International Comparison Program

[03.01]

User Cost Method

Global Office

2nd Regional Coordinators Meeting
April 14-16, 2010

Washington, DC

Table of Contents

Guidelines for the User Cost Method to calculate rents for owner occupied housing

1. Introduction

1. The standard procedure recommended in the SNA for owner-occupied dwellings is to assume that the rents that would be paid are the same as the rents actually paid for similar dwellings. But the standard procedure cannot always be applied. This is the case where so few dwellings are rented that rents actually paid cannot be regarded as typical. For example, in some countries, most of the dwellings available for rent are occupied by foreigners or by employees of government or large public enterprises at rents which cannot be regarded as representative, while in other countries, dwellings may only be available for rent in the capital city or other principal urban areas.

2. The following rules are recommended for deciding when the standard method should not be used:

- less than 25 per cent of all dwellings in the country are actually rented;
- more than half of the rented dwellings are occupied by foreigners paying high rents or by government or other employees paying low rents; or
- rented dwellings are not evenly distributed over all parts of the country.

3. When the standard procedure cannot be used, expenditure on dwellings is estimated by the **user cost method**. The user cost method consists of estimating each of the costs that owners of dwellings would need to take into account in fixing a market rent if they decided to rent their dwellings to other people rather than to live in them themselves. These costs (with 1993 SNA codes in brackets) are:

- Intermediate consumption (P2).
- Other taxes on production (D29).
- Consumption of fixed capital (K1).
- Real net operating surplus (B2).

4. Table 1 is in the form of a worksheet and lists the various data items that are required to impute expenditure on owner occupied dwelling services by the user cost method.

5. The Table is completed for each type of owner-occupied dwelling that can be separately distinguished in the housing statistics available in each country. At a very minimum it would be desirable to distinguish:

- Single-family dwellings (houses or villas).

- Apartments below a certain floor space (such as below 30 m²).
- Apartments above a certain floor space (such as 30 m² or more).

6. The main difficulties in applying the user cost method as outlined in Table 1 are:

- estimating the **stock of owner-occupied dwellings**, which is required to calculate both consumption of fixed capital (UC 09) and the net operating surplus (UC 14);
- calculating **consumption of fixed capital** (UC 09) once the stock has been estimated; and
- choosing the **real rate of return** (UC 13) to be applied to the current value of the stock of owner-occupied dwellings (UC 12) to calculate the net operating surplus (UC 14). Box 1 explains what is meant by a real rate of return and why a real rather than a nominal rate is used.

7. Each of these problems is now considered in turn.

Box 1. Why the real rate of return is needed the User Cost Method.

Landlords usually expect that the value of the dwellings they own will rise in line with the overall rate of inflation. This rise in the value of dwellings is a nominal holding gain for landlords and it allows them to set the rent lower than it would otherwise have been.

This means that the user cost method should be written in full as:

User cost = intermediate consumption + other taxes net of subsidies on production + consumption of fixed capital + nominal operating surplus – nominal holding gain.

The nominal operating surplus is calculated as the value of the dwelling multiplied by the nominal rate of interest. The nominal holding gain is calculated as the value of the dwelling multiplied by the overall rate of inflation. This means that the last two terms in the equation above can be calculated in a single step by multiplying the value of the dwelling by the nominal rate of interest minus the rate of inflation i.e. multiplying the value of the dwelling by the real rate of interest.

Thus, provided that a real rate of interest is used, the estimated rent obtained from Table 1 is corrected for holding gains. It is lower than it would have been if there was no inflation and therefore no nominal holding gains to the landlord.

Both nominal interest rates and rates of inflation can be quite volatile from year to year so that if we calculated the real rate of return each year, the estimated rent will also be volatile. In practice, however, rents tend to be rather stable from year to year because they are mostly based on long-term contracts that prevent sharp falls or increases. For this reason is better to use a real interest rate calculated as a long-term average of nominal interest rates minus long-term inflation rates. In Table 1 below it is suggested that a fixed real rate of 2.5% should be used for all years.

2. Stock of owner-occupied dwellings

8. The standard procedure for estimating the stock of a capital asset is the perpetual inventory method (PIM). The PIM requires long time series on gross fixed capital formation (GFCF) and on prices of capital assets as well as assumptions about the average service lives of assets and about how retirements of assets are distributed around this average. Most countries, however, do not have capital stock estimates or the means to derive them by the PIM so it is necessary to consider an alternative method.

9. Table 2 is a worksheet that can be used to estimate the value at current market prices of the stock of each type of owner-occupied dwelling. It is designed for countries that only have information from a recent population census on the number of owner-occupied dwellings classified by a few broad types of dwellings.

10. The first step is to draw up a classification of dwellings which distinguishes between the main types of owner-occupied dwellings in the country. The stocks of owner-occupied dwellings will then be estimated separately for each type. A simple three-way classification – single family dwellings (houses or villas) and two size classes of apartments - was suggested above.

3. Consumption of Fixed Capital

11. Countries that estimate stocks of dwellings using the PIM will already have estimates of consumption of fixed capital. For countries that do not do so, some other method must be used and one alternative method is described here.

12. When the PIM is used, the commonest way of calculating consumption of fixed capital is to assume *straight-line depreciation* – equal fall in value of the asset each year of its service life – and to assume that retirements of assets are distributed around the average service life according to a *bell-shaped mortality function*[1]. This method of calculating consumption of fixed capital can be described as "straight-line depreciation with a bell-shaped mortality function".

13. This method can be approximated by a simpler procedure in which annual consumption of fixed capital is calculated as a constant fraction of the value of the stock of dwellings at current market prices. This method of calculating consumption of fixed capital is described as "geometric depreciation with no mortality function".

[1] The mortality function determines what percentage of assets installed in a given year are retired in each of the years prior to the average, in the year when they reach their average service life, and in each year following the average service life. Several different functions are used for this purpose including Weibull, Winfrey and the log-normal distributions. For details see *Measuring Capital: Measurement of Capital Stocks, Consumption of Fixed Capital and Capital Services,* OECD, Paris, 2001.

14. Although it is only an approximation to *straight-line depreciation with a bell shaped mortality function, geometric depreciation with no mortality function* offers the important advantage that it does not require countries to have a long time-series of gross fixed capital formation in order to calculate the mortality function.

15. For countries that have used the method described in Table 2 to estimate the stock of owner-occupied dwellings, *geometric depreciation with no mortality function* is the only feasible method. Consumption of fixed capital (CFC) is obtained by multiplying the mid-year value of the net capital stock by the *depreciation rate*.

16. The *depreciation rate* used for geometric depreciation is usually written as *D/L*, where *D* is the "declining balance rate" and *L* is the average service life of the assets. *D* is usually assumed to lie between 1 and 3 and it has been found that for dwellings in Europe and North America, a value of 1.6 produces estimates of consumption of fixed capital that are similar to those that are obtained using straight-line depreciation with a bell-shaped mortality function. In the absence of information to the contrary, it is here recommended that *D* be set at 1.6. Thus, for example, if the mid-year net value of the stock of a particular type of owner-occupied dwelling is 4000, and if the average service life for that type of dwelling is 70 years, CFC is obtained as 4000*(1.6/70) = 91.

17. Table 3 is a worksheet for calculating CFC. As was explained above with regard to the stock of owner-occupied dwellings, the calculations are made separately for each type of dwelling for which separate information is available. Note that for calculating consumption of fixed capital, the capital stock must exclude the value of land underlying dwellings.

4. Real rate of return used to estimate net operating surplus

18. Economists assume that people acquire capital assets because the net operating surplus that they expect to earn is at least as high as the interest that they could earn by investing in a financial asset. It has been suggested that interest on a relatively safe, long term bond is the appropriate nominal rate to use. This might be the rate of return on ten-year government bonds, for example. An alternative approach is to assume that home owners aim to recover the interest they have to pay on any housing loans they may have taken out. In this case the rate on housing loans could be used as the nominal rate of return.

19. Whatever rate is used as the nominal rate, it needs to be reduced to a real rate by subtracting the overall rate of inflation. The reason for this is explained in Box 1. The overall rate of inflation could be measured either by the GDP deflator or by the all-items Consumer Price Index.

20. In countries where financial markets are not well developed, neither of these alternatives may be feasible to estimate the nominal rate of return. In these circumstances it is recommended that a standard real rate of 2.5% should be used. This means that the real net operating surplus will be calculated as 0.025 times the current market value of the stock of owner-occupied dwellings.

5. Table 1: Worksheet for estimating expenditure on owner-occupied dwelling services by the user-cost method

Item No.	Description of the item	Value
Intermediate consumption		
UC 01	Expenditure on maintenance and repair of owner-occupied dwellings	
UC 02	Gross insurance premiums paid on owner-occupied dwellings	
UC 03	Insurance claims paid to owners (minus)	
UC 04	Net insurance premiums paid by owners. (UC 02) – (UC 03)	
UC 05	Total intermediate consumption. (UC 01) + (UC 04)	
Other taxes on production		
UC 06	Taxes paid by owners on dwelling services	
UC 07	Taxes paid by owners on the value of owner-occupied dwellings and their associated land	
UC 08	Total taxes paid by owners. (UC 06) + (UC 08)	
Consumption of fixed capital		
UC 09	Consumption of fixed capital on owner-occupied dwellings at current prices (excluding land)	
Net operating surplus		
UC 10	Current market value of the stock of owner occupied dwellings at the beginning of the year (including land)	
UC 11	Current market value of the stock of owner occupied dwellings at the end of the year (including land)	
UC 12	Current market value of the stock of owner occupied dwellings at mid-year (including land) ((UC 10) + (UC 11))/2 or (K6 + K8)	
UC 13	Real rate of return on owner-occupied dwellings (including land) in percent per annum.	
UC 14	Real net operating surplus. (UC13) * (UC12)/ 100	
Expenditure on owner-occupied dwelling services		
UC 15	Expenditure on owner-occupied dwelling services. (UC05) + (UC 08) + (UC09) + (UC14)	

Notes to Table 1

UC 01: Expenditures on maintenance and repair are expenditures on replacing or repairing parts of the dwelling that are broken or dilapidated; repairing the roof, replacing window frames, painting the outside of the building are examples. Maintenance and repair expenditures do not extend the service lives of dwellings beyond their previously expected lifetimes and do not involve enlarging the dwelling. (Expenditures of this kind are treated as gross fixed capital formation in the SNA).

Information about expenditures on maintenance and repairs is usually obtained from a household expenditure survey although some countries estimate them from a supply/use table. In some countries expenditures on maintenance and repair of dwellings are incorrectly shown as a separate component of final consumption expenditure of households. When the user cost method is used, they must be included as part of rents and not as a separate expenditure item. Note also that when countries use the standard procedure, rents will already include these expenditures and showing them as a separate item of household consumption expenditure will lead to double counting.

UC 02: Gross insurance premiums on dwellings should only include insurance on the dwellings themselves and not on their contents; premiums for the latter are a separate item of household final consumption expenditure. When data are available only for the total of both kinds of insurance, the necessary split between the two can be estimated as being proportional to the relative values of the stock of dwellings and the contents.

UC 06: Some countries charge taxes on the imputed value of the dwelling services that individuals derive from owning the dwellings they reside in. Taxes on dwelling services are the value of any such taxes. Any subsidies that owner-occupiers receive to assist them in paying current housing expenses, such as government subsidisation of mortgage payments, should be included here as negative taxes.

UC 07: Taxes on dwellings and land are taxes paid on the value of the dwelling units themselves and the land on which they are located. These taxes are often called "property taxes".

UC 09: Consumption of fixed capital on the stock of owner-occupied dwellings is measured at current prices and is sometimes called *depreciation at current replacement cost*. Estimates of consumption of fixed capital should be obtained from estimates of the stock of owner-occupied dwellings valued in current prices. The stock estimates are preferably obtained by the Perpetual Inventory Method (PIM) which is described in detail in the OECD Manual, *Measuring Capital: Measurement of Capital Stocks, Consumption of Fixed capital and Capital Services* (Paris, 2001). However, many countries that do not have sufficient data to apply the PIM and Table 2 below is a worksheet that gives a method for deriving an approximate estimate of the stock of owner-occupied dwellings that can be used by these countries.

UC 10, UC 11: The value of the stock of owner-occupied dwellings represents the value of the net (or "depreciated") stock of these dwellings valued at current market prices. Table 1 assumes that the estimates of the stock of owner-occupied dwellings refer to the end of each year and so successive end-year estimates must be averaged to obtain mid-year estimates. The procedure shown in Table 2 produces an estimate of the stock for the middle of the year so that this averaging procedure is not required.

Note that the stock of dwellings used here must include the estimated value of the land underlying the buildings. Table 2 below is a worksheet to calculate both the value of the dwellings themselves and the land on which they are situated.

UC 13: The choice of the real rate of return used to calculate the net operating surplus was discussed above, where it was suggested that the real rate of return should be set at 2.5% for all countries.

UC 14: The net operating surplus of owner-occupied dwellings is calculated by applying the rreal rate of return to the mid-year, current value of the stock of dwellings.

6. Table 2: Worksheet for estimating the stock of dwellings at current market prices **for countries that cannot apply the perpetual inventory method**

Item No.	Description of the item	Value
K 1	Number of owner-occupied dwelling units at the time of the most recent census	
K 2	Growth rate of owner-occupied dwellings between the last census and the middle of the current year	
K 3	Estimated number of owner-occupied dwellings in the middle of the current year. ((K1)*(K 2))	
K 4	Average price of newly-constructed dwellings, excluding land, in the current year	
K 5	Average net value (i.e. after deducting accumulated depreciation) of a dwelling, excluding land, in the current year. ((K 4)*(1-A/L)) See explanation below.	
K 6	Value at current market prices of the stock of owner-occupied dwellings, excluding land. ((K 3)*(K 5))	
K 7	Ratio of the value of land to the average net value of dwellings (excluding land), in the current year	
K 8	Value at current market prices of land underlying dwellings((K6) * (K7))	

Notes to Table 2

K 1: Population censuses invariably collect some information on dwellings – at a minimum the number of owner-occupied dwellings with some indications of their physical characteristics. The more recent the Census, the better will be the estimate of the stock of dwellings for the current year. Many countries also carry out some kind of *Living Standards* survey and these usually collect detailed statistics on the type of structure and the facilities contained in dwellings.

K 2: The growth rate in the number of owner-occupied dwellings since the last census could be derived from a number of sources. These include gross fixed capital formation (GFCF) statistics, building permits issued, and administrative data on completion and destruction of buildings. In the absence of any information of this kind, it is reasonable to assume that the stock of owner-occupied dwellings grows at the same rate as the population.

K 4: Information on prices can be obtained from various sources including real estate agents, property developers, and advertisements in journals and magazines that specialise in sales of dwellings. If these sources are used it will be necessary to adjust the prices downwards by subtracting the value of the land underlying the buildings, since the prices must refer only to the physical structure An alternative is to obtain information on the costs of new buildings from construction companies or from "public works" departments that in some countries build dwellings for government employees. If a cost method is used, the cost figure will need to be adjusted to market prices by adding the estimated profit margins. The advantage, however, is that the cost estimates will refer only to the physical structure and will exclude the cost of the underlying land.

K 5: Since K 4 refers to the price of a newly constructed dwelling, this price needs to be adjusted downwards so that it approximates the price of a dwelling of average age. To do this it is necessary to make an assumption about how the prices of dwellings decline as they grow older. The simplest assumption, and the one recommended here, is to assume that the prices of dwellings decline by the same amount each year reaching a zero price in the last year of their life. With this assumption, the price of a dwelling of average age $(P_{average})$ will equal the new price (P_{new}) times the ratio of the remaining years that the dwelling of average age (A) will continue to exist to the expected service life $(L))$, that is.

[1]

Intuitively, one would expect that if the stock of dwellings is constant because the number of new dwellings constructed each year is the same as the number of old dwellings demolished each year, the average age will be half of the average service life – i.e. $(P_{average})$ will be half of (P_{new}). In the usual case, however, stocks of dwellings are not constant. When stocks are growing or falling, the average age of the dwellings in a stock (A) can be written as:

$$A = \frac{\sum_{i}^{L} i(1+r)^{L-i}}{\sum_{i}^{L} (1+r)^{L-i}} \S \qquad [2]$$

where:

L is the average service life of dwellings,

r is the annual rate of growth in the stock of dwellings, and

i is the age of dwellings constructed in a given year and takes the values of *1,2,3,.....,L*

Note that when a stock of dwellings is stable (that is when $r = 0$), the numerator is the sum of the first *L* digits, that is $\frac{L(L+1)}{2}$ § and the denominator is *L* so that [2] reduces to *(L+1)/2.* This is the mid-point of the digits from *1* to *L* and confirms the intuitive result mentioned above.

If the stock is growing, the average age will be less than the mid-point because the number of younger dwellings will exceed the number of older dwellings. (And *vice versa* if the stock is declining.) When the percentage of new dwellings is growing, the average price will also rise and vice versa if the percentage of older dwellings is rising.

If the stock of dwellings is thought to be growing, the value of *A* should be calculated with *r* set at the rate used to calculate K 2, and *L* set at the estimated average service life of dwellings. The value of the stock of dwellings (K 6) is then obtained as: (Number of dwellings in the stock (K 3)) *times* (Price of a newly constructed dwelling (K 4)) *times* (1- *A/L*).

Table 2A gives the values of the adjustment factor, 1-(A/L), for values of L commonly assumed for dwellings and rates of annual growth in the housing stock from -1% to + 3%.

Table 2A: Values of (1-(A/L))

Average service life of dwellings	Annual growth rate of the stock of dwellings				
	-1%	zero	1%	2%	3%
60 years	0.442	0.492	0.541	0.588	0.632
70 years	0.435	0.493	0.550	0.605	0.654
80 years	0.427	0.494	0.559	0.621	0.675

K7: In order to calculate consumption of fixed capital, the estimated value of the stock of dwellings must exclude the value of the land on which the dwellings are situated, because no consumption of fixed capital is calculated in respect of land. However, for calculating the net operating surplus it is necessary to include the value of the land together with the dwellings because the owner's total investment covers both. For this reason, two estimates of the stock of dwellings are required – one with, and one without, the value of land.

Estimates of the average ratio of the value of land to the average value of dwellings (excluding land) can be obtained from sources such as realtors (estate agents) or official records of land values. Some countries may be able to borrow ratios estimated from neighbouring countries which have similar population densities and housing structures.

In the United States, land values represent about one-third of the value of the building itself. Ratios are higher in Western Europe where the amount of land available for constructing dwellings is more limited but they are likely to be lower than one-third in less densely populated countries. In some countries, land cannot be owned and plots are granted for families to construct their dwellings. In such cases, the land value is zero since it cannot be traded and so has no commercial value to the owner of the dwelling.

7. Table 3: Worksheet for estimating consumption of fixed capital of owner-occupied dwellings at current prices

Item No.	Description of the item	Value
CFC 1	Mid-year current market value of the stock of owner-occupied dwellings, excluding land.	
CFC 2	Estimated service life of owner-occupied dwellings (in years)	
CFC 3	Depreciation rate for owner-occupied dwellings. 1.6/(CFC 2)	
CFC 4	Consumption of fixed capital formation of owner-occupied dwellings in current market prices. (CFC 1) * (CFC 3)	

Notes to Table 3

CFC 1: The current market value of the stock of owner-occupied dwellings is taken from K 6 in Table 2 above. Note that K6 is the value of the dwelling stock excluding the value of the underlying land.

CFC 2: The average service life is the number of years that dwellings of this type are expected to remain in use from the year of construction until the dwelling is demolished. The estimate of the

average service life is important because it effectively determines the depreciation rate. Estimates of service lives for dwellings vary widely. European countries have generally used service lives of between 50 and 90 years. In the absence of any reliable information, an average service life of 70 years can be used.

Population Censuses usually collect information on the age of dwellings and this can be used to estimate life expectancies.

CFC 3: A "declining balance" rate of 1.6 is to be used, so that the depreciation rate is 1.6/ (CFC 2). As noted above, a value of 1.6 has been found to provide a plausible pattern of CFC for dwellings in Europe and North America. With a declining balance rate of 1.6 and an average service life of 70 years, the depreciation rate will be 1.6 / 70 = 0.023 so that CFC will be calculated as 0.023 times the current market value of the stock of owner-occupied dwellings.