Changing the treatment of shelter costs for homeowners in the CPI

In 1983, the treatment of housing in the official Consumer Price Index for All Urban Consumers will change to reflect only the cost of shelter services of owner-occupied housing

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In late 1981, Commissioner of Labor Statistics Janet L. Norwood announced plans to change the procedures used to compile the homeownership component of the Consumer Price Index (CPI). Although the particular procedures used in compiling the CPI might seem dry and technical and of little general interest, such is not the case with respect to the homeownership component. The treatment of owner-occupied housing in the CPI has been one of the most widely discussed issues in economic statistics in recent years. The interest in this component stems from its substantial weight in the CPI and the sensitivity of the overall index—our most widely publicized measure of inflation—to the particular procedures used.

Currently, the homeownership component is based on house prices, mortgage interest rates, property taxes and insurance, and maintenance costs. This treatment captures elements of both the service flow and asset investment aspects of housing expenditures. The Bureau first raised questions about this component 10 years ago and, since then, has encouraged public review of alternative approaches. For some time, the Bureau staff has supported a change in favor of a treatment which would focus solely on the cost of the shelter services of owner-occupied housing, thus abstracting from investment aspects. The Commissioner believes that the increased general understanding of the issues surrounding this component, along with the growing problems inherent in continuing the current procedure, make a change imperative. This paper summarizes the proposed modifications and the reasons why an immediate decision to make them was necessary,[1] describes the current treatment of homeownership to provide an understanding of the flaws in the current approach,[2] explains why the proposed rental equivalence approach is the best alternative for improving the index, and outlines the technical procedures which the Bureau is currently implementing to ensure an adequate rental equivalence index.

Why the CPI must be changed

As noted, the current approach to homeownership is based on, *inter alia*, house prices and mortgage interest rates. In announcing the changes for the CPI homeownership component, the Commissioner cited several serious difficulties in obtaining reliable data on these components to continue the current approach. First, important changes have occurred in financial markets which are not reflected in the CPI. Funds available for long-term mortgage commitments have declined sharply. New types of mortgage instruments involving variable rates, shorter financing terms, and other special arrangements have developed so that the standard,

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long-term, fixed rate mortgage used in the CPI is becoming increasingly unrepresentative of the mortgage market. In fact, some of the new instruments have characteristics, such as variable rates and principal amounts, which make it impossible to use them in computing the CPI which assumes a long-term mortgage at fixed interest rates. Furthermore, because of high interest rates and difficulties faced by home buyers in securing bank mortgages, many owners who wish to sell their homes are facilitating sales by providing financing to buyers at below bank rates. These financing arrangements are not reflected in the CPI. The house prices used in the CPI are obtained from the Federal Housing Administration (FHA) and pertain to sales financed with FHA-insured mortgages. This data base represents a small and specialized segment of the housing market and presents BLS with increasingly serious estimation problems.

In addition to problems of data adequacy, impetus to change the homeownership component stems from an important new use of the index. The Economic Recovery Tax Act of 1981 (Public Law 97–34) requires use of the CPI for All Urban Consumers (CPI-U) for escalation of income tax brackets and the personal exemption amount. The law requires announcement of the new tax brackets in December 1984 based on CPI-U data for the prior 2 years. This is a major new use of the index which will have a broad effect on total Federal Government revenues, and this new use underscores the importance of action to ensure that the CPI reflects the consumption cost experience of consumers to the fullest extent possible.

Another reason to immediately initiate the proposed change is the increasing public awareness of the issues surrounding the measurement of homeownership costs in the CPI. A growing number of concerned parties feel that this component is seriously flawed and that changes must be made in order to maintain public confidence in the index. The specific changes to be made are detailed in exhibit 1. The essence of the decision is to change the homeownership component of the CPI from its current form, which includes both investment and consumption aspects, to a flow of services approach, which focuses only on the consumption of shelter services, on the principle that the index should focus only on current consumption.

Exhibit 1. Dates of change in the Consumer Price Index

Date	Action
January 1982	Publication of CPI for December 1981 • increased prominence for experimental rental equivalence measure (CPI-U-X1) in the text of CPI press release
1982	Work on enhancement of CPI-U-X1
February 1983	Publication of CPI for January 1983 • first publication of CPI-U with rental equivalence homeownership • last publication of CPI experimental measures
July 1983	Publication of CPI for June 1983 • last publication of overlap CPI-U with current homeownership methods
1984	Publication of rental equivalence homeownership with expanded rent sample and improved computation methods
February 1985	Publication of CPI for January 1985 • first publication of CPI for Urban Wage Earners and Clerical Workers (CPI-W) with rental equivalence homeownership
July 1985	Publication of CPI for June 1985 • last publication of overlap CPI-W with current homeownership method

Current treatment

In its current form in the index, homeownership has five parts, or elements. Each has its own weight and procedure to estimate monthly price change. The appropriateness of these methods can only be judged in terms of underlying conceptual framework for CPI homeowner costs. Unfortunately, the current treatment of homeownership has no clear conceptual rationale, so the particular procedures used are largely definitional and cannot be justified by resorting to any broader conceptual framework. It is not surprising, then, that much of the debate over homeownership has focused on them.

Weights. The weights reflect consumption patterns reported in the 1972–73 Consumer Expenditure Survey, which forms the basis for the overall weighting scheme of the CPI. (The relative importance of the items as of December 1980 is given in table 1.) The weight for home purchase is the purchase price for homes bought in the survey year, less the sales price for homes sold, plus transactions costs for these purchases and sales. Thus, consideration is limited to those consumers who purchased or sold homes during the survey period. To reduce the sampling error, data from a longer period (1968–73), annualized and adjusted for the price increase which took place over the period, were used to compute this weight. Use of these procedures resulted in a home purchase weight which is quite large.

Like home purchase, the mortgage interest concept is limited to mortgages obtained in the survey period. The mortgages must be for the purchase of homes, and only mortgages initiated at the time of house purchase are included in the weight. The weight for "contracted

mortgage interest cost" is the amount of interest that survey period borrowers promise to pay during the first half of the term of their mortgage loans. It is called contracted mortgage interest cost because it includes future payments. With long mortgages, homeowners will not, in general, hold their mortgages for the full term. The choice of half the term for the specification of this weight was based on procedures established during the 1964 CPI revision.

The weight derivations for the other homeownership elements follow more conventional CPI methods. They depend only on expenditures actually made in the survey year, and refer to expenses incurred by all survey year homeowners—not just home buyers.

Measuring house price changes. The estimate of the monthly change in house prices is one of the most difficult tasks entailed in the CPI. This estimate moves the weight for home purchase and, with a mortgage interest rate index, is also used in estimating the mortgage interest cost index. It is not feasible to follow, over time, the prices of a fixed sample of houses—a practice which would be analogous to that used to track price change on most consumer goods and services—because individual houses change hands only infrequently. So, a new selection of recently sold homes must be used each month. To obtain an estimate for the change in house prices from last month to this month, the average price of this month's set of homes must be compared—after adjustment for quality difference—to the average price for last month's set.

The primary difficulty in pursuing this approach is finding a source of data on recent house sales, with both price and quality information, that are (1) available promptly and (2) inclusive of the various types of houses and housing areas. In the current CPI, the data are for house sales on which financing is insured by the Federal Housing Administration. These data fall far short of the ideal. Processing delays often mean that several months elapse between the time a house sale occurs and the time it is used in the CPI. For some geographic areas, especially those in the Northeast, the number of FHA transactions is very small. In addition, the FHA mortgage ceiling virtually eliminates higher priced homes from consideration. The impact of the ceiling—and especially changes in the ceiling—may be quite substantial, possibly resulting in a downward bias in the house price indexes used in the CPI.[3]

The other important difficulty in estimating house price change is the development of good quality adjustment procedures, required before a valid comparison between two different samples can be made. Quality adjustment is currently accomplished by sorting the observations on FHA sales into 600 mutually exclusive cells. The cells were generated from the cross classification of the 40 CPI geographic areas, 5 age ranges, and 3 size groups. The estimate of change in house prices is computed from the cells. First, the average of the prices per square foot is obtained for each cell. Second, the change is computed for each cell from the average price per square foot of the previous month. Finally, the average of the change is taken over the cells with weights that reflect the base period importance of each cell.[4]

Mortgage interest and other cost changes. Changes in mortgage interest costs are determined from the combination of (1) an estimate of changes in mortgage interest rates and (2) the estimate of the changes in house prices. Thus, the mortgage interest cost element of the CPI shows the effect of changing interest rates, with other loan features held constant, and changing house values, with house quality held constant. Put another way, this element shows the change in the amount required to finance a given house in the face of changes in both the interest rate and the price of the house.

The rate change is estimated using quality control cells similar to those used for house prices. For conventional loans, the cells result from the cross classification of the 40 CPI geographic areas, 3 downpayment classes, and 2 classes to distinguish between mortgages on new and existing houses. The source data for conventional loans are provided by the Federal Home Loan Bank Board. They consist of all mortgages closed during the first 5 business days each month by a sample of savings and loans and other lenders. There is currently a 1-month lag before the data are used in the CPI. In addition, there are cells for FHA and VA ceiling rates; these have 13.5 percent of the mortgage weight.

Price changes for the other homeownership elements are estimated with the standard CPI technique of following the prices of a fixed set of selected items over time. The property taxes on a sample of homes are tracked from year to year, after removing the effect of capital changes and exemption changes which are not the result of new tax rules. Price change for property insurance is

Table 1. Relative importance of index components of the official (CPI-U) and experimental (CPI-U-X1) measures, December 1980

Component	Relative importance	
	CPI-U	CPI-U-X1
All items	100.000	100.00
Food and beverages	18.309	21.264
Housing	45.519	36.720
Shelter	31.650	20.613
Rent, residential	5.120	5.946
Other rental costs	.714	.830
Homeownership	25.816	13.837
Fuel and other utilities	6.550	7.604
Household furnishings and operation	7.319	8.503
Apparel and upkeep	4.854	5.639
Transportation	18.955	22.020
Medical care	4.717	5.476
Entertainment	3.647	4.237
Other goods and services	3.999	4.643

estimated by following the price of a specified amount of homeowners or fire and extended coverage insurance, with annual inflation adjustments to any dollar values used in the specifications. For maintenance and repair expenses, a specified set of commodities and services are priced in retail outlets by CPI field representatives.

The rental equivalence approach

The current treatment of homeownership in the CPI has some very ad hoc aspects: there is no recognition of the distinction between investment and consumption, nor is there any clearly identified underlying conceptual structure. This is not the case for the rental equivalence approach. The following summarizes the conceptual arguments for this approach and outlines the operational steps which will be taken to ensure that the approach is effectively implemented.[5]

Conceptual framework. The overall conceptual framework for the Consumer Price Index was presented by Robert Gillingham in 1974. To summarize, we assume that the consumer's welfare is determined by the flow of consumption services received, where the services can be (1) directly provided, (2) obtained coincidentally with the consumption of a nondurable good (in which case the distinction between a good and a service is unnecessary), or (3) obtained from the use of a durable good owned by the consumer. In each case, satisfaction is derived from the act of consumption; ownership of a source of consumption services—a durable good—produces no additional satisfaction. In other words, the purchase of a durable good is an "investment," designed to provide consumption services over a future time span.

Within this framework, we want the CPI to measure the cost over time of the market basket of services *consumed* in the base period. For the services provided by directly-purchased services and nondurable goods, this implies observing market prices and transaction levels in the base period, as well as the subsequent time path of market prices. However, for the services provided by durable goods owned by consumers, the implicit price of the services must be estimated, because market transactions do not take place each time the service is consumed.

Within this framework, the problem is basically one of estimation. This problem is not serious for many durable goods because aggregate service flows and aggregate purchase flows are closely related, and asset price movements are closely related to service price movements. Thus, standard techniques can be used. For housing, however, this pattern does not typically hold, and alternative procedures must be developed. To analyze this problem for housing, we will start by defining the user cost of housing in the simplest case—in a world of certainty without taxes, and with perfectly competitive markets—and proceed to outline the complications which arise when these assumptions are dropped.

In a world with perfect rental and resale markets and no uncertainty, the user cost of a house in a given period can be shown to be the following:

$$C_t = r_t P_t - A_t + Z_t \tag{1}$$

where r is the (single) rate of interest in period t, P is the average price of the house in period t, A is equal to the change in the average price over the period, and Z represents all other cost components. In other words, the user cost is defined as the opportunity cost of holding the house, $r \cdot P + Z$, less the increase in the house's value. In equilibrium, the rental price of the house, R, will be equal to the user cost and, because we have assumed frictions away, the rent received by a landlord will equal the rent paid by a tenant. Thus, in a perfect world the following obtains

$$R_t^L = C_t = R_t^T \tag{2}$$

where the superscripts L and T denote landlord and tenant.

Under the conditions we have assumed, measurement of the value of the flow of shelter services from a house becomes a trivial matter. It can be measured with information from either rental or resale and money markets and it does not matter whether the information refers to buyers' or sellers' prices. Problems arise, however, when we attempt to measure the cost of shelter for homeowners in a more complicated setting, in which the exact form of the user cost function is more difficult to define and the equalities above need not hold.

To lay out this problem more clearly, we will drop the assumption of perfect certainty, thereby allowing for a structure of differing asset yields. We will also relax the assumption of perfect markets to allow for the possibility that the rent received by a homeowner may be less than the rent paid by a tenant, the difference representing, for instance, the value of a management function. Although we no longer assume perfect rental markets, we do assume that there is some price at which each homeowner can rent shelter services equivalent to those provided by his own home, and some strictly positive price at which another consumer would be willing to rent his house. Under these conditions, the user cost measure can be redefined as

$$C_t = r_{et} E_t + r_{mt} M_t - A_t + Z_t \tag{3}$$

where M and E are mortgage and equity amounts which sum to the average price of housing (P), r_m is the

mortgage interest rate, and r_e is the opportunity cost of equity capital.[6]

The relationship between user cost, defined in this manner, and the alternative rent measures defined above is now ambiguous, and depends critically on the manner in which the opportunity cost of equity capital is defined. Certainly, the rent paid by a tenant must be greater than or equal to that received by a landlord, but depending on the manner in which one chooses to define and estimate the opportunity cost of equity capital, the relationship between each of the rent measures and user cost is uncertain.

The variables included in the redefined user cost function are all conceptually and operationally straightforward with one crucial exception—the opportunity cost of equity capital. Unfortunately, estimates of user cost are also sensitive to alternative definitions of this variable. In 1980, Gillingham presented several somewhat "natural" alternatives for defining the opportunity cost of equity capital.[7] In 1972, he had suggested that r_e be estimated as an internal rate of return defined by the identity

$$(4) \qquad R_t^L + A_t \equiv r_{et}E_t + r_{mt}M_t + Z_t$$

where R_t^L is an estimate of the market rental which an owner could receive for his house.[8] Alternatively, one might argue that the appropriate internal rate of return be defined by substituting R^T in equation (4). In either case, the resulting estimate of user cost, which we will call C_1, reduces to an implicit rent, and the following relationship holds:

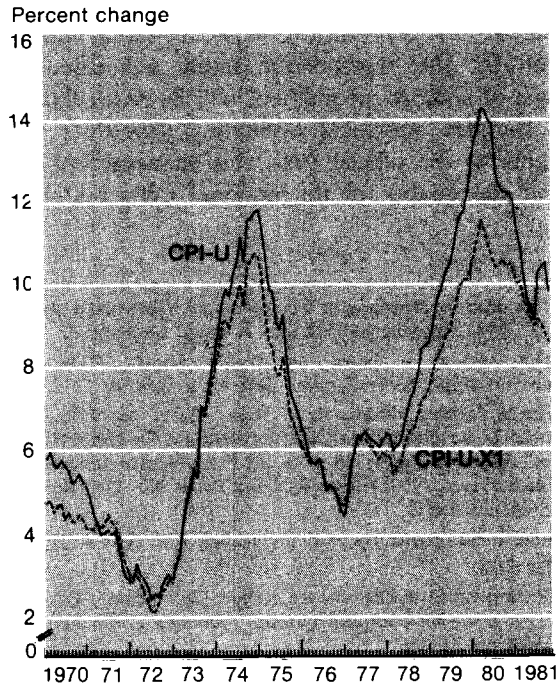
$$(5) \qquad R_t^L \leq C_{rt} \leq R_t^T$$

The suggestion to use an internal rate of return on housing to estimate user cost is based on the assumption that this rate best describes the alternative rate of return an owner/investor could receive on another investment with similar liquidity and risk characteristics.

That is, the household's user cost of owner-occupied housing or cost of *consuming* the flow of services from its housing unit must be at least as great as the income which the household could receive by renting the unit to someone else. This cost is independent of the capital gains achievable from holding housing assets, except insofar as such gains are reflected in rent levels. Each household determines its housing stock based on decisions regarding the expected rates of return on housing equity and other assets with varying characteristics. This determination is separate, however, from the decision as to the rate of consumption of housing services. Such factors as the rate of change in house prices determine the rate of return on equity, but *ex post* capital gains do not affect the user cost. In the same way, defining r_e other than as the internal rate of return has the effect of incorrectly including in C some element of the investment return on housing investments. This result implies that rental equivalence measures are a necessary input into the development of acceptable user cost measures.

Empirical implementation. The foregoing discussion emphasizes the importance of explicit or implicit rental market information in developing conceptually sound user cost measures. It has been demonstrated that estimated user cost functions are subject to extreme volatility and that direct use of rental market information is a far more promising approach.[9] The basic question then becomes the appropriate design of a rental equivalence estimation procedure.[10] Over the past several years, the Bureau has produced an experimental rental equivalence index (CPI-U-X1) which simply uses the rent index to move a rental equivalence weight derived from the 1972–73 Consumer Expenditure Survey. Relative importances for this index are shown in table 1 and the rela-

Chart 1. Changes in the Consumer Price Index for All Urban Consumers, official (CPI-U) and experimental rental equivalence (CPI-U-X1) measures, 1970-81



NOTE: Percent changes are calculated using 12 months of unadjusted data.

tive movements of this index and the official index are displayed in chart 1. Although CPI-U-X1 gives a rough idea of how a rental equivalence index would move, the Bureau believes several procedural improvements are required before an official rental equivalence index is introduced. Following are the steps currently underway to improve the method of calculating the rental equivalence measure now used in the CPI-U-X1. This work will be completed in the latter part of 1982 and will be ready for introduction into the CPI-U with data for January 1983. (See exhibit 1.)

Specifically, three limitations of the current rental equivalence measure will be addressed. First, the sample of rental units now used will be reweighted so that it will represent owner-occupied housing units instead of renter-occupied units. The current sample of rental units was selected, with a probability-based technique, from the renter-occupied units in selected neighborhoods in each CPI pricing area. The rent survey neighborhoods were selected using, among other stratification variables, the percent of the neighborhood that was owner-occupied. By taking advantage of this element of the design of the rent survey, new weights can be assigned to the housing units in the sample so that they will represent the owner-occupied housing units in their neighborhoods, CPI areas, and, ultimately, all urban places in the United States. The reweighted rent sample can then be viewed as representing—under the rental equivalence concept—homeowner costs for all urban consumers in the United States.

Second, the expenditure weight for rental equivalence, which for the experimental index was calculated by means of a short-cut method, will be recalculated using the complex statistical estimating procedure used for weights in the official CPI. This enhancement will improve the quality of the national CPI's rental equivalence weight, and will provide weights for computation of local area CPI using the rental equivalence approach.

Finally, the data processing system which produces the CPI each month will be expanded to accommodate the calculation of a CPI-U, with complete item and geographic detail, which employs the rental equivalence approach.

Subject to resource availability, longer range plans for improving the rental equivalence measure include an augmentation of the sample of rental units. This new sampling will be concentrated in areas where the housing is predominantly owner-occupied in order to increase the proportion of rental units that have characteristics similar to owner-occupied units. In addition, improvements in the statistical estimating techniques for rental equivalence will also be developed.

THE DECISION TO CHANGE to a flow-of-services approach in measuring shelter costs for homeowners implies a major conceptual change for this component of the CPI. We believe the current approach is severely lacking in conceptual rationale, and that the proposed changes will be a great improvement. Much of the controversy over the change, however, has centered around the empirical question of which index will increase more rapidly over the next several years. As shown in chart 1, the rental equivalence index increased less rapidly over the past decade. However, this period has been marked by substantial activity in housing markets and widely fluctuating mortgage interest rates. It would be extremely difficult to predict relative future movements and, thus, the decision to change the index should be based on conceptual and operational adequacy, a subject on which we do have information, rather than on predictions of future movements in the indexes, a subject on which our information is extremely uncertain. □

——*FOOTNOTES*——

[1] This section paraphrases Commissioner Norwood's statement of Oct. 27, 1981, announcing that the CPI would be changed.

[2] This section is based on Walter Lane's, "The Costs of Homeownership," *Seller/Servicer*, September–October 1979.

[3] For a detailed discussion of these effects, see John Greenlees, "Sample Truncation in FHA Data: Implications for Home Purchase Indexes," Working Paper No. 113 and "Alternative Indexes of Home Purchase Prices, 1973–1978," Working Paper No. 114 (Bureau of Labor Statistics, 1981).

[4] Additional procedures exist for dealing with cells with inadequate sample sizes.

[5] For a detailed discussion, see Robert Gillingham, "Estimating the user cost of owner-occupied housing," *Monthly Labor Review*, February 1980, pp. 31–35.

[6] Robert Gillingham, "A Conceptual Framework for the Revised Consumer Price Index," *Proceedings*, Business and Economics Statistics Section, American Statistical Association, 1974, pp. 246–52.

[7] Gillingham, "Estimating the user cost."

[8] Robert Gillingham, "Measurement in the Consumer Price Index of the Cost of Shelter for Homeowners," Bureau of Labor Statistics. June 1972.

[9] Robert Gillingham, "Measuring the Cost of Shelter for Homeowners: Theoretical and Empirical Considerations," Working Paper No. 122 (Bureau of Labor Statistics, 1981).

[10] *Ibid.* Gillingham produces experimental rental equivalence indexes using a very different set of procedures unsuited for use in the CPI. The results, however, give no evidence that a reasonable rental equivalence measure would be excessively difficult to produce.