A GLOSSARY OF MAIN TERMS

The appendix to this glossary gives the main aggregate index number formulae used for consumer price index (CPI) purposes and also explains the interrelationships between them.

Acquisitions approach An approach to CPIs in which consumption is identified with the consumption goods and services acquired by a household in some period (as distinct from those wholly or partially used up for purposes of consumption). Depending on the intended scope of the CPI, acquisitions may include not only goods and services purchased, but also those acquired by own-account production or as social transfers in kind from government or non-profit institutions.

Additivity At current prices, the value of an aggregate is identical to the sum of the values of its components. Additivity requires this identity to be preserved for the extrapolated values of the aggregate and its components when their current values in some period are extrapolated using a set of interrelated quantity indices; or, alternatively, when the current values of an aggregate and its components in some period are deflated using a set of interrelated price indices.

Aggregate A set of transactions relating to a specified flow of goods and services, such as the total purchases made by resident households on consumer goods and services in some period. The term "aggregate" is also used to mean the value of the designated set of transactions.

Aggregation The process of combining, or adding, different sets of transactions to obtain larger sets of transactions. The larger set is described as having a higher *level* of aggregation than the sets of which it is composed. The term "aggregation" is also used to mean the process of adding the values of the lower-level aggregates to obtain higher-level aggregates. In the case of price indices, it means the process by which price indices for lower-level aggregates are averaged, or otherwise combined, to obtain price indices for higher-level aggregates.

Axiomatic, or test approach The approach to index number theory that determines the choice of index number formula on the basis of its mathematical properties. A list of tests is drawn up, each test requiring an index to possess a certain property or satisfy a certain axiom. An index number may then be chosen on the basis of the number of tests satisfied. Not all tests may be considered to be equally important and the failure to satisfy one or two key tests may be considered sufficient grounds for rejecting an index.

Base period The base period is usually understood to mean the period with which all the other periods are compared. The term may, however, have different meanings in different contexts. Three types of base period may be distinguished:

- the *price reference period* – the period that provides the prices to which the prices in other periods are compared. The prices of the price reference period appear in the denominators of the price relatives, or price ratios, used to calculate the index. The price reference period is typically designated as period 0;
- the *weight reference period* – the period, usually one or more years, of which the expenditures serve as weights for the index. When the expenditures are *hybrid* (i.e., the quantities of one period are valued at the prices of some other period), the weight reference period is the period to which the quantities refer. The weight reference period is typically designated as period b in this manual;
- the *index reference period* – the period for which the value of the index is set equal to 100.

It should be noted that, in practice, the duration of the weight reference period for a CPI is typically a year, or even two or more years, whereas the CPI is calculated monthly or quarterly, the duration of the price reference period being a month or quarter. Thus, the weight and price reference periods seldom coincide in practice, at least when a CPI is first calculated, although the price and index reference periods frequently coincide.

Basket A specified set of quantities of goods and services. In a CPI context, the set may comprise the actual quantities of consumption goods or services acquired or used by households in some period, or may be made up of hypothetical quantities.

Basket price index A price index that measures the proportionate change between periods 0 and t in the total value of a specified basket of goods and services: that is, $\sum p^t q / \sum p^0 q$, where the terms q are the specified quantities. See *Lowe index*.

Bias A systematic tendency for the calculated CPI to diverge from some ideal or preferred index, resulting from the method of data collection or processing, or the index formula used. See *Cost of living bias* and *Representativity bias*.

Bouncing A situation in which the set of prices for the second period is simply a reordering of the set of prices for the first period, the price relatives thus being obtained by matching each price in the first period with another price from the same set of prices.

Carli price index	An elementary price index defined as a simple, or unweighted, arithmetic average of the sample price relatives.
Carry forward	A situation in which a missing price in some period is imputed as being equal to the last price observed for that item.
Central product classification (CPC)	An internationally agreed classification of goods and services based on the physical characteristics of goods or on the nature of the services rendered.
Chain index	An index number series for a long sequence of periods obtained by linking together index numbers spanning shorter sequences of periods. See *Linking*; see also *equation (6) of the Appendix*.
Characteristics	The physical and economic attributes of a good or service that serve to identify it and enable it to be classified.
Circularity (transitivity)	An index number property such that, if ${}_jI_k$ denotes a particular kind of price index that measures the change between periods j and k, then ${}_jI_l \equiv {}_jI_k \cdot {}_kI_l$ where the indices ${}_jI_l$ and ${}_kI_l$ are of the same type. When an index is transitive, the index that compares periods j and l indirectly through period k is identical with the index that compares j and l directly. One test that might be required under the axiomatic approach is that the index number should be transitive.
Collective consumption	Goods and services that are consumed simultaneously by a group of consumers or by the community as a whole; for example, defence services provided by the State.
Commensurability	See *Invariance to changes in the units of measurement test*.
Commodity reversal test	A test that might be used under the axiomatic approach, which requires that, for a given set of products, the price index should remain unchanged when the ordering of the products is changed.
Component	A subset of the goods and services that make up some defined aggregate.
Conditional cost of living index	A conditional cost of living index measures the change in the cost of maintaining a given utility level, or standard of living, on the assumption that all the factors, *except the prices covered by the index*, that influence the consumer's utility or welfare (e.g., the state of the physical environment) remain constant. See *Cost of living index*.
Consistency in aggregation	An index is said to be consistent in aggregation when the index for some aggregate has the same value whether it is calculated directly in a single operation, without distinguishing its components, or whether it is calculated in two or more steps by first calculating separate indices, or sub-indices, for its components, or sub-components, and then aggregating them, the same formula being used at each step.
Consumer price index (CPI)	A monthly or quarterly price index compiled and published by an official statistical agency that measures changes in the prices of consumption goods and services acquired or used by households. Its exact definition may vary from country to country.
Consumers	Individual persons or groups of persons living together as households.
Consumption	There are several types of consumption: • *intermediate consumption* consists of the goods and services used by enterprises as inputs into their processes of production; it is excluded from CPIs; • *collective consumption* consists mainly of the collective services provided by governments to the community as a whole; it is excluded from CPIs; • *final individual consumption* consists of goods and services that individual households may acquire in order to satisfy their own needs and wants. See also *Households' consumption expenditures*.
Consumption of own production	Goods or services that are consumed by the same household that produces them. The housing services consumed by owner-occupiers fall within this category. If goods and services produced and consumed within the same household are to be included in CPIs, prices must be imputed for them. Their inclusion or exclusion depends on the intended scope of the CPI.
Continuity	The property whereby the price index is a continuous function of its price and quantity vectors.
Cost of living bias	An alternative term used to describe *Substitution bias*.
Cost of living index (COLI)	An index that measures the change between two periods in the minimum expenditures that *would* be incurred by a utility-maximizing consumer, whose preferences or tastes remain unchanged, in order to maintain a given level of utility (or standard of living or welfare). As consumers may be expected to change the quantities they consume in response to changes in relative prices (see *Substitution effect*), the COLI is not a basket index. The expenditures in one or other, or possibly both, periods cannot usually be observed. COLIs cannot be directly calculated but may be approximated by superlative indices. See *Conditional cost of living index*.
Coverage	The set of goods and services of which the prices are actually included in the index. For practical reasons, coverage may have to be less than the ideal scope of the index, that is, the set of goods and services that the compilers of the index would prefer to include if it were feasible.

Current period, or comparison period	In principle, the current period should refer to the most recent period for which the index has been compiled or is being compiled. The term is widely used, however, to mean the comparison period; that is, the period that is compared with the base period, usually the price reference or index reference period. It is also widely used simply to mean the later of the two periods being compared. The exact meaning is usually clear in the context.
Current prices	The actual prices prevailing in the period in question.
Current value	The actual value of some aggregate in the period in question: the quantities in the period multiplied by the prices of the same period.
Cut-off sampling	A sampling procedure in which a predetermined threshold is established with all units in the universe at or above the threshold being included in the sample, and all units below the threshold being excluded. The threshold is usually specified in terms of the size of some relevant variable, the largest sampling units being included and the rest given a zero chance of inclusion. In the case of retail outlets, size may be defined in terms of sales.
Deflation	The division of the current value of some aggregate by a price index (described as a *deflator*) in order to revalue its quantities at the prices of the price reference period.
Democratic index	A form of CPI in which each household is given equal weight in the calculation of the index, irrespectively of the size of its expenditures.
Discount	A deduction from the list or advertised price of a good or a service that is available to specific customers under specific conditions. Examples include cash discounts, prompt payment discounts, volume discounts, trade discounts and advertising discounts.
Divisia index	A price or quantity index that treats both prices and quantities as continuous functions of time. By differentiating with respect to time, the rate of change in the value of the aggregate in question is partitioned into two components, one of which is the price index and the other the quantity index. In practice, the indices cannot be calculated directly, but it may be possible to approximate them by chain indices in which indices measuring the changes between consecutive periods are linked together.
Domain	An alternative term for the scope of an index.
Drift	A chain index is said to drift if it does not return to unity when prices in the current period return to their levels in the base period. Chain indices are liable to drift when prices fluctuate over the periods they cover.
Drobisch price index	The arithmetic average of the Laspeyres price index and the Paasche price index.
Durable consumption good	A consumption good that can be used repeatedly or continuously for purposes of consumption over a long period of time, typically several years.
Dutot index	An elementary price index defined as the ratio of the unweighted arithmetic averages of the prices in the two periods compared.
Economic approach	The economic approach to index number theory assumes that the quantities are functions of the prices, the observed data being generated as solutions to various economic optimization problems. In the CPI context, the economic approach usually requires the CPI to be some kind of cost of living index.
Edgeworth price index	A basket price index in which the quantities in the basket are simple arithmetic averages of the quantities consumed in the two periods.
Editing	The process of scrutinizing and checking the prices reported by price collectors. Some checks may be carried out by computers using statistical programs written for the purpose.
Elementary aggregate	The smallest aggregate for which expenditure data are available and used for CPI purposes. The values of the elementary aggregates are used to weight the price indices for elementary aggregates to obtain higher-level indices. The range of goods and services covered by an elementary aggregate should be relatively narrow, and may be further narrowed by confining the goods and services to those sold in particular types of outlet or in particular locations. Elementary aggregates also serve as strata for the sampling of prices.
Elementary price index	An elementary index is a price index for an elementary aggregate. Expenditure weights cannot usually be assigned to the price relatives for the sampled products within an elementary aggregate, although other kinds of weighting may be explicitly or implicitly introduced into the calculation of elementary indices. Three examples of elementary index number formulae are the Carli, the Dutot and the Jevons.
Expenditure weights	See *Weights*.
Explicit quality adjustment	A direct estimate of how much of the change in the price of a product is attributable to changes in its physical or economic characteristics. It requires an evaluation of the contributions of the differences in particular characteristics to the differences in the observed prices of two products. It includes quality adjustments based on hedonic methods. See also *Implicit quality adjustment*.

Factor reversal test	Suppose the prices and quantities in a price index are interchanged to yield a quantity index of exactly the same functional form as the price index. Under the axiomatic approach, the factor reversal test requires that the product of this quantity index and the original price index should be identical to the proportionate change in the value of the aggregate in question.
Fisher price index	The geometric average of the Laspeyres price index and the Paasche price index. It is a symmetric index and a superlative index.
Fixed basket indices	A time series of basket indices that all use the same basket; see *equation (4) of the Appendix*. In a CPI context, the fixed basket usually consists of the total quantities consumed by the designated set of households over a period of a year or more.
Fixed weight indices	An abbreviated description for a series of weighted arithmetic averages of price relatives that all use the same weights; see *equation (13) of the Appendix*. The weights are usually either actual or hybrid expenditure shares.
Geometric Laspeyres index	A weighted geometric average of the price relatives using the expenditure shares of the price reference period as weights. Also called Logarithmic Laspeyres index.
Goods	Physical objects for which a demand exists, over which ownership rights can be established and for which ownership can be transferred between units by engaging in transactions on the market.
Hedonic method	A regression model in which the market prices of different products are expressed as a function of their characteristics. Non-numerical characteristics are represented by dummy variables. Each regression coefficient is treated as an estimate of the marginal contribution of that characteristic to the total price. The estimates may be used to predict the price of a new product for which the mix of characteristics is different from that of any product already on the market. The hedonic method can therefore be used to estimate the effects of quality changes on prices.
Higher-level index	An aggregate index as distinct from an elementary index.
Household budget surveys (HBSs)	Sample surveys of households in which the households are asked to provide data on, or estimates of, the amounts they spend on consumption goods and services, and for other purposes over a given period of time.
Households	Households may be either individual persons living alone or groups of persons living together who make common provision for food or other essentials for living. Most countries choose to exclude groups of persons living in large institutional households (barracks, retirement homes, etc.) from the scope of their CPIs.
Households' consumption expenditures	Expenditures on final consumption goods and services incurred by individual households on their own behalf. They exclude expenditures incurred by governments or non-profit institutions on goods or services provided to households as free social transfers in kind.
Hybrid values or expenditures	Hypothetical values, or expenditures, in which the quantities are valued at a different set of prices from those at which they were actually bought or sold: for example, when the quantities purchased in an earlier period, such as b, are valued at the prices prevailing in a later period, such as 0.
Hybrid weights	Weights defined as hybrid value, or hybrid expenditure, shares.
Identity test	A test under the axiomatic approach that requires that, if each and every price remains unchanged between the two periods, the price index must equal unity.
Implicit quality adjustment	Inferring indirectly the change in the quality of a product of which the characteristics change over time by estimating, or assuming, the pure price change that has occurred. For example, if the pure price change is assumed to be equal to the average for some other group of products, the implied change in quality is equal to the actual observed price change divided by the assumed pure price change. If the whole of the observed price change is assumed to be pure price change, there is assumed to be no change in quality. See also *Explicit quality adjustment*.
Imputed price	The price assigned to an item for which the price is missing in a particular period. The term "imputed price" may also refer to the price assigned to an item that is not sold on the market, such as a good or service produced for own consumption, including housing services produced by owner-occupiers, or one received as payment in kind or as a free transfer from a government or non-profit institution.
Indexation	The periodic adjustment of the money values of some regular scheduled payments based on the movement of the CPI or some other price index. The payments may be wages or salaries, social security or other pensions, other social security benefits, rents, interest payments, etc.
Index reference period	The period for which the value of the index is set at 100.
Institutional unit	A national accounts concept defined as an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and transactions with other entities. Households are institutional units. Other kinds of units include enterprises and governments.
Invariance to changes in the units of measurement test	A test under the axiomatic approach that requires that the price index does not change when the units of quantity to which the prices refer are changed: for example, when the price of some drink is quoted per litre rather than per pint. This test is also described as the commensurability test.

Invariance to proportional change in current or base quantities test	A test under the axiomatic approach that requires that the price index remains unchanged when all the base period quantities, or all the current period quantities, are multiplied by a positive scalar.
Inverse proportionality in base year prices test	A test which may be invoked under the axiomatic approach that requires that, if all the base period prices are multiplied by the positive scalar λ, the new price index is $1/\lambda$ times the old price index.
Item	An individual good or service in the sample of products selected for pricing.
Item or product rotation	The deliberate replacement of a sampled item, or product, for which prices are being collected, by another product before the replaced product has disappeared from the market or individual outlet. It is designed to keep the sample of products up to date and reduce the need for forced replacements caused by the disappearance of products.
Jevons price index	An elementary price index defined as the unweighted geometric average of the sample price relatives.
Laspeyres price index	A basket index in which the basket is composed of the actual quantities of goods and services in the earlier of the two periods compared, the price reference period; see *equation (3) of the Appendix*. It can also be expressed as a weighted arithmetic average of the price relatives that uses the expenditure shares in the earlier period as weights; see *equations (7) to (10) of the Appendix*. The earlier period serves as both the weight reference period and the price reference period.
Linking	Splicing together two consecutive sequences of price observations, or price indices, that overlap in one or more periods. When the two sequences overlap by a single period, the usual procedure is simply to rescale one or other sequence so that the value in the overlap period is the same in both sequences and the spliced sequences form one continuous series. See *equation (6) of the Appendix*.
Lowe index	A price index that measures the proportionate change between periods 0 and t in the total value of a specified basket of goods and services; that is, $\sum p^t q / \sum p^0 q$, where the terms q are the specified quantities. The basket does not necessarily have to consist of the actual quantities in some period. See *Appendix*. This type of index is described in the manual as a Lowe index after the index number pioneer who first proposed this general type of index. The class of indices covered by this definition is very broad and includes, by appropriate specification of the terms q, the Laspeyres, Paasche, Edgeworth and Walsh indices, for example. Lowe indices are widely used for CPI purposes, the quantities in the basket typically being those of some weight reference period b, which precedes the price reference period 0.
Lower-level index	An elementary index as distinct from an aggregate index.
Matched products or models	The practice of pricing exactly the same product in two or more consecutive periods. It is designed to ensure that the observed price changes are not affected by quality change. The change in price between two perfectly matched products is described as a pure price change.
Mean value test for prices	A test under the axiomatic approach, which requires that the price index should lie between the smallest price relative and the largest price relative.
Non-probability sampling	The deliberate, i.e. non-random, selection of a sample of outlets and products on the basis of the knowledge or judgement of the person responsible. Also known as purposive sampling and judgemental sampling.
"One hoss shay"	A model of depreciation, in which the durable delivers the same services for each vintage: a chair is a chair, no matter what its age (until it falls to pieces and is scrapped). Also known as the light bulb model of depreciation.
Outlier	A term that is generally used to describe any extreme value in a set of survey data. In a CPI context, it is used for an extreme value of price or price relative that requires further investigation or that has been verified as being correct.
Owner-occupied housing	Dwellings owned by the households that live in them. The dwellings are fixed assets that their owners use to produce housing services for their own consumption, these services being usually included within the scope of the CPI. The rents may be imputed by the rents payable on the market for equivalent accommodation or by user costs. See *Rental equivalence* and *User cost*.
Paasche price index	A basket index in which the basket is composed of the actual quantities of goods and services in the later of the two periods compared. The later period serves as the weight reference period and the earlier period as the price reference period. The Paasche index can also be expressed as a weighted harmonic average of the price relatives that uses the actual expenditure shares in the later period as weights. See *equations (7) to (11) of the Appendix*.
Price reference period	The period of which the prices appear in the denominators of the price relatives. See also *Base period*.
Price relative	The ratio of the price of an individual product in one period to the price of that same product in some other period.

Price updating	A procedure whereby the quantities in an earlier period are revalued at the prices of a later period. The resulting expenditures are hybrid. In practice, the price-updated expenditures may be obtained by multiplying the original expenditures by price relatives or price indices.
Probability proportional to size sampling (PPS)	A sampling procedure whereby each unit in the universe has a probability of selection proportional to the size of some known variable, such as the value of the sales of an outlet.
Probability sampling	The random selection of a sample of units, such as outlets or products, in such a way that each unit in the universe has a known non-zero probability of selection.
Products	A generic term used to mean a good or a service. Individual sampled products selected for pricing are often described as items.
Proportionality in current prices test	A test under the axiomatic approach that requires that, if all current period prices are multiplied by the positive scalar λ, the new price index is λ times the old price index.
Purchaser's price	The amount payable by the purchaser to acquire a good or service. The purchaser's price includes any charges incurred in order to take delivery at the time and place required by the purchaser.
Pure price change	The change in the price of a good or service of which the characteristics are unchanged; or the change in the price after adjusting for any change in quality.
Quality adjustment	An adjustment to the change in the price of a product of which the characteristics change over time that is designed to remove the contribution of the change in the characteristics to the observed price change. In a CPI context, the adjustment is needed when the price of a replacement product has to be compared with the price of the product it replaces. In practice, the required adjustment can only be estimated. Different methods of estimation, including hedonic methods, may be used in different circumstances. See *Explicit quality adjustment* and *Implicit quality adjustment*.
Quantity relative	The ratio of the quantity of a product in one period to the quantity of that same product in some other period.
Quantity weights	A term sometimes used to describe the quantities in the basket. However, expenditures rather than quantities act as weights for price relatives. See *Weights*.
Rebasing	Rebasing may have different meanings in different contexts. It may mean: • changing the weights used for a series of indices; or • changing the price reference period used for a series of indices; or • changing the index reference period for a series of indices. The weights, price reference period and index reference period may be changed separately or at the same time.
Reference population	The set of households included within the scope of the index.
Rental equivalence	The estimation of the imputed rents payable by owner-occupiers on the basis of the rents payable on the market for accommodation of the same type.
Replacement product	A product chosen to replace a product for which prices have been collected previously, either because the previous product has disappeared altogether or because it accounts for a diminishing share of the sales of the outlet, or the expenditures within the elementary aggregate.
Representative product	A product, or category of products, that accounts for a significant proportion of the total expenditures within an elementary aggregate, and/or for which the average price change is expected to be close to the average for all products within the aggregate.
Representativity bias	Bias in a basket index that results from the use of quantities that are not representative of the two periods compared; that is, that systematically diverge from the average quantities consumed in the two periods. For example, representativity bias may result from the use of an old, out-of-date basket which deviates systematically from the baskets in both the periods compared. In practice, representativity bias tends to be similar to substitution bias, as it is attributable to the same economic factors.
Reweighting	Replacing the weights used in an index by a new set of weights.
Sample augmentation	Maintaining and adding to the sample of outlets in the survey panel to ensure that they continue to be representative of the population of outlets. A fixed sample of outlets tends to be depleted over time, as outlets cease trading or stop responding. Including new outlets also tends to facilitate the inclusion of new products in the CPI.
Sampled price	The price collected for a sampled product, sometimes described as a price quote.
Sampled product	An individual product that is included in the sample selected for pricing within an elementary aggregate.
Sample rotation	Limiting the length of time that outlets and/or products are included in the price surveys by dropping a proportion of them, or possibly all of them, after a certain period of time and selecting a new sample of outlets and/or products. Rotation is designed to keep the sample up to date.

Sampling frame	A list of the units in the universe from which a sample of units can be selected. The list may contain information about the units, which may be used for PPS sampling. Examples of lists that may be used for retail outlets are business registers, telephone directories (''yellow pages''), local authority records, trade directories, etc. Such lists may not cover all the units in the designated universe and may also include units that do not form part of that universe.
Scanner data	Detailed data on sales of consumer goods obtained by scanning the bar codes for individual products at electronic points of sale in retail outlets. The data can provide detailed information about quantities, characteristics and values of goods sold, as well as their prices. Scanner data constitute a rapidly expanding source of data with considerable potential for CPI purposes. They are increasingly used for purposes of hedonic analysis.
Scope	The set of products for which the index is intended to measure the price changes. The scope of a CPI will generally be defined in terms of a designated set of consumption goods and services purchased by a designated set of households. In practice, certain goods and services or households may have to be excluded because it is too difficult, time-consuming or costly to collect the relevant data on expenditures or prices: for example, illegal expenditures. The coverage of an index denotes the actual set of products included, as distinct from the intended scope of the index.
Seasonal products	Seasonal products are products that either are not available on the market during certain seasons or periods of the year, or are available throughout the year but with regular fluctuations in their quantities and prices that are linked to the season or time of the year.
Specification	A description or list of the characteristics that can be used to identify an individual sampled product to be priced. A tight specification is a fairly precise description of an item intended to narrow the range of items from which a price collector might choose, possibly reducing it to a unique item, such as a particular brand of television set identified by a specific code number. A loose specification is a generic description of a range of items that allows the price collector some discretion as to which particular item or model to select for pricing, such as colour television sets of a particular size.
Stochastic approach	The approach to index number theory that treats the observed price relatives as if they were a random sample drawn from a defined universe for which the mean can be interpreted as the general rate of inflation. The sample mean provides an estimate of the rate of inflation.
Substitute	A product of which the characteristics are similar to those of another product and that can be used to meet the same kinds of consumer needs or wants.
Substitution	The replacement of products by substitutes, typically in response to changes in relative prices. Rational utility-maximizing consumers, as price takers, typically react to changes in relative prices by reducing, at least marginally, their consumption of goods and services that have become relatively dearer and increasing their consumption of substitutes that have become relatively cheaper. Substitution results in a negative correlation between the quantity and price relatives.
Substitution bias	This is generally understood to be the bias that results when a basket index is used to estimate a cost of living index, because a basket index cannot take account of the effects on the cost of living of the substitutions made by consumers in response to changes in relative prices. In general, the earlier the period of which the basket is used, the greater the upward bias in the index; see also *Representativity bias*.
Substitution effect	The effect of substitution on the value of an index.
Superlative index	A type of index formula that can be expected to approximate to the cost of living index. An index is said to be exact when it equals the true cost of living index for consumers whose preferences can be represented by a particular functional form. A superlative index is then defined as an index that is exact for a flexible functional form that can provide a second-order approximation to other twice-differentiable functions around the same point. The Fisher, the Törnqvist and the Walsh price indices are examples of superlative indices. Superlative indices are generally symmetric indices.
Symmetric index	An index that treats both periods symmetrically by attaching equal importance to the price and expenditure data in both periods. The price and expenditure data for both periods enter into the index formula in a symmetric way.
System of National Accounts (SNA)	A coherent, consistent and integrated set of macroeconomic accounts, balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules. Household income and consumption expenditure accounts form part of the SNA. The expenditure data are one of the sources that are used to estimate expenditure weights for CPI purposes.
Time reversal	An index number property such that, if ${}_jI_k$ denotes a particular kind of price index formula that measures the change from period j to period k, then ${}_jI_k \equiv 1/{}_kI_j$ where ${}_kI_j$ measures the change from period k to period j. When an index has this property, the change is the same whether it is measured forwards from the first to the second period or backwards from the second to the first period. An index may be required to satisfy the time reversal test under the axiomatic approach.
Törnqvist price index	A symmetric index defined as the weighted geometric average of the price relatives in which the weights are simple arithmetic averages of the expenditure shares in the two periods. It is a superlative index. Also known as the Törnqvist–Theil price index.

Transitivity	See *Circularity*.
Unit value or average value	The unit value of a set of homogeneous products is the total value of the purchases/sales divided by the sum of the quantities. It is therefore a quantity-weighted average of the different prices at which the product is purchased/sold. Unit values may change over time as a result of a change in the mix of the products sold at different prices, even if the prices do not change.
User cost	The cost incurred over a period of time by the owner of a fixed asset or consumer durable as a consequence of using it to provide a flow of capital or consumption services. User cost consists mainly of the depreciation of the asset or durable (measured at current prices and not at historic cost) plus the capital, or interest, cost.
Uses approach	An approach to CPIs in which the consumption in some period is identified with the consumption goods and services actually used up by a household to satisfy their needs and wants (as distinct from the consumption goods and services acquired). In this approach, the consumption of consumer durables in a given period is measured by the values of the flows of services provided by the stocks of durables owned by households. These values may be estimated by the user costs.
Value	Price times quantity. The value of the expenditures on a set of homogeneous products can be factored uniquely into its price and quantity components. Similarly, the change over time in the value of a set of homogeneous products can be factored uniquely into the change in the unit value and the change in the total quantities. There are, however, many different ways of factoring the change over time in the value of a set of heterogeneous products into its price and quantity components, a phenomenon that gives rise to the index number problem.
Walsh price index	A basket index in which the quantities are geometric averages of the quantities in the two periods; see the *Appendix*. It is a symmetric index and a superlative index.
Weight reference period	The period of which the expenditure shares serve as the weights for a Young index, or of which the quantities make up the basket for a Lowe index. There may be no weight reference period when the expenditure shares for the two periods are averaged, as in the Törnqvist index, or when the quantities are averaged, as in the Walsh index. See also *Base period*.
Weighted arithmetic average index	An index defined as a weighted arithmetic average of the price relatives: namely, $\sum w(p^t/p^0)$, where the weights w sum to unity.
Weights	A set of numbers summing to unity that are used to calculate averages. In a CPI context, the weights are generally actual or hybrid expenditure shares that sum to unity by definition. They are used to average price relatives, or elementary price indices; see the *Appendix*. Quantities of different kinds of products are not commensurate and not additive. They cannot serve as weights. The quantities that make up a basket should therefore not be described as quantity weights.
Young index	A Young index is a weighted arithmetic average of the price relatives, $\sum w(p^t/p^0)$, in which the terms w refer to the actual expenditure shares of period b, the weight reference period; that is, $w = s^b = p^b q^b / \sum p^b q^b$. It is a weighted version of the Carli index.

Appendix to the glossary. Some basic index number formulae and terminology

1. Throughout this Appendix, the sums are understood to be running over all items n.

A *basket* price index is an index of the form

$$\frac{\sum p_n^t q_n}{\sum p_n^0 q_n} \tag{A.1}$$

which compares the prices of period t with those of (an earlier) price reference period 0, using a certain specified quantity basket. The basket does not have to consist of the actual quantities in any particular period. This general type of index is called a Lowe price index after the index number pioneer who first proposed this general type of index. The family of Lowe indices includes some well-known indices as special cases:

- when $q_n = q_n^0$, we get the Laspeyres index;
- when $q_n = q_n^t$, we get the Paasche index;
- when $q_n = (q_n^0 + q_n^1)/2$, we get the Marshall–Edgeworth index;
- and when $q_n = (q_n^0 q_n^t)^{1/2}$, we get the Walsh index.

In practice, statistical offices frequently work with a Lowe index in which $q_n = q_n^b$, where b denotes some weight reference period that is typically prior to 0.

2. A useful feature of a Lowe index for period t relative to period 0 is that it can be decomposed, or factored, into the product of two or more indices of the same type: for instance, as the product of an index for period $t-1$ relative to period 0 and an index for period t relative to period $t-1$. Formally,

$$\frac{\sum p_n^t q_n}{\sum p_n^0 q_n} = \frac{\sum p_n^{t-1} q_n}{\sum p_n^0 q_n} \frac{\sum p_n^t q_n}{\sum p_n^{t-1} q_n} \tag{A.2}$$

In particular, when $q_n = q_n^0$, expression (2) turns into

$$\frac{\sum p_n^t q_n^0}{\sum p_n^0 q_n^0} = \frac{\sum p_n^{t-1} q_n^0}{\sum p_n^0 q_n^0} \frac{\sum p_n^t q_n^0}{\sum p_n^{t-1} q_n^0} \tag{A.3}$$

The left-hand side of expression (3) is a direct Laspeyres index. Note that only the first of the indices that make up the right-hand side is itself a Laspeyres index, the second being a Lowe index for period t relative to period $t-1$ that uses the quantity basket of period 0 (not $t-1$). Some statistical offices describe the index on the right-hand side of expression (3) as a modified Laspeyres index.

3. In a time series context, say when t runs from 1 to T, the series

$$\frac{\sum p_n^1 q_n}{\sum p_n^0 q_n}, \frac{\sum p_n^2 q_n}{\sum p_n^0 q_n}, \ldots, \frac{\sum p_n^T q_n}{\sum p_n^0 q_n} \tag{A.4}$$

is termed a series of *fixed basket* price indices. In particular, when $q_n = q_n^0$, we get a series of Laspeyres indices.

4. At period T one could change to a new quantity basket q', and calculate from this period onwards

$$\frac{\sum p_n^{T+1} q'_n}{\sum p_n^T q'_n}, \frac{\sum p_n^{T+2} q'_n}{\sum p_n^T q'_n}, \frac{\sum p_n^{T+3} q'_n}{\sum p_n^T q'_n}, \ldots. \tag{A.5}$$

To relate the prices of periods $T+1$, $T+2$, $T+3, \ldots$ to those of period 0, chain linking can be used to transform the series (5) into a series of the form

$$\frac{\sum p_n^T q_n}{\sum p_n^0 q_n} \frac{\sum p_n^{T+1} q'_n}{\sum p_n^T q'_n}, \frac{\sum p_n^T q_n}{\sum p_n^0 q_n} \frac{\sum p_n^{T+2} q'_n}{\sum p_n^T q'_n}, \frac{\sum p_n^T q_n}{\sum p_n^0 q_n} \frac{\sum p_n^{T+3} q'_n}{\sum p_n^T q'_n}, \ldots. \tag{A.6}$$

This could be termed a series of *chain-linked fixed basket* price indices. In particular, when $q_n = q_n^0$ and $q'_n = q_n^T$, we get a series of chain-linked Laspeyres indices. Since the basket is changed at period T, the adjective fixed applies literally only over a certain number of time intervals. The basket is fixed from period 1 to period T, and is again fixed from period $T+1$ onwards. When the time intervals during which the basket is kept fixed are of the same length, such as one, two or five years, this feature can be made explicit by describing the index as an annual, bi-annual or five-yearly chain-linked fixed basket price index.

5. A *weighted arithmetic-average* price index (so-called to distinguish it from a geometric or other kind of average) is an index of the form

$$\sum w_n (p_n^t / p_n^0) \tag{A.7}$$

which compares the prices of period t with those of period 0, using a certain set of weights adding up to 1. In particular, when the weights are the period b value shares

$$w_n = s_n^b \equiv p_n^b q_n^b / \sum p_n^b q_n^b \tag{A.8}$$

we obtain the Young index.

Note that any basket price index (1) can be expressed in the form (7), since

$$\frac{\sum p_n^t q_n}{\sum p_n^0 q_n} = \sum \frac{p_n^0 q_n}{\sum p_n^0 q_n} \frac{p_n^t}{p_n^0}. \tag{A.9}$$

When the weights are the period 0 value shares,

$$w_n = s_n^0 \equiv p_n^0 q_n^0 / \sum p_n^0 q_n^0 \tag{A.10}$$

expression (7) turns into the Laspeyres index. When

$$w_n = p_n^0 q_n^t / \sum p_n^0 q_n^t \tag{A.11}$$

that is, hybrid period (0, t) value shares, we get the Paasche index.

One could also think of setting

$$w_n = s_n^b (p_n^0 / p_n^b) / \sum s_n^b (p_n^0 / p_n^b) = p_n^0 q_n^b / \sum p_n^0 q_n^b \tag{A.12}$$

that is, price-updated period b value shares.

Note that hybrid value shares, such as given by expressions (11) or (12), are not observable but must be constructed.

6. In a time series context, when t runs from 1 to T, the series

$$\sum w_n (p_n^1 / p_n^0), \sum w_n (p_n^2 / p_n^0), \ldots.., \sum w_n (p_n^T / p_n^0) \tag{A.13}$$

is termed a series of *fixed weighted arithmetic-average* price indices. In particular, when the weights are equal to the period 0 expenditure shares, we get a series of Laspeyres indices, and when the weights are equal to the price-updated period b expenditure shares, we get a series of Lowe indices in which the quantities in the basket are those of period b.

7. In period T one could change to a new set of weights w', and calculate from this period onwards

$$\sum w'_n (p_n^{T+1} / p_n^T), \sum w'_n (p_n^{T+2} / p_n^T), \sum w'_n (p_n^{T+3} / p_n^T), \ldots.. \tag{A.14}$$

or, using chain-linking to relate the prices of periods $T+1$, $T+2$, $T+3$, ... to those of period 0,

$$\sum w_n(p_n^T/p_n^0)\sum w'_n(p_n^{T+1}/p_n^T),$$
$$\sum w_n(p_n^T/p_n^0)\sum w'_n(p_n^{T+2}/p_n^T), \ldots. \quad \text{(A.15)}$$

This could be termed a series of *chain-linked fixed weighted arithmetic-average* price indices. In particular, when $w_n = s_n^0$ and $w'_n = s_n^T$, we get a series of chain-linked Laspeyres indices. When $w_n = s_n^b(p_n^0/p_n^b)/\sum s_n^b(p_n^0/p_n^b)$ and $w'_n = s_n^{b'}(p_n^T/p_n^{b'})/\sum s_n^{b'}$ $(p_n^T/p_n^{b'})$ for some later period b', we get a series of chain-linked Lowe indices.

8. Again, since the weights are changed at period T, the adjective fixed applies literally only over a certain number of time intervals. The weights are fixed from period 1 to period T, and are again fixed from period $T+1$ onwards. When the time intervals during which the weights are kept fixed are of the same length, this feature can be made explicit by adding a temporal adjective, such as annual, bi-annual or five-yearly.