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The Consumer Price Index: Concepts, Construction, and Controversy

by Michael F. Bryan

The Consumer Price Index (CPI) is commonly referred to as "the rate of inflation" or as "the cost of living in the United States." The Consumer Price Index is not, however, nor was it ever intended to be, either a definitive or an ideal measure of cost-of-living changes in the United States. Indeed, as a practical matter, such an ideal measure is probably impossible to construct. By its broadest definition, the CPI is a price guide for goods and services purchased by families living in the urban centers of the United States. More specifically, it is a price index for a "fixed basket" of goods and services generally purchased by moderate-income urban families and single persons during 1972-73. To imply that the CPI is a measure of price changes for all goods or for all consumers exaggerates the value of the index as an inflation barometer.

Despite its limitations as a cost-of-living indicator, the CPI remains the most popular and widely accepted measure of inflation in the domestic economy. Constructed by the Bureau of Labor Statistics (BLS), the CPI has been a timely and reliable price statistic for over 60 years. In the past decade, it has come into extensive use in collective-bargaining agreements and in the current indexing of social-security benefits. Consequently, the CPI ranks among the most influential economic statistics published; unfortunately, it is often misused. This *Economic Commentary* examines the construction of the Consumer Price Index and explores some of the inherent problems that have prompted the controversy surrounding its use in measuring inflation, particularly during periods of rapidly changing prices.

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The CPI: What It Is (or What It Isn't)

Between 1972 and 1973, the Bureau of the Census conducted a Consumer Expenditure Survey covering 40,000 families living in 216 urban areas of the United States. The detailed survey data of consumer-expenditure patterns were used to construct a "representative" basket of goods and services purchased by "typical" consumers in each metropolitan region. The regional baskets were weighed with respect to the relative size of the various metropolitan areas and finally aggregated to produce a national average market basket. The 1972-73 consumer-expenditure patterns were first introduced into the CPI in 1978, updating the previously used 1960-61 spending patterns. The CPI basket, therefore, represents the consumption of an *average* urban family in 1972 (but not an individual family or group of families in particular).[1]

Once constructed, the basket and individual items were priced and standardized to the value of 100 for the year 1967. Current index values are obtained by a monthly (in some areas, bimonthly) survey of consumer-goods prices in 85 standard metropolitan statistical areas (SMSAs). These prices then

1. Actually, the BLS constructs two baskets based on the 1972-73 CES study. The index for urban wage and clerical workers (CPI-W) includes only employed wage and clerical workers. The index for all urban consumers (CPI-U) encompasses a broader group of consumers, including salaried workers, retirees, and unemployed persons, as well as wage and clerical workers. The CPI-U covers approximately 80 percent of the noninstitutional civilian population, while the CPI-W covers 40 percent. All data reported in this *Economic Commentary* refer to the CPI-U.

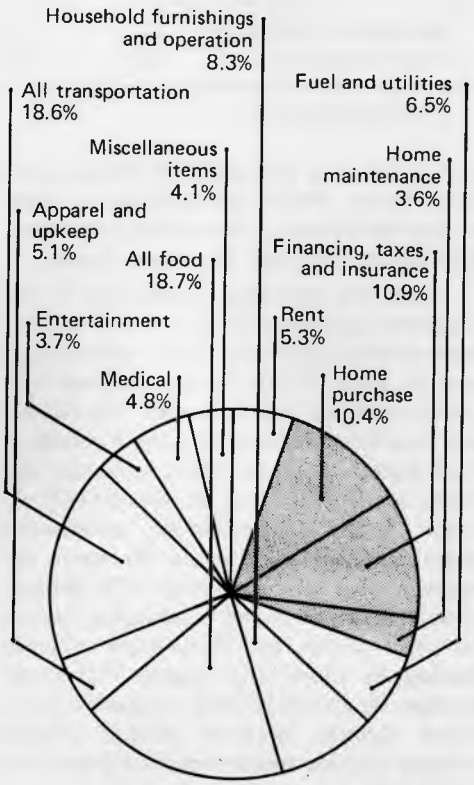
replace previous prices.[2] A resulting index of 150, for example, simply means that the current basket is 50 percent more expensive than in 1967.

Conceptual Limitations

Inherent to the construction of any price index are technical problems such as selecting an appropriate base period from which to construct the consumer basket. The ideal base period would be one in which no price changes were occurring; hence, the consumer basket would be assumed to be in equilibrium (or constant). Because such a period is virtually nonexistent, analysts are limited to approximating the ideal. Other problems involve determining the frequency of purchase, especially for durable goods, and adjusting for changes in quality. Added to these are the questions of "who" should be surveyed for current price information, and how often the price surveys should be conducted.

Beyond the technical concerns, though, are difficulties resulting from a "fixed-basket" composition. To begin with, the basket for the average urban family, even in 1972, did not represent persons who were not part of the "average" family or who did not live in an urban community. Survey data, for example, indicate that elderly consumers spend a greater percentage of their income on food and medical care and less on transportation and entertainment than average consumers. Persons living in rural areas probably spend relatively more on transportation and less on food and housing than urban residents. Using the CPI to assess individual cost-of-living changes for consumers other than the average urban family can be misleading.

Chart 1 Relative Importance of Various Product Groupings in the CPI, December 1979



Perhaps most important of all, CPI construction presumes that the basket of items consumed does not change from that which was consumed during the "base period" (in this instance, 1972-73). In actuality, however, patterns of consumption do change over time because of changes in tastes, incomes, and relative prices. During periods of changing prices, consumers attempt to substitute less expensive items for more expensive items; therefore, changes in the CPI tend to overstate changes in the average cost of living. If the price of beef, for example, increases relative to other foods, consumers will purchase more pork or tuna fish and less beef. This is, in fact, a good example of the behavior of the American consumer over the past five years. The 1980 per-capita consumption of beef in the United States is expected to be almost 20 percent less than in 1976, while the per-capita consumption of pork has grown 27.5 percent over the same

2. The theoretical construction of the CPI approximates the summation

$$\frac{\Sigma P_c^i Q_{72}^i}{\Sigma P_{67}^i Q_{72}^i} \times 100,$$

where

P_c^i = current prices of item i,

Q_{72}^i = weight (or composition) of item i in basket according to 1972 consumer survey,

P_{67}^i = price of item i in 1967,

Σ = summation of items, $i, 1 \ldots n$, where n is number of items in basket.

For a complete description of the technical construction of the CPI, see William H. Wallace and William E. Cullison, *Measuring Price Changes: A Study of Price Indexes,* 4th ed. (Federal Reserve Bank of Richmond, 1970).

Table 1 Twelve-month CPI Percent Changes Using Experimental Home-ownership Components

		Flow of services method			Outlay method	
	Official CPI	X1 Rental equivalence	X2 User cost current interest	X3 User cost average interest	X4 Outlay current interest	X5 Outlay average interest
January 1980	13.9	11.2	13.9	12.7	13.1	11.7
February 1980	14.1	11.6	14.3	13.1	13.4	12.1
March 1980	14.7	12.0	15.5	14.1	13.9	12.5
April 1980	14.7	11.7	15.7	14.2	13.8	12.3
May 1980	14.4	11.4	15.4	13.9	13.5	11.9
June 1980	14.3	11.1	15.6	13.7	13.4	11.5

SOURCE: Bureau of Labor Statistics.

period.[3] Generally, any change in the price of one good or service will result in substitution among competing goods and lead to change in the quantities of those goods in the consumer basket. The CPI, as a fixed-weight index, does not incorporate these changes on a regular basis.[4]

Similar adjustments in energy consumption have clearly occurred. Sharp increases in the relative price of energy have forced consumers to be more energy conscious, resulting in curbed consumption of products such as gasoline. In this respect, the construction of the CPI increases the impact of energy costs on the average urban family.

The Durable-goods Dilemma

The treatment of durable-goods prices is especially troublesome for any price index. An ideal measure of the current cost of living must distinguish between purchasing and consuming. When consumers purchase a washing machine, for example, they are in effect purchasing the regular clothes washing service that the machine provides over its lifetime. Consumers who choose to launder at a laundromat also are purchasing laundry service, but they are paying for it in a different manner. Where the laundromat user pays for each individual laundering, the machine purchaser pays for the entirety of services at the time of purchase. Because the CPI does not distinguish between purchasing and consuming, an increase in the purchase price of a durable good is absorbed entirely by the CPI consumer pocketbook at the time of purchase, rather than distributed over the useful life of the durable good.

The treatment of durable goods in the consumer basket is even more complex once we introduce the investment aspect of durable goods. While all durable goods provide a service, many serve an investment function in that they are held, in some part, as an asset that will be sold in the future. In this respect, an increase in the cost of a durable good increases the value of the durable good "asset" held by current owners. Nowhere is the distinction between purchasing, consuming, and investing more difficult than in the housing component of the index, where home owners frequently purchase not only for shelter, but also for investment that later will yield a return. Under current CPI construction, an upward movement in home prices only increases the measured cost of housing.

Most of the controversy currently surrounding the CPI concerns the manner in which interest rates are incorporated in the home-ownership component of the index. This component includes the purchase price, financing, insurance, and maintenance of a home and accounts for almost 25 percent of the CPI basket (see chart 1). Thus, cost changes in these items have pronounced effects on the overall CPI in comparison with

3. See U.S. Department of Agriculture, Economic Statistic and Cooperative Service, *Livestock and Meat Situation,* LMS 236, forthcoming in August 1980.

4. The CPI consumption basket is revised with each major Consumer Expenditure Survey approximately every 10 years. An "ongoing" CES analysis has been initiated by the Bureau of the Census. It should also be noted that if CPI revisions occurred too frequently, changes in spending patterns due to transient factors enter the index, thus distorting a normal consumption basket.

other individual items in the index. During periods of rapidly rising interest rates, as in the early months of 1980, consumers sharply reduce their purchases of housing. Yet the fixed CPI basket weighs housing purchases according to the 1972-73 survey.

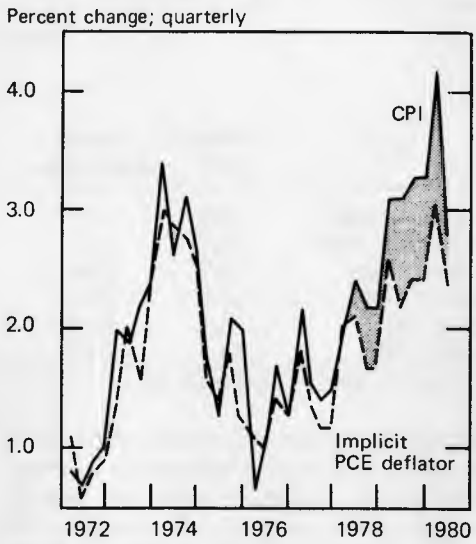
In response to this problem, the Bureau of Labor Statistics has developed five experimental measures, built around alternative assumptions of the consumer cost of housing (see table 1). The first three measures, called "flow of services" measures, attempt to capture the concept of housing as the shelter that a home provides. All consumers are included in the weighing scheme, since all consumers require some sort of shelter. "Outlay measurements," however, assume the cost of housing is determined by the amount spent, or outlays, by consumers during the base period. Only those consumers who contracted for a mortgage payment in the base period are included in the weighing procedure. Some of the experimental measures use current interest rates, while others use a 15-year moving average of interest rates to reflect the age distribution of mortgage debt outstanding.[5] Over the 12-month period ending in April 1980, the rate of change in consumer prices using the alternative housing methods varied from 15.7 percent (X2) to 11.7 percent (X1). In other words, the assumptions chosen to measure the cost of housing materially affect rates of change of the CPI.

The Implicit PCE Deflator

Problems inherent in the fixed-basket construction of the CPI can be resolved in some part by the use of the implicit personal consumption expenditure (PCE) deflator. Constructed by the Department of Commerce, the PCE deflator allows changes in consumption patterns to be reflected in weighting shifts from one period to another. The index is derived by adjusting current consumer expenditures by corresponding price indexes (primarily the CPI) and then dividing nominal personal consumption expenditures by the adjusted consumer expenditures. The separate price indexes that span

5. The purpose of the experimental home-ownership measures is to provide CPI users with a range of housing cost possibilities. For a more thorough description of the measures and their impact on the CPI, see U.S. Department of Labor, Bureau of Labor Statistics, *CPI Issues,* Report 593, February 1980.

Chart 2 Performance of the CPI and PCE Deflator



the items in the consumer basket, therefore, are "implicitly" weighed according to current consumption patterns.[6] Moreover, this measure excludes new home purchases, using a rental-equivalence approximation of housing costs—in other words, the cost associated with the rent that a home owner would have been charged had he rented rather than purchased.

The PCE deflator also has some technical problems. Perhaps the most practical limitation of the deflator is that initial monthly estimates are quite tentative and subject to considerable revision for at least four months. It is therefore a less timely measure of inflation. Furthermore, although the rental equivalence method is probably more accurate in periods of changing interest rates, it is accurate only to the point that the stock of purchased homes can be equated with a sample

6. The theoretical construction of the PCE implicit price deflator approximates the summation

$$\frac{\Sigma P_c^i Q_c^i}{\Sigma P_{72}^i Q_c^i} \times 100,$$

where

P_c^i = current prices of item i,

Q_c^i = weight of item i according to current personal consumption expenditures,

P_{72}^i = price of item i in 1972,

Σ = summation of items i, 1 - n, where n is number of items in PCE accounts.

Table 2 Selected Personal Consumption Expenditure Shares, percent

	1972 IQ	1974 IQ	1976 IQ	1978 IQ	1980 IQ	CPI 1979 December
Gasoline and motor oil	3.4	3.0	3.1	3.1	2.7	5.6
Fuel oil and coal	0.8	0.7	0.7	0.7	0.5	1.2[a]

a. Includes bottled gas.

of rental homes. The sample of rental homes must display similar characteristics to those of purchased homes, such as size and location, for accurate reflection of changes in cost.

Even the changing composition of the consumer basket in the PCE deflator has limitations when assessing changes in the average cost of living. As substitution between consumer goods and services occurs, the deflator will tend to understate the rate of change in fixed-basket consumer prices; consumer sacrifices incorporated into the implicit PCE deflator basket underestimate conclusions about cost-of-living changes. Moreover, because goods and services in the PCE deflator change in every period, comparing indexes for periods other than the base period is misleading to those who assume that index changes result purely from changes in price. Index changes between periods contain changes in price and changes in composition of the basket.[7]

Behavior of the CPI and the PCE deflator can vary widely over short periods of time, although over more lengthy periods the differences are much less pronounced (see chart 2). For the most part, the two price measures moved reasonably parallel between 1972 and 1976. After 1976, the two indexes behaved less harmoniously; since early 1978 the rate of change in the CPI has been well above that of the PCE deflator. Most of the current deviation stems from definitional differences in the treatment of the home-ownership costs and the effect of rising interest rates on the CPI. Further, the implicit PCE consumer basket becomes less comparable to the CPI's fixed basket in periods of changing prices. The weight of energy in the consumer basket, for example, has changed considerably since 1972, as consumers increasingly conserve on expensive petroleum products (see table 2).

7. The Department of Commerce constructs a "chain price index" that weighs the composition of output in the prior period and, therefore, reflects the change in prices between two periods. This index, however, is limited to price changes between two consecutive periods. A "fixed basket" PCE deflator is also constructed, although, fundamentally, it is subject to similar criticism to the CPI in terms of composition-related overstatements in prices.

Summary

The fixed-basket CPI is a timely, informative statistic for measuring price changes of a fixed basket of goods and services. How accurately this basket typifies a specific consumer depends on differences in consumption patterns of groups and individuals in the population. In periods of rapidly changing prices, the pattern of consumption changes, and, at times, the fixed 1972 basket will not accurately represent the consumption pattern even of the average urban family. Technical problems, such as the effect of sharply changing interest rates, add to the doubt that the CPI accurately captures cost-of-living changes.

Although the PCE deflator is a useful supplement to the CPI, especially during periods of change, it also has limitations. The PCE deflator is less timely. The accuracy of the rental-equivalence method for measuring housing costs is also questionable, even though it is not subject to the direct effects of sharply changing interest rates. As a cost-of-living guide, the PCE deflator does not account for the sacrifices that the average consumer makes in his consumption basket as he substitutes less expensive alternatives for goods he would have purchased.

Experience prior to 1978 suggests that these two measures of consumer prices will behave more consistently as the rate of change in prices slows and the effect of interest rates on the CPI weakens. It is important, however, to recognize that the process of measuring cost-of-living changes is difficult. Limitations in the data and problems inherent in the construction of price indexes insure that any price statistic will fall short as an absolute measure of inflation.