**1. How to calculate weight for lower-level index?**

The weight for the lower-level index is not based on expenditure survey data. The weights for the first stage come from the sampling frame for the category. (Sampleing frame is a complicate process for items, outlets selection)

There are about 80,000 quotes included in CPI calculation. The handbook of method published by BLS illustrate how to calculate quote weights[[1]](#footnote-1).

*Wj, POPS = αEfgb/MB*

where

*α* is the proportion of the total dollar volume of sales for the ELI relative to the entire POPS category within the outlet (called the outlet’s *percent of POPS* for the ELI);

*E* is an estimate of the total daily expenditure for the POPS category in the PSU half-sample by people in the Upopulation (called the *basic weight*);

*f* is a *duplication factor* that accounts for any special subsampling of outlets and quotes;

*g* is a *geographic factor* used to account for differences in the index area’s coverage when the CPI is changing from an area design based on an old decennial census to a design based on a more recent census;

*b* is the number of times the ELI was selected to represent the item stratum, divided by the total selections for the item stratum, in the PSU half-sample;

*M* is the number of quotes with usable prices in both months *t-1* and *t* for the ELI-PSU half-sample;

*B* is the proportion of the item stratum’s expenditure accounted for by the ELI in the region.

**2. How to calculate weigh for second stage of CPI**

The weights for the second stage are derived from reported expenditures from the Consumer Expenditure Survey (CE). (Weights used in 2002-2003 were based on the 1999-2000 Consumer Expenditure Survey; weights used in 2004-05 were based on the 2001-02 Consumer Expenditure Survey; weights used in 2006-07 were based on the 2003-04 Consumer Expenditure Survey.)

According to method of handbook published by BLS[[2]](#footnote-2), the estimated expenditure for item (*i*) in area (*a*) for population *(p)* in reference period (β is derived from a weighted average of the item’s relative importance in the elementary area *(a)* and its relative importance in its corresponding region-size classification (*m*), for each year encompassing reference period (β). (The weight is calculated by relative importance). (I still do not totally understand how to calculate the this.)

According to Schmidt (1995), the weight is an expenditure-population weight. To calculate the CPI an estimate of the expenditure pattern is needed to define and weight the market basket of goods and services for which the index is computed. Each expenditure-population weight is the product of estimates of mean expenditures per consumer unit derived from the 1982-84 Consumer Expenditure Survey and estimates of the number of consumer units obtained from the 1980 census files. Mean expenditures are calculated using preliminary expenditures and their relative importance, composite estimated and raked to minimize the average mean square error of the relative importance of the total weight for the index. (Expenditure-population weight)

Each consumer unit in the survey is assigned a weight that is the number of similar consumer units in the U.S. civilian noninstitutional population the sampled consumer unit represents. Using these weights, the average expenditure per consumer unit on a particular item category is estimated with the formula[[3]](#footnote-3):

where

= the average expenditure per consumer unit on the item category,

*yi* = the expenditure made by the *ith* consumer unit on the item category,

*wi* = the weight of the *ith* consumer unit in the sample, and

*S* = the sample of consumer units that participated in the survey.

**3. How does BLS decide certain quote are included in maker basket or not?**

In frequent asked questions for CPI, BLS answers how to determine the market basket[[4]](#footnote-4). The CPI market basket is developed from detailed expenditure information provided by families and individuals on what they actually bought. For the current CPI, this information was collected from the Consumer Expenditure Surveys for 2011 and 2012. In each of those years, about 7,000 families from around the country provided information each quarter on their spending habits in the interview survey. To collect information on frequently purchased items, such as food and personal care products, another 7,000 families in each of these years kept diaries listing everything they bought during a 2-week period.

Over the 2 year period, then, expenditure information came from approximately 28,000 weekly diaries and 60,000 quarterly interviews used to determine the importance, or weight, of the more than 200 item categories in the CPI index structure. (Expenditure Survey is used to determine the market basket and the relative importance of items of the market basket).

In frequent asked questions for CPI, BLS answers what goods and services the CPI cover[[5]](#footnote-5). The CPI represents **all goods and services purchased for consumption** by the reference population (U or W) BLS has classified all expenditure items into more than 200 categories, arranged into eight major groups. (The BLS use “all goods and services purchased for consumption” here. ).

Also included within these major groups are various government-charged user fees, such as water and sewerage charges, auto registration fees, and vehicle tolls. In addition, the CPI includes taxes (such as sales and excise taxes) that are directly associated with the prices of specific goods and services. However, the CPI excludes taxes (such as income and Social Security taxes) not directly associated with the purchase of consumer goods and services.

The CPI does not include investment items, such as stocks, bonds, real estate, and life insurance. (These items relate to savings and not to day-to-day consumption expenses.)

For each of the more than 200 item categories, using scientific statistical procedures, the Bureau has chosen samples of several hundred specific items within selected business establishments frequented by consumers to represent the thousands of varieties available in the marketplace. For example, in a given supermarket, the Bureau may choose a plastic bag of golden delicious apples, U.S. extra fancy grade, weighing 4.4 pounds to represent the Apples category.

To enable the CPI to reflect changes in the marketplace, new item and outlet samples are selected each year, on a rotating basis, for approximately 25 percent of the item strata in each PSU. Each year, four regional item universes are tabulated from the 2 most recent years of CE data. Independent samples of ELIs are selected from the corresponding regional item universe for each item stratum PSU replicate scheduled for rotation that year. Within each sample PSU-replicate, each item sample is based on a systematic probability-proportional-to-size (PPS) sampling procedure, in which each ELI has a probability of selection proportional to the CPI-U population expenditures for the region for the ELI within its stratum.

**3. How does BLS get the relative importance of items?**

According to Schmidt (1995), the relative importance based on CE data refers to the ratio of expenditure of an item or a group of items to the total expenditures for all items. The patterns of expenditures at major group levels are quite similar over these time periods.

According to Mason and Butler (1987), the expenditure weight for each item stratum is an estimate of total expenditure by the index population for that item. It is calculated as the product of estimates of mean expenditures of consumer units and the number of consumer units. Mean expenditures are derived from 1982-84 Consumer Expenditure Survey data, and estimates of the number of consumer units are obtained from a special tabulation of the 1980 census files.

Mason and Bulter (1987) defines relative importance as the share that the base-period expenditure multiplied by the price relative for a particular item stratum is of the sum of all base-period expenditures multiplied by their price relatives.

Where

*Pti* is the price of item I in the comparison period t;

*Poi* is the price of item I in the base period;

*Eoi* is the expenditure for item i in the base period

**Other useful information**

**Price collection**

In frequent asked questions for CPI, BLS answers how CPI prices collected and revised[[6]](#footnote-6). Each month, BLS data collectors called economic assistants visit or call thousands of retail stores, service establishments, rental units, and doctors' offices, all over the United States, to obtain information on the prices of the thousands of items used to track and measure price changes in the CPI. These economic assistants record the prices of about 80,000 items each month, representing a scientifically selected sample of the prices paid by consumers for goods and services purchased.

During each call or visit, the economic assistant collects price data on a specific good or service that was precisely defined during an earlier visit. If the selected item is available, the economic assistant records its price. If the selected item is no longer available, or if there have been changes in the quality or quantity (for example, eggs sold in packages of ten when they previously were sold by the dozen) of the good or service since the last time prices were collected, the economic assistant selects a new item or records the quality change in the current item.

The recorded information is sent to the national office of BLS, where commodity specialists who have detailed knowledge about the particular goods or services priced review the data. These specialists check the data for accuracy and consistency and make any necessary corrections or adjustments, which can range from an adjustment for a change in the size or quantity of a packaged item to more complex adjustments based upon statistical analysis of the value of an item's features or quality. Thus, commodity specialists strive to prevent changes in the quality of items from affecting the CPI's measurement of price change. (Consumer Expenditure Survey data is different from CPI price collections, they are two different process.)

**Purpose of CE survey**

The objectives of the CE remain the same: to provide the basis for revising weights and associated pricing samples for the CPI and to meet the need for timely and detailed information on the spending patterns of different types of families. (Weight and associated pricing samples)

Results of the CE are used to select new “market baskets” of goods and services for the index, to determine the relative importance of components, and to derive cost weights for the baskets.

The BLS describe how CE data are used in the CPI[[7]](#footnote-7).

1. The BLS combines the spending information from respondents across the country to see how much is spent on each type of item.
2. All reported expenses are used to estimate how much urban households spend on each item.
3. These estimates are used to construct the market basket which contains a representative sample of expenses.
4. The BLS conducts another survey to find out where consumers purchased items in the market basket.
5. BLS data collectors visit housing units and a sample of the identified stores to obtain current price information on about 80,000 items each month across the country.
6. The BLS combines the information about the items purchased, the expenditures on these items, and their current prices to calculate the CPI.

Reference

Mason, Charles, and Clifford Butler. 1987. “New Basket of Goods and Services Being Priced in Revised CPI.” *Monthly Labor Review*, 3–22.

Schmidt, Mary Lynn, and Bureau Of Labor Statistics. 1995. *Comparing Market Basket Changes and the CPI*.

1. Chapter 17 The Consumer Price Index, page 22, available at <http://www.bls.gov/opub/hom/pdf/homch17.pdf> [↑](#footnote-ref-1)
2. Chapter 17 The Consumer Price Index, page 34, available at <http://www.bls.gov/opub/hom/pdf/homch17.pdf> [↑](#footnote-ref-2)
3. Chapter 16 Consumer expenditures and income, page 6, available at <http://www.bls.gov/opub/hom/pdf/homch16.pdf> [↑](#footnote-ref-3)
4. BLS Frequent Asked Questions CPI, how is the CPI market basket determined? Available at <http://stats.bls.gov/cpi/cpifaq.htm#Question_6> [↑](#footnote-ref-4)
5. BLS Frequent Asked Questions CPI, what goods and services does the CPI cover? Available at <http://stats.bls.gov/cpi/cpifaq.htm#Question_7> [↑](#footnote-ref-5)
6. BLS Frequent Asked Questions CPI, how are CPI prices collected and reviewed? Available at <http://stats.bls.gov/cpi/cpifaq.htm#Question_8> [↑](#footnote-ref-6)
7. The CE and the Consumer Price Index, available at <http://www.bls.gov/respondents/cex/ceandcpi.htm> [↑](#footnote-ref-7)