

Worksheet for estimating the current market price of the stock of dwellings in 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. $((K-1)*(K 2))$	
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($(K6) * ((K7)$	

Explanatory notes

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 approach 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.

$$P_{average} = P_{new} \left(\frac{L-A}{L} \right) \text{ or } P_{new} \left(1 - \left(\frac{A}{L} \right) \right) \quad [1]$$

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:

$$A = \frac{\sum_i^L i(1+r)^{L-i}}{\sum_i^L (1+r)^{L-i}} \quad [2]$$

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 $1, 2, 3, \dots, L$

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 there is 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.