Distr.
GENERAL

CES/AC.49/2003/8
25 September 2003

Original: ENGLISH

STATISTICAL COMMISSION and UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE (UNECE)

INTERNATIONAL LABOUR ORGANISATION (ILO)

CONFERENCE OF EUROPEAN STATISTICIANS

Joint UNECE/ILO Meeting on Consumer Price Indices
(Geneva, 4-5 December 2003)

SWEDISH RE-CONSIDERATIONS OF USER-COST APPROACHES TO OWNER OCCUPIED HOUSING

Invited paper submitted by Statistics Sweden, Stockholm [*]

I. INTRODUCTION

1. This paper discusses how a practical index for the cost of owner occupied housing can be interpreted and understood in a theoretical framework of user cost.

2. The Swedish Consumer Price Index (CPI) is used mainly as a compensation index, with a true Cost-of-Living Index (coli) as an ideal target. It is explicitly stipulated that the Swedish CPI is to pertain to a constant standard of consumption. Accordingly, for owner occupied housing a user-cost approach is taken (cf. Ribe, 2001; Statistics Sweden, 2001).

---

[*] Prepared by M. Ribe, Statistics Sweden, Stockholm. The author is grateful to and has benefited substantially from discussions and comments of the CPI Board and colleagues at Statistics Sweden, especially Mats Haglund and Gun Hult. The views expressed in this paper are those of the author solely.

GE.03-

3. A priori it is far from straightforward how to appropriately compute the consumers' cost of owner occupied housing. A house constitutes a durable asset which is used by the consumer for a very long time. Then there appears a problem how to appropriately distribute the cost over time, so that the current cost at each time can be derived (cf. Goodhart, 1999). The methods presently used for the housing component in the Swedish CPI were proposed by a Government Commission nearly fifty years ago (Bostadsindexutredningen, 1955).

4. More recently a new Government Commission (SOU 1999:124) reviewed the methods of the entire Swedish CPI. That Commission devoted much of its work to the treatment of owner occupied housing in the CPI, and it took a fresh approach to the issue of computing the user cost. A new solution was proposed, as far as possible adhering to a consistent theoretical framework, although it would have to rely on simplifying assumptions in the practical application.

5. That proposal was however severely criticised and will not be implemented. Now the Swedish Government (Prop. 2001/02:1) has stated that it is urgent to improve the computations and left to the Swedish CPI Board to consider how this could be done.

6. The point of the present paper is to try to show how the present Swedish method for owner occupied housing can be interpreted and understood in the general theoretical framework devised by the recent CPI Commission. This view may on the one hand explore possible motivations for the present method, and on the other hand highlight some of its deficiencies. The idea was suggested by Mats Haglund of Statistics Sweden.

7. The present treatment of owner occupied housing in the Swedish CPI essentially follows a user cost approach(cf. Ribe, 2001; Statistics Sweden, 2001; CSO, 1994). The consumers' cost of owner occupied housing is in the present Swedish CPI reflected by several sub-components:

- Depreciation
- Interest of mortgages and capital
- Real estate tax
- Leasehold site rent
- Repairs
- Insurance
- Water, sewerage, chimney sweeping
- Oil, electricity.

8. For each of these sub-components, a monthly sub-index and an annual weight is computed, so that the sub-indices can be weighted into the CPI.

9. The first two of the mentioned components, i.e., depreciation and interest, express the capital cost for the dwelling. They constitute the essentially problematic part of owner occupied housing, as they represent those costs whose appropriate allocation in time is far from evident. The other components are essentially operating costs, which are not problematic in this sense.

10. Depreciation stands for the consumer cost due to the decrease in the value of houses due to wear and obsolescence. The depreciation sub-index is computed as a price index for repairs, covering material and labour for repairs.

11. The interest component follows a calculated cost which may be expressed as follows (KI, 2001):

$$\left(K_s^t + K_N^t\right) \cdot \sum_i w_i^{RS} \overline{R}_i^t \ .$$

Here K_s^t is the capital invested, at purchase price, in existing houses and K_N^t the price of newly built houses, at time t. Further $\overline{R}_i^t$ is the interest rate of mortgages of type i at time t, computed as a moving average over a period back in time during which the interest rates of individual such mortgages may have been fixed. Changes in $K_s^t + K_N^t$ and $\overline{R}_i^t$ are shown in the index, while the weights w_i^{RS} for types of mortgages are fixed throughout the annual link.

12. It may be noted that the interest considered is based on the total capital value of the house, including both borrowed and paid-up capital. The interest on borrowed capital is expenditure, while the interest on paid-up capital is "opportunity cost", corresponding to a savings interest forgone. The sub-index for interest is computed as the product of two indices: an interest rate index and a capital stock index.

13. Capital gains are not shown as price changes in the CPI. The possibility to deduct interest from incomes in taxation is not accounted for.

II. A GENERAL EXPRESSION FOR THE CAPITAL COST

14. As is described in a paper by M. Haglund (2003), the recent CPI Commission (SOU 1999:124) formulates a general theoretical framework of user cost for owner occupied housing. The Commission recognises the annual capital cost of an owner occupied dwelling at time t as

$$(1) \quad C_t = P_t \left(r_t + d_t - \pi_t\right),$$

where P_t is the current market value of the dwelling, r_t is the current rate of interest, d_t is the nominal rate of depreciation, and π_t is the rate of capital gain due to dwelling inflation. Here and in the sequel we may think of P_t and C_t as averages per dwelling, over the entire population of owner occupied dwellings.

15. Here the nominal rate of depreciation d_t is the potential rate of deterioration of the physical capital, due to wear and increasing obsolescence, without regard to changes in the market value of the dwelling. And the rate of gain due to dwelling inflation π_t is the rate of potential capital gain due to changes in the market value, without regard to deterioration of

the physical capital. (In principle that gain may of course be negative, i.e. a loss, if dwelling prices are falling.)

16. The CPI Commission further specifically motivates that π_t should here be taken as the *expected* rate of future dwelling inflation. That future expectation is to be seen in a long-term perspective, corresponding to the expected future duration of a home ownership.

17. In addition to the capital cost C_t there are also operating costs for heating, maintenance etc. They are unproblematic and are left aside here.

III. MOTIVATION

18. The expression (1) for annual capital cost has an apparent motivation in the context of a cost-of-living index. That is, cost raises are incurred by home-owners because of raises in the interest cost $P_t\ r_t$ and raises in the cost of nominal depreciation $P_t\ d_t$. But from the cost raises it would then be fair to deduct raises in the capital gains $P_t\ \pi_t$.

IV. COMMENTS

19. The expression (1) may be seen as a kind of ideal expression for the annual capital cost of owner occupied housing. It defines a target for the estimation of the cost. However a direct measurement of (1) or its changes would not really be feasible, whence one or another kind of approximation has to be used in practice.

20. The sum of the capital cost expressed as (1) plus operating costs may be conceived as the total user cost. That cost should in principle correspond to a fair rent for the dwelling, at least in the long run. In practice however estimates of the user cost often show stronger short-term volatility than actual rents.

V. PROPOSAL OF THE RECENT CPI COMMISSION

21. The recent CPI Commission reviews various alternative approaches to owner occupied housing in a CPI. The Commission concludes that a user cost approach is still the most adequate one for the Swedish CPI, given the main use for compensation and the coli target. The rental equivalence approach could potentially have been an alternative but has been considered not practicable in Sweden due to the structure and conditions of the Swedish housing market.

22. The Commission suggests that in equation (1) the term $r_t - \pi_t$, called the "real interest" of housing, should be assumed to be constant during each annual index link. This may be motivated by an assumption that house buyers should be likely to take a long-term view on their costs. Likewise *d* would be considered constant, and consequently the index for

capital cost is proposed to follow P_t. Namely, by the mentioned assumptions, the index link for the change of the capital cost from time t to $t+1$ turns out to be

$$\frac{C_{t+1}}{C_t} = \frac{P_{t+1}\left(r_t + d_t - \pi_t\right)}{P_t\left(r_t + d_t - \pi_t\right)} = \frac{P_{t+1}}{P_t} \; .$$

23. Thus a user cost approach is taken both in the present and in the proposed treatment, but in the latter more consistently so. It may be noted that changes in market interest rates are shown in the present index but not in the proposed one. The view of the Commission is apparently that short-term changes in interest rates are of concern not necessarily to housing or consumption as such but rather to the liquidity of the households, which is something else.

24. As the Commission's proposal for owner occupied housing turned out to be highly controversial, the Government later called on the Swedish Institute for Economic Research for a supplementary analysis (KI, 2001). The report of the Institute gives a modified form of the proposal, with and index which does show interest changes but in a smoothed way. The discussion is continued in the Swedish CPI Board (cf. Assarsson et al., 2002).

VI. THE PRESENT METHOD REFORMULATED

25. It will now be shown how the method presently used for owner occupied housing in the Swedish CPI can be described in the general framework of equation (1). By the present method, the annual capital cost at time t, on average per dwelling, is in effect computed as

$$(2) \quad C'_t = r_t \sum_{s=0}^{\omega} w_{t;s} P_{t-s} + P_t d_t \,, \qquad \text{with} \quad \sum_{s=0}^{\omega} w_{t;s} = 1 \,,$$

where $w_{t;s}$ is the proportion of those dwellings that by time t had most recently been sold at time $t-s$, among all dwellings existing at time t. (And ω is a cut-off limit, a practical maximum duration of ownership.)

26. Now (2) can be readily re-written in this form:

$$3) \qquad C'_t = P_t\left(r_t - \theta_t r_t + d_t\right), \quad \text{where} \quad \theta_t = \sum_{s=0}^{\omega} w_{t;s} \frac{P_t - P_{t-s}}{P_t} \; .$$

27. This expression for C'_t has an apparent formal similarity to the expression (1), with the term $-\theta_t r_t$ in the place of the deducted expected house inflation rate, $-\pi_t$. It will here be argued that this formal similarity could be given meaningful interpretations.

28. Technically, in the index computation the interest cost and the depreciation have one sub-index each. The sub-index for the interest cost shows the change in the first main term of equation (2). The link from time t to $t+1$ of that sub-index is in effect computed as

$$\frac{r_{t+1}}{r_t} \cdot \frac{(1-a_{t+1})\sum_{s=0}^{\omega} w_{t;s} P_{t+1-s} + a_{t+1} P_{t+1;\text{new}}}{(1-a_{t+1})\sum_{s=0}^{\omega} w_{t;s} P_{t-s} + a_{t+1} P_{t+1;\text{new}} / (\text{BPI})_{t+1}} ,$$

where a_{t+1} denotes the proportion of owner occupied dwellings existing in $t+1$ that were newly built since t, where $P_{t+1;\text{new}}$ denotes the average price of those newly built dwellings, and $(\text{BPI})_{t+1}$ denotes the link from t to $t+1$ in a building price index.

29. The treatment of newly built dwellings in the index formula just stated will for simplicity be left aside from the following discussion.

VII. INTERPRETATIONS

Ex post view

30. First, it should be noted that $P_t\ \theta_t$ is the amount that the home-owners had gained by house-price inflation from the time they bought their homes until time t. So θ_t is the proportion of accumulated past inflation gains in the homeowners' capital stock. For the latter statement to hold, it is assumed that the potential physical deterioration at rate d_t is effectively compensated for by e.g. renovations in due time, so that the capital stock is unaffected by physical deterioration.

31. Now the expression (3) can be given a similar motivation as that just given for (1). Namely, it seems fair that from cost raises due to raises in $P_t\ r_t$ and in $P_t\ d_t$, one should deduct raises in the yield $P_t\ \theta_t\ r_t$ on accumulated past inflation gains.

32. It may be noted that here the deduction for capital gains is obtained as the annual yield on accumulated capital gains, not as the current annual capital gain itself.

Ex ante view

33. Alternatively one could take an ex ante view and deduct the yield on expected future capital gains, rather than on past ones. Consider the following expression:

$$(4) \qquad C''_t = P_t\left(r_t - \eta_t r_t + d_t\right), \quad \text{where} \quad \eta_t = \sum_{s=0}^{\omega} w''_{t;s} \frac{P_{t+s} - P_t}{P_{t+s}} ,$$

and where $w''_{t;s}$ is the proportion of dwellings that will next become sold at time $t+s$, among all dwellings existing at time t. (For simplicity all dwellings are assumed to become sold some at time between $t+1$ and $t+\omega$).

34. The expression (4) can be seen as a further conception of the capital cost of owner occupied housing. It can be given a motivation similar to that of (3), but in an ex ante rather than ex post perspective. First notice that η_t is that proportion of the capital that corresponds to future house inflation gains of the owners at time t. In the ex ante perspective, it is then reasonable that from compensation for raises in $P_t\ r_t$ and in $P_t\ d_t$, one should deduct raises in the yield $P_t\ \eta_t\ r_t$ on the part of the capital that corresponds to future inflation gains.

35. The expression (4) is of course very unpractical, since it depends on future prices P_{t+s} which are not known at time t. Nevertheless the capital commitment of owning a home involves an anticipation of the future. "Future capital gains" may then be read as future capital gains that may be expected.

36. In the lack of knowledge about the future, it may be sensible to assume that consumers may tacitly have a hypothetical long-term stationary perspective in mind in their anticipations of the future. In such a perspective, homeowners at any given time may on average be expected to keep their homes for just as many years more as they have owned them. Under the hypothetical stationary conditions there is some symmetry between past and future.

37. In that view at time t, it may even be that the term $-\theta_t r_t$ in (3) may be taken as a fair anticipation of the term $-\eta_t r_t$ in (4). This means that the expression (3) can alternatively be given the ex ante motivation of the expression (4). So this again gives a way of motivating the present method.

38. Another way to put it is to directly consider the term $-\theta_t r_t$ in (3) as an estimate of the term $-\pi_t$ for the expected house inflation rate in (1). It may be noted that in Sweden housing is to a large extent financed by mortgages at interest rates that may often be fixed for a few or more years. Therefore $\theta_t r_t$ may to some extent tend to follow the expected future inflation.

VIII. COMPARISON OF OUTCOME

39. It may be instructive to consider how the outcome of the expression (3) for the present method may compare to the outcome of the ideal cost expression (1).

40. For an assumed simplified scenario it is possible to simulate how the outcomes of (1) and (3) would compare. Assume that the rate of house inflation π_t is equal to a given constant throughout time, and that all houses have now been owned during the same given number of years by the current owner.

41. For that simple scenario, the following table shows what the interest rate r_t would have to be in order to make the values of expressions (1) and (3) equal to each other. The

corresponding interest rate r_t is here shown for different values of the rate of house inflation and of the duration of past ownership.

Duration of past ownership	Rate of house inflation Per cent						
Years	2	4	6	8	10	12	14
5	21.2	22.5	23.7	25.0	26.4	27.7	29.1
10	11.1	12.3	13.6	14.9	16.3	17.7	19.2
15	7.8	9.0	10.3	11.7	13.1	14.7	16.3
20	6.1	7.4	8.7	10.2	11.7	13.4	15.1
25	5.1	6.4	7.8	9.4	11.0	12.7	14.5
30	4.5	5.8	7.3	8.9	10.6	12.4	14.3
35	4.0	5.4	6.9	8.6	10.4	12.2	14.1
40	3.7	5.1	6.6	8.4	10.2	12.1	14.1
45	3.4	4.8	6.5	8.3	10.1	12.1	14.0
50	3.2	4.7	6.3	8.2	10.1	12.0	14.0

42. It is seen in the table that for past ownership durations of roughly about 15-20 years, the corresponding interest rates assume rather realistic values. This indicates that if homes have now been owned by their current owners for about 15-20 years on average, expression (3) of the present method should not too badly approximate expression (1) of the ideal.

IX. A COMMENT ON THE PRESENT METHOD

43. The last-mentioned observation indicates that the present method may give reasonable results if past ownership durations are on average roughly about 15-20 years, a not too unrealistic figure. So in that way the present method is here supported from yet another angle.

44. At the same time a fundamental weakness of the present method may be noticed. Both from the table and directly from expression (3) it is verified that the outcome of the present method strongly depends on the duration of past ownership. That is, the estimated cost may depend rather heavily on how frequently the homeowners sell their homes and move. That dependence indicates a theoretical deficiency of the present method as a measure of the capital cost, which should truly not depend on how often people move. But as noticed, it anyhow seems that the results may turn out about right for a roughly suitable mean duration of ownership.

X. A POSSIBLE REMEDY

45. So the present index for owner occupied housing may depend on how the rate of transfer of homes to new owners may fluctuate between years. Such fluctuations should however hardly be seen as some kind of fluctuations in the rate of price change, and they should not show up as such in a price index.

46. A possible remedy of this apparent deficiency might be to compute the weights $w_{t;s}$ used in equation (2) in another way, so that they become less sensitively dependent on the transfer frequencies in particular years. One way of achieving this would be to replace the weights $w_{t;s}$ by weights computed so as to be smoothed over time, as

$$w_{t;s}^{\mathrm{A}} = \frac{\sum_{i=0}^{L} m_{t-i;s-i}}{\sum_{s=0}^{\omega} \sum_{i=0}^{L} m_{t-i;s-i}} ,$$

where $m_{t;s}$ stands for the number of dwellings that exist by time t and have then been sold most recently by time s. Here L denotes a suitably chosen period length over which the smoothing is to be made. The original weights in (2) correspond to taking $L = 0$ here.

47. Another way to make the weights insensitive to irrelevant fluctuations would be to use some kind of chosen standard weights, in the place of the $w_{t;s}$ in equation (2). One would then use an assumed or chosen, rather than observed, distribution of ownership durations. Such standard weights may e.g. be chosen to be equal over a chosen interval, computed as

$$w_{t;s}^{\mathrm{B}} = \begin{cases} 1/(M-K+1) & \text{for} \quad t-M \le s \le t-K \\ 0 & \text{otherwise}. \end{cases}$$

Here K and M stand for chosen minimum and maximum standard durations of ownership of a dwelling.

References

B. Assarsson, A. Klevmarken, R. Pettersson (2002), Measuring the price on housing services within the Swedish CPI, Statistics Sweden, Memorandum.

Bostadsindexutredningen (1955), Bostadsposten i konsumentprisindex, Report, Stockholm (in Swedish).

CSO (1994), Treatment of owner occupiers' housing costs in the retail price index, London: Central Statistical Office, Retail Price Index Advisory Committee.

Ch. Goodhart (1999), Time, inflation and asset prices, Proc. Measurement of Inflation Conference, in Cardiff, pp. 242-257.

M. Haglund (2003), A summary of the CPI Commission (SOU 1999:124) proposal on owner occupied housing, Stockholm: Statistics Sweden, Memorandum.

KI (2002), Egnahemsposten i konsumentprisindex – en granskning av KPI-utredningens förslag, Specialstudie nr 2, Stockholm: Konjunkturinstitutet [Institute for Economic Research], Report (in Swedish; loose English summary available).

Prop. 2001/02:1, Nya riktlinjer för konsumentprisindex (Bilaga 4), Goverment Proposition, annex, Stockholm (in Swedish).

M. Ribe (2001), Cost-of-living index (coli) as target for the Swedish CPI, UN/ECE Meeting on Consumer Price Indices, in Geneva.

SOU 1999:124, Konsumentprisindex, Betänkande från Utredningen om översyn konsumentprisindex, Statens Offentliga Utredningar (in Swedish; with English summary and appendices).

SCB (2001), The Swedish Consumer Price Index, A Handbook of Methods, by J. Dalén, Stockholm: Statistics Sweden.
