing over the life of the season or not and, if so, whether a similar approach should (or can) be taken in respect of fashion items. The example data set was contrived so that each category displayed broadly constant growth in prices on a year-on-year basis. Those users primarily interested in measures that best capture persistent or underlying price pressures in the economy are likely to prefer those approaches which do not yield significant variations in the rate of price change that are solely attributable to how the statistical agency treats seasonal items. Such users may prefer that seasonal items be excluded altogether or that only the first seasonal observation be included with prices for other months being imputed.

**10.89** What is clear is that national statistical offices need to carefully weigh up user requirements, theoretical issues, costs and the implications of alternative approaches before settling on the methodology to be adopted.

## Telecommunication services

**10.90** The global telecommunications sector has undergone rapid change in recent years. Technological innovation has resulted in a proliferation of new services while deregulation has led to sharp growth in the number of providers in many countries. Taken together, these factors have resulted in suppliers adopting a range of new strategies to differentiate their services in order to attract and retain customers.

**10.91** Characteristics of particular significance to compilers of price indices are:

- 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;
- rapid changes in the contracts offered to consumers as an effective means of encouraging the take-up of the ever-increasing range of services.

**10.92** Increasingly, telecommunication companies offer services via plans that require customers to enter into longer-term contractual arrangements with the providers. This also poses problems for index compilation. Two broad types of plan 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. These plans are differentiated by charging different prices for different services. For example, a simple plan may be differentiated by charging more for monthly line rental but less for local calls, so appealing to users who make a higher volume of local calls. The emergence of new tailored plans designed to maximize customer demand overall is continuous.

**10.93** If statistical agencies follow traditional sampling approaches 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 unit values for telecommunication services have been declining significantly in many countries.

**10.94** All statistical agencies are struggling to develop methodologies capable of coping with the complexities of this sector. In particular, 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.

**10.95** With the telecommunications sector under continual change, statistical practices need to be kept under constant review. Statistical agencies that are considering the construction of telecommunications indices for the first time, or considering reviewing their current practices, are advised to seek out the most recent research in this field. Nevertheless, this section seeks to provide a general description of four approaches that are currently used by national statistical agencies to measure changes in the prices of telecommunication services. The approaches, in increasing order of cost, are:

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

**10.96** Each approach is briefly described and potential deficiencies noted. There is no firm recommendation on the best approach as the choice 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.

## Representative items – matched samples

**10.97** This approach 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 household expenditure surveys. A sample of service providers is approached to obtain 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* with weights derived from the revenue data.

**10.98** 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 sufficient to represent the range of specific services purchased by consumers within each representative item. 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 10.7 illustrates the approach.

**10.99** The list of representative items (the lowest level in the structure) generally does not need to cover all telecommunication services, but those selected should be sufficient to be representative of price behaviour as a whole, in particular taking account of published tariffs. Expenditures on those services not selected for pricing should be distributed over the other services within that general class for the purpose of deriving weights. For example, the expenditures on any fixed line services not selected for pricing should be distributed over those fixed line services selected.

**10.100** 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 telephone call of five minutes' duration at 8 a.m. can be regarded as a different product to an equivalent call made at 8 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.

**10.101** 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. 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 10.8.

**10.102** It is assumed that the origin of both the telephone calls and Internet access is also identified. All times 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 use.

**10.103** The most costly aspect of this approach therefore 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, so minimizing the burden on respondents between reviews of the specifications.

**10.104** The dynamic nature of the telecommunication sector and the common use of the pricing mechanism to change consumer behaviour are likely to require that the specifications be updated relatively frequently. When a specification disappears (i.e. a particular 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

Table 10.7 An illustrative index structure for telecommunication services (representative item approach)

| |
|---|
| *Fixed line services* |
| Telephone connection costs |
| Telephone line rental |
| Local calls |
| Long-distance national calls |
| International calls |
| *Mobile telephones* |
| Connection costs |
| Handset purchase or rental |
| National calls |
| International calls |
| *Payphones* |
| Local calls |
| *Internet services* |
| Connection fees |
| Usage fees |

Table 10.8 Examples of specifications of telecommunication services

| Representative item | Examples of specifications |
|---|---|
| International calls (fixed line) | Plan A: Call to Athens at 8 a.m. on a Friday, duration 10 minutes<br>Plan B: Call to London at 9 p.m. on a Saturday, duration 5 minutes<br>Plan A: Call to New York at 11 a.m. on a Wednesday, duration 20 minutes<br>Plan B: Call to Paris at 7 p.m. on a Sunday, duration 15 minutes<br>Plan A: Call to Durban at 8 p.m. on a Monday, duration 30 minutes |
| Usage fees (Internet) | Plan A: 10 hours dial-up connect time between 4 p.m. and 7 p.m. weekends, total download 20 Mb<br>Plan B: 20 hours dial-up connect time between 6 p.m. and midnight weekdays, total download 50 Mb<br>Plan C: Permanent broadband connection, total download 100 Mb |

to question whether all 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. Although hedonic techniques offer some prospects for resolving this dilemma, they are costly to implement.

## Representative items – unit values

**10.105** The unit value approach is similar to the previous approach, with the exception that specifications are not priced. The 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.

**10.106** Compared to the matched sample approach, the unit value approach attributes all of 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 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. Moreover, care needs to be exercised with this approach to ensure that the measure is not affected by undesirable compositional changes (see Chapter 9, where unit value indices are discussed in more detail). 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.

**10.107** Although this approach appears to address at least some of the known deficiencies of the matched sample approach, it is likely to have a medium- to long-term downward bias and, unless implemented carefully, it is likely to exhibit period-to-period volatility because of compositional shifts, if only as a result of seasonal variations in usage patterns. There are also a number of 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 commercially 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.

## Customer profiles

**10.108** 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 analyse 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.

**10.109** Statistical agencies 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 to the consumer (based on the simplifying assumption of cost-minimizing consumer behaviour 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.

**10.110** 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. 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, however, not be available or at least very costly to obtain. Table 10.9 gives an example of a profile for mobile telephone services, taken from Beuerlein (2001), which describes the current approach used in the German CPI.

**10.111** Consistent with the fixed basket approach, the activity of consumers (in terms of numbers and types of calls) 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 plan changes, as such, fundamentally represent price change rather than quality change, but it eliminates the cruder compositional effects associated with the unit value approach, which does not take account of customer profiles.

**10.112** The success of this approach is determined by the degree to which the profiles truly reflect consumer

Table 10.9 Example of a user profile for mobile phone services

| Specification | Unit | Rare callers | Low-volume callers | Average callers |
|---|---|---|---|---|
| Total length of calls | Minutes | 16 | 42 | 96 |
| Length of individual call | | | | |
| Type A | Seconds | 35 | 45 | 45 |
| Type B | Seconds | 65 | 95 | 115 |
| Calls[1] | Number | 20 | 36 | 72 |
| Within the same network | Number | 8 | 12 | 24 |
| Beyond the network | Number | 12 | 24 | 48 |

[1]The calls are distributed over times of the day and days of the week so that it is possible to take account of changes in the delimitation of between peak and off-peak, weekday and weekend tariffs.
Source: Beuerlein (2001).

behaviour 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 co-operation from service providers and, given the known volume changes, they will require updating at reasonably regular intervals, possibly more frequently than other items in the CPI basket. Data on plan usage by customer category for each index compilation period (month or quarter) may also be required if compilers decide to allow for such effects.

### Sample of bills

**10.113** 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.

**10.114** The advantages of this approach compared to the customer profile approach are:

- It is able to take account of any within-year variations in customer behaviour (e.g. a higher incidence of international calls associated with religious or cultural events of significance).
- It better reflects the diversity of consumer behaviour by identifying actual activities (i.e. calls actually made by a sample of consumers).
- 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 fixed line phone plus Internet).

**10.115** Calculation of the index still requires monthly information on the relative significance of various plans by customer category (which can then be randomly allocated across the sampled bills). With the bill sample repriced 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.

**10.116** 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 sophisticated data processing system.

## Financial services

**10.117** The construction of reliable, comprehensive price indices for financial services in CPIs is in its infancy. Given the increasing use of financial services by households, however, national statistical agencies are coming under pressure to account for at least some financial services in their CPIs. There is a particularly strong demand for CPIs to include those fees and charges faced by households in respect of deposit and loan accounts held with financial institutions.

**10.118** The construction of price indices for financial services is inherently difficult, as there is no unanimous view about which financial services ought to be included in the CPI, or indeed about precisely how they should be measured. The discussion in this section attempts to present what might be regarded as the majority view based on what is practically feasible. Much of the material is based on Fixler and Zieshang (2001), Frost (2001) and Woolford (2001).

**10.119** 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, stockbroking services, and real estate agency services. The range of items explicitly regarded as financial services for inclusion in a CPI, and also the way in which they are measured, will depend on the principal purpose of the CPI and hence on whether an acquisitions, use or payments approach is employed.

**10.120** Where a *payments* approach is used, the gross interest payable on mortgages is often included as a cost of owner-occupied housing (see paragraphs 10.4 to 10.50 above). In the interests of strict consistency, this might imply that the CPI should also include 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 earlier 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 the importance of this item within overall 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.

**10.121** Assuming that households acquire all of their financial services from the private sector (i.e. they are not generally subsidized by governments or provided by non-profit institutions serving households), the *acquisitions* and *use* approaches take an identical view 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 which are acquired to directly facilitate current household consumption.

**10.122** Under the more restrictive view of coverage, it is argued that the use of some financial services is inextricably linked with capital (or investment) activity. This suggests that such activities should be considered outside the scope of CPIs intended to provide measures of changes in consumption prices. Proponents of this view often draw upon national accounts practices as the starting point. For example, *SNA 1993* 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. It is important to note, however, that the CPI is not constrained to follow the practices adopted for national accounting. Rather, individual countries will need to make decisions on the item coverage of the CPI which best meets the domestic requirements of the price index itself.

**10.123** 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. First, it distinguishes between the services facilitating the transfer and holding of assets and the assets themselves. Second, it makes no distinction between whether the underlying asset is a real asset or a financial asset.

**10.124** The degree of complexity involved in placing a value on financial services acquired by households and constructing the companion price indices varies markedly by service. Three specific examples reflecting current Australian research are used to illustrate the issues: currency exchange, stockbroking, and deposit and loan facilities. Real estate agency services are discussed separately in this chapter (see paragraphs 10.149 to 10.155) because they may be classified as either a housing expense or a financial service.

## Currency exchange

**10.125** For weighting purposes, the estimation of the base period expenditures incurred by households in exchanging domestic currency for currencies of other countries is, in principle, relatively straightforward and should be reportable in household expenditure surveys.

**10.126** Construction of the companion price index is 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 usually specified in terms of some percentage of the domestic currency value of the transaction. These 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). To measure price change over time, the index compiler has to form a view about the quantity underpinning the original transaction.

**10.127** The purchase of foreign currency can be seen as facilitating the purchase of some desired quantity of foreign goods and services (e.g. expenditure on foreign travel, or direct import of a commodity). 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 quantum of foreign goods and services purchased in the base period.

**10.128** A practical translation implies that the original foreign currency amount is 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 to deliver 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.

**10.129** 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 would 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.

## Stockbroking services

**10.130** 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 broker (stockbroker). 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).

**10.131** 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 proves convenient to adopt this principle here, as it allows for the – perhaps less contentious – comparable treatment of taxes on banking services.) Allowing for current tax schedules poses no difficulty in that they will be widely available in all countries.

**10.132** Working from the premise that stockbrokers' fees are more likely to follow a step function than a linear function, a price measure would be constructed as follows. First, select a representative sample of transactions (domestic currency values) and calculate the tax payable and the fees payable by reference to the respective schedules. The taxes and fees 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 methodology 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?

**10.133** The quantum underlying share transactions can be regarded as forgone consumption, i.e. the quantity of goods and services that could have been purchased instead. The value of a constant quantum of consumption forgone in successive comparison periods therefore will vary with consumer prices. In this case, the obvious choice for an escalator would be the CPI itself, based on current period preliminary estimates, or the previous period's result. However, the use of a single period's movement in the CPI (either previous or current) has the potential to result in the prices of stockbroking services moving in a way that is unlikely to reflect reality. This would be particularly evident where, for example, the current or previous period's CPI was influenced significantly by some one-off, temporary or unusual price change (e.g. an oil price shock, or change to health care arrangements). Any "echoing" of abnormal shorter-term price changes through the precise treatment of stockbrokers' or similar fees is likely to stretch public credibility in the CPI. As an alternative, a 12-month moving average CPI might be employed, itself consistent with a base period comprising a full year's activity.

**10.134** Alternatively, it might be argued that the quantum of shares could be revalued in subsequent periods in line with movements in equity prices themselves. According to this view, the price of equities may be seen as an important influence on the actual costs of storing forgone consumption in much the same way as tax and fee 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 own equities per se, rather than using them simply as an appropriate vehicle to store forgone consumption. Moreover, the introduction of equity prices within the price indicator is likely to impart additional short-term volatility to the CPI.

**10.135** Competition in the stockbroking 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.

**10.136** 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 reality, households review their investment strategies regularly in order to "store" their deferred consumption in whatever asset class they believe offers the greatest security or prospect for growth. A symmetrical treatment of the purchase and sale of shares is particularly appealing. Unless different fees or taxes apply to sales, there is no need to distinguish between the two in constructing the index.

## Deposit and loan facilities

**10.137** Accounting for the costs of services provided by financial intermediaries represents a significant 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 difficult to visualize comprehensively, and the prices comprise significant elements that are not directly observable.

**10.138** *SNA 1993* recommends (6.125 and Annex III) 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.

**10.139** For a summary of the developments in national accounts treatment in this area, and a discussion of the notion of a reference rate, see OECD (1998). In concept, *SNA 1993* 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 very difficult to 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 the mid-point being favoured).[1] Given the complexities involved, expenditures on financial intermediation required for index weighting purposes cannot be collected from households in expenditure surveys and so must be estimated by collecting data from financial institutions.

**10.140** 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. In some countries, the traditional bank does not charge direct fees, but all income is derived through an interest margin on lending rates over deposit rates.

**10.141** 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.

**10.142** Again, the issue of an appropriate escalator needs to be addressed. While the base period flows of deposits and withdrawals can readily be conceptualized as forgone 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 quantum 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 regular basis, in this case annually.

**10.143** The traditional bank has all but disappeared in some countries and most financial institutions now derive income from a combination of indirect fees (margins) and direct fees and charges, with the trend being for a move from margins towards direct fees. In this case, the 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 stockbroking 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 the more practical aspects of constructing price indices for deposit and loan facilities based on recent Australian experience.

**10.144** Given the clear scope for financial intermediaries to shift charges between the direct (fee) and indirect (margin) elements, there are clear dangers in constructing broad measures of margins – known by national accountants as financial intermediation services indirectly measured (FISIM) – independent 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 direct and indirect 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.

**10.145** The 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 associated with each product by element (margin, direct fees and taxes). These value aggregates can be viewed as being equivalent to prices for some quantum. 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.

**10.146** Appendix 10.1 contains a worked example of the calculation of a price index for a single deposit product.

**10.147** 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

[1]OECD (1998) expresses some concerns 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.

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.

**10.148** 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.

## Real estate agency services

**10.149** The services provided by real estate agencies in the acquisition and disposal of properties can be treated in a number of ways. If the CPI is constructed as an economic cost of *use* index, these services are out of scope as they form part of the input costs of the notional landlords (*SNA 1993* also assigns all transfer costs on dwellings to gross fixed capital formation). The transfer costs associated with the acquisition of a dwelling (legal fees, real estate agency fees and taxes) can be included in both a *payments* 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 expenditures on which the fees are charged (to preserve the underlying quantum) via some appropriate price index, and then estimating the fees payable in the comparison period.

**10.150** Real estate agents typically quote their fees as some percentage of the price received for the dwelling. In common with other items where charges are determined as a margin, this needs to be converted to a domestic currency price. 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.

**10.151** The methodology chosen for estimating the percentage margin will depend upon 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 value added tax (VAT) or goods and services tax (GST), from a sample of agencies and deriving an average.

**10.152** Percentage margins charged by individual agencies sometimes vary with transaction price (typically declining with increasing prices of dwellings). Where tariffs do vary within agencies, a more sophisticated estimation procedure may be required. 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 will be required to determine the precise functional form for this relationship. For example, in the Australian case research has shown that ordinary least squares regression can be used to estimate this relationship and that the following functional form is adequate:

$$R = a + b_1(1/p) + b_2(1/p)^2$$

where: $R$ = the commission rate, $p$ = the house price, $a$ = a constant, and $b_1$ and $b_2$ are parameters to be estimated.

**10.153** Estimation of the current period value of transactions to which the percentage margin applies depends on whether real estate agency fees are classified as a cost of housing or as a separate financial service. If the former, the value of the current period transaction, relative to the value of the base period transaction, would reflect changes in house prices. If the latter, where the purchase of a dwelling is regarded as forgone consumption, the current period value would reflect changes in the CPI itself.

**10.154** If a single percentage margin is assumed to operate, then only a single current period transaction is required, i.e. 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 indexing forward the average base period house price, applying the average comparison period percentage margin and adding GST or VAT.

**10.155** If a single percentage margin is not assumed to operate, then a sample of representative base period transactions is required. 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 indexing forward each of the base period representative transactions and then applying the same model. Note that, in this case, there is no need to exclude any GST or VAT from the initial margins data.

## Property insurance services

**10.156** The construction of reliable price indices for insurance can be difficult to achieve in practice. 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 nevertheless provides only an illustration of the issues that index compilers face, 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. Separation of the service charges relating to the insurance and investment elements within a single premium poses significant problems for index compilers.

**10.157** For the purposes of the discussion below, property insurance is defined to include:

– dwelling insurance;
– household contents insurance;
– motor vehicle insurance.

**10.158** The common feature of these policies is that for a fee (premium), households receive financial compensation if a nominated event results in the loss of, or damage to, designated property. The alternative to purchasing insurance is for the household to self-insure. For households as a group, the service received is represented by the elimination of the risk of a financial loss. The appropriate treatment of property insurance in the CPI depends on whether the CPI is constructed using the acquisitions, use or payments approach.

## Payments

**10.159** 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 necessary to consider both the gross premiums payable and the claims receivable by households. The definitions of gross premiums payable and claims receivable are straightforward. It is possible, however, to treat claims receivable in a number of ways, which will have an impact on either the weight assigned to insurance or the weight assigned to the items 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). Likewise, items which are insured against loss may also be weighted gross or net (in the latter case, excluding purchases explicitly financed by insurance claims receivable). Taken together, this suggests three plausible alternative treatments:

– gross premiums, net expenditures;
– net premiums, gross expenditures;
– gross premiums, gross expenditures.

**10.160** *Gross premiums, net expenditures*. It may be argued that calculating expenditures net of purchases financed by insurance claims avoids double counting of that portion of gross premiums which funds the claims. There are some problems with this approach. First, it is necessary to assume that all proceeds from insurance claims are used to purchase replacement items or to repair damaged items. In some cases, claims receivable may be to compensate for damage or destruction 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 arbitrary choices. More generally, because money is fungible, attempts to restrict coverage only to those expenditures made from selected sources of funds are questionable. Finally, the potential distortion of weights for these items may reduce the usefulness of sub-indices for other purposes.

**10.161** *Net premiums, gross expenditures*. Within a payments index, the ''net premiums, gross expenditures'' approach is based on the view that claims receivable should be regarded as negative expenditure on insurance. This may be seen as an attempt to avoid the double counting of expenditures on items financed by claims receivable and already included in gross expenditures on other items elsewhere in the index. The net premiums approach is much less problematic than the net expenditures approach (as at least the impact is restricted to the weights for insurance). It may, however, be argued that the net premiums approach is inconsistent with approaches adopted for other items in a payments index, in particular mortgage interest and consumer credit charges, where weights are based on gross payments. Any allowance for interest receipts would be likely to yield negative weights since households are generally net savers overall.

**10.162** The fact that the net premiums approach effectively measures the value of the insurance service as required for indices constructed according to both the acquisitions and use approaches is incidental. The task here is to determine the appropriate treatment for a payments-based index.

**10.163** *Gross premiums, gross expenditures*. The ''gross premiums, gross expenditures'' approach is based on the view that the claims receivable by households simply represent one of the sources of funds from which expenditures are made. This is the most appealing approach for a payments index, as it recognizes the fungible nature of money and provides a consistent means of identifying both the item coverage of the index and the relative weights by reference only to the actual outlays of households.

## Use

**10.164** Under the *use* approach, dwelling insurance is out of scope as an input cost of the notional landlord. 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.

**10.165** It is not possible to estimate the nominal value of the net insurance service from household expenditure surveys alone. For weighting purposes, the most appealing approach is to obtain data from a sample of insurance providers, permitting estimation of the ratio of net insurance services to gross premiums, and to apply

this ratio to the estimated value of gross premiums obtained from household expenditure surveys. However, it has not been possible to devise a corresponding price measure that is conceptually sound. 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

**10.166** Under the *acquisitions* approach, all three items are in scope. Because the objective is to measure price inflation for the household sector, the expenditures 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

**10.167** 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 (dwellings, motor vehicles, 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.

**10.168** While 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 this be regarded as a quality improvement or simply 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 simply expects to be compensated for any loss. From the perspective of the consumer, any increase in risk simply 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.

**10.169** 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 reprice 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. timber or brick) 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 (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.

**10.170** Every effort 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 per cent drop in the aggregate value of claims payable. This could be considered as equivalent to a 3 per cent increase in price.

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

**10.171** The net insurance service charge captures the administration costs and profits of the insurance provider along with any taxes. The problem is that taxes on insurance are normally levied on the gross premiums. Therefore, 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. Simply using the gross insurance premium inclusive of taxes as the price measure understates the real effect of any increase in the tax rates. This is best illustrated by way of an example.

**10.172** 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 per cent of gross premiums to 20 per cent. Then the values in Table 10.10 are likely to be observed. Under this scenario it is clear that the insurance service charge has increased from \$45 to \$60 (an increase of 33.3 per cent), yet gross premiums have only increased by 14.3 per cent.

Table 10.10 Illustration of the impact of taxes on measures of insurance services ($)

| Period | Premiums before tax | Tax | Gross premiums | Claims | Insurance service |
|---|---|---|---|---|---|
| 1 | 100 | 5 | 105 | 60 | 45 |
| 2 | 100 | 20 | 120 | 60 | 60 |

**10.173** Given that changes in the tax rates on gross insurance premiums are often subject to significant variation, this is a non-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. Further research is required to develop a workable methodology for directly measuring changes in prices of insurance services before tax.

# Appendix 10.1 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.

Taxes

| Date | Debit (D) or Credit (C) | Transaction | Transaction value ($) | Tax ($) | Balance ($) |
|---|---|---|---|---|---|
| | | | | | 456.23 |
| 2 Jan | D | Over the counter withdrawal | 107.05 | 0.70 | 348.48 |
| 12 Jan | C | Deposit | 4 000.00 | 2.40 | 4 346.08 |
| 13 Jan | D | EFTPOS[1] transaction | 50.62 | 0.30 | 4 295.16 |
| 13 Jan | D | Over the counter withdrawal | 371.00 | 0.70 | 3 923.46 |
| 14 Jan | D | Own ATM[2] cash | 300.00 | 0.70 | 3 622.76 |
| 14 Jan | D | Own ATM cash | 100.00 | 0.70 | 3 522.06 |
| 16 Jan | D | Own ATM cash | 100.00 | 0.70 | 3 421.36 |
| 16 Jan | D | Over the counter withdrawal | 371.00 | 0.70 | 3 049.66 |
| 16 Jan | D | Cheque | 90.00 | 0.30 | 2 959.36 |
| 19 Jan | D | Own ATM cash | 100.00 | 0.70 | 2 858.66 |
| 19 Jan | D | Own ATM cash | 100.00 | 0.70 | 2 757.96 |
| 19 Jan | C | Deposit | 4 000.00 | 2.40 | 6 755.56 |
| 19 Jan | D | Cheque | 740.00 | 1.50 | 6 014.06 |
| 20 Jan | D | EFTPOS transaction | 76.42 | 0.30 | 5 937.34 |
| 21 Jan | D | Other ATM cash | 20.00 | 0.30 | 5 917.04 |
| 21 Jan | D | Cheque | 100.00 | 0.70 | 5 816.34 |
| 22 Jan | D | Cheque | 43.40 | 0.30 | 5 772.64 |
| 22 Jan | D | Cheque | 302.00 | 0.70 | 5 469.94 |
| 22 Jan | D | Cheque | 37.00 | 0.30 | 5 432.64 |
| 23 Jan | D | Over the counter withdrawal | 371.00 | 0.70 | 5 060.94 |
| 23 Jan | D | Cheque | 72.00 | 0.30 | 4 988.64 |
| 27 Jan | D | Own ATM cash | 150.00 | 0.70 | 4 837.94 |
| 27 Jan | D | Cheque | 73.50 | 0.30 | 4 764.14 |
| 27 Jan | D | Cheque | 260.00 | 0.70 | 4 503.44 |
| 27 Jan | D | EFTPOS transaction | 51.45 | 0.30 | 4 451.69 |
| 28 Jan | D | Over the counter withdrawal | 19.95 | 0.30 | 4 431.44 |
| 28 Jan | D | Cheque | 150.00 | 0.70 | 4 280.74 |
| 29 Jan | D | Cheque | 140.00 | 0.70 | 4 140.04 |
| 30 Jan | D | Over the counter withdrawal | 371.00 | 0.70 | 3 768.34 |
| 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** | |

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

Fees

| Activity | Total no. | No. charged | Amount($) |
|---|---|---|---|
| Over the counter withdrawal | 6 | 2 | 6.00 |
| EFTPOS transaction | 3 | 0 | 0.00 |
| Own ATM cash | 6 | 0 | 0.00 |
| Own ATM cash | 1 | 1 | 1.20 |
| Cheque | 13 | 3 | 3.00 |
| Deposit | 2 | 2 | 0.00 |
| **Total fees** | | | **10.20** |

Fees and taxes are calculated using data in tables (b) and (c), respectively.
Source: Woolford (2001)

***(b) Fee schedule***. This 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 free indicates that no transactions are free and a zero charge indicates that all transactions are free.

| Description | Base period | | Current period | |
|---|---|---|---|---|
| | No. free | Charge ($) | No. free | Charge ($) |
| Over the counter withdrawal | 4 | 3.00 | 4 | 3.00 |
| EFTPOS transaction | 10 | 0.50 | 9 | 0.50 |
| Own ATM cash | 10 | 0.50 | 9 | 0.50 |
| Other ATM cash | 0 | 1.20 | 0 | 1.20 |
| Cheque | 10 | 1.00 | 9 | 1.00 |
| Deposit | 0 | 0.00 | 0 | 0.00 |

Source: Woolford (2001).

***(c) Tax schedule***. This is a table of tax rates of the type that used to be employed 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

| Transaction value ($) | | Tax ($) | |
|---|---|---|---|
| Min. | Max. | Base period | Current period |
| 0 | 1 | 0.00 | 0.00 |
| 1 | 100 | 0.30 | 0.30 |
| 100 | 500 | 0.70 | 0.70 |
| 500 | 5 000 | 1.50 | 1.50 |
| 5 000 | 10 000 | 3.00 | 3.00 |
| 10 000+ | | 4.00 | 4.00 |

Financial institutions duty (%)

| Base period | Current period |
|---|---|
| 0.06 | 0.06 |

Source: Woolford (2001).

***(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.

| | Base period | | | | Current period | | | |
|---|---|---|---|---|---|---|---|---|
| | Balance ($ million) | Interest ($ million) | Interest rate (%) | Margin (%) | Balance ($ million) | Interest ($ million) | Interest rate (%) | Margin (%) |
| **Deposit products** | | | | | | | | |
| Personal accounts | 22 000 | 740 | 3.3636 | 2.4937 | 23 600 | 775 | 3.2839 | 2.3971 |
| Current accounts | 6 000 | 68 | 1.1333 | 4.7241 | 6 600 | 75 | 1.1364 | 4.5446 |
| Other accounts | 16 000 | 672 | 4.2000 | 1.6574 | 17 000 | 700 | 4.1176 | 1.5634 |
| Business accounts | 25 000 | 920 | 3.6800 | 2.1774 | 28 000 | 1 000 | 3.5714 | 2.1096 |
| Total deposit accounts | 47 000 | 1 660 | 3.5319 | 2.3255 | 51 600 | 1 775 | 3.4399 | 2.2411 |
| **Loan products** | | | | | | | | |
| Personal accounts | 42 000 | 3 188 | 7.5905 | 1.7331 | 46 000 | 3 400 | 7.3913 | 1.7103 |
| Business accounts | 28 000 | 2 540 | 9.0714 | 3.2140 | 31 000 | 2 700 | 8.7097 | 3.0287 |
| Total loan accounts | 70 000 | 5 728 | 8.1829 | 2.3255 | 77 000 | 6 100 | 7.9221 | 2.2411 |
| **Reference rate** | | | **5.8574** | | | | **5.6810** | |

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.

| | *t*–5 | *t*–4 | *t*–3 | *t*–2 | *t*–1 |
|---|---|---|---|---|---|
| All groups | 117.5 | 121.2 | 123.4 | 127.6 | 129.1 |
| 4-term moving average | | | | 122.4 | 125.3 |
| Indexation factor (movement) | | | | | 1.0237 |

Source: Woolford (2001).

***(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).

Taxes

| Date | Debit (D) or Credit (C) | Transaction | Transaction value ($) | Tax ($) | Balance ($) |
|---|---|---|---|---|---|
| | | | | | 467.04 |
| 2 Jan | D | Over the counter withdrawal | 109.59 | 0.70 | 356.75 |
| 12 Jan | C | Deposit | 4 094.75 | 2.46 | 4 449.05 |
| 13 Jan | D | EFTPOS transaction | 51.82 | 0.30 | 4 396.93 |
| 13 Jan | D | Over the counter withdrawal | 379.79 | 0.70 | 4 016.44 |
| 14 Jan | D | Own ATM cash | 307.11 | 0.70 | 3 708.63 |
| 14 Jan | D | Own ATM cash | 102.37 | 0.70 | 3 605.56 |
| 16 Jan | D | Own ATM cash | 102.37 | 0.70 | 3 502.50 |
| 16 Jan | D | Over the counter withdrawal | 379.79 | 0.70 | 3 122.01 |
| 16 Jan | D | Cheque | 92.13 | 0.30 | 3 029.57 |
| 19 Jan | D | Own ATM cash | 102.37 | 0.70 | 2 926.51 |
| 19 Jan | D | Own ATM cash | 102.37 | 0.70 | 2 823.44 |
| 19 Jan | C | Deposit | 4 094.75 | 2.46 | 6 915.73 |
| 19 Jan | D | Cheque | 757.53 | 1.50 | 6 156.70 |
| 20 Jan | D | EFTPOS transaction | 78.23 | 0.30 | 6 078.17 |
| 21 Jan | D | Other ATM cash | 20.47 | 0.30 | 6 057.40 |
| 21 Jan | D | Cheque | 102.37 | 0.70 | 5 954.33 |
| 22 Jan | D | Cheque | 44.43 | 0.30 | 5 909.60 |
| 22 Jan | D | Cheque | 309.15 | 0.70 | 5 599.75 |
| 22 Jan | D | Cheque | 37.88 | 0.30 | 5 561.57 |
| 23 Jan | D | Over the counter withdrawal | 379.79 | 0.70 | 5 181.08 |
| 23 Jan | D | Cheque | 73.71 | 0.30 | 5 107.08 |
| 27 Jan | D | Own ATM cash | 153.55 | 0.70 | 4 952.83 |
| 27 Jan | D | Cheque | 75.24 | 0.30 | 4 877.28 |
| 27 Jan | D | Cheque | 266.16 | 0.70 | 4 610.43 |
| 27 Jan | D | EFTPOS transaction | 52.67 | 0.30 | 4 557.46 |
| 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** | |

Fees

| Activity | Total No. | No. charged | Amount ($) |
|---|---|---|---|
| Over the counter withdrawal | 6 | 2 | 6.00 |
| EFTPOS transaction | 3 | 0 | 0.00 |
| Own ATM cash | 6 | 0 | 0.00 |
| Own ATM cash | 1 | 1 | 1.20 |
| Cheque | 13 | 4 | 4.00 |
| Deposit | 2 | 2 | 0.00 |
| **Total fees** | | | **11.20** |

Source: Woolford (2001).

***(g) Indices for current accounts***. This 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.

| Component | Base period | | Current period | |
|---|---|---|---|---|
| | Value aggregate ($) | Index | Value aggregate ($) | Index |
| Margins | 28 344 | 100.0 | 27 913 | 98.5 |
| Fees | 11 904 | 100.0 | 13 071 | 109.8 |
| Taxes | 14 739 | 100.0 | 14 818 | 100.5 |
| Total | 54 987 | 100.0 | 55 803 | 101.5 |

Source: Woolford (2001).