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OWNER OCCUPIED HOUSING: MARKET PRICE APPROACH TO USER COST*

Invited paper submitted by Statistics Iceland**

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Summary

One of the most important aspects of the Owner Occupied Housing question is the use of market price information in the calculation of consumer's use of own housing. This is independent of which of the three methods for deciding upon weights is used for this purpose. This paper describes the simple user cost method used for the calculation of owner occupied housing in Iceland. This method uses the long time real interest rate approximately fixed and depreciation in the measurement of the expenditure shares. The price change of properties is measured by a constant quality price index for all properties sold.

Key words
Consumer price index, cost of living index, household expenditure surveys, owner occupied housing, user cost.

JEL Classification
C43, C81, D11, E31.

Introduction

Housing in the Consumer price index

1. To buy own house is usually the biggest investment in individuals' lifetime. House is a place to live in and at the same time an investment and to price measure the use has been a problem in CPI calculation. The use of own house is calculated, as imputed rent in the consumer price index, but the buying of the house is an investment and therefore not taken into account in the calculation. In the years 2000-2002 about 82 per cent of Icelanders lived in own housing according to the Households Expenditures Survey.

Methods in the calculation of owner occupied housing

2. Two main methods exist for calculating owner occupied housing. One is based on the flow of services measurement and the other one on capitalizing the housing as a net cost. The flow of services approach covers rental equivalence and user cost.
3. Where there are at hand strong rental markets rental equivalence is the most convenient method. The measurement results for rented housing that are comparable to the owner occupiers are used in the calculation. The rental equivalence is therefore based on comparing rent for similar apartments or houses. The primary assumption is that the rent market has an adequate coverage so market rent can be measured for comparable types and sizes of properties and that the results can be used as equivalence to changes in rent for own housing.

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4. The precondition for the use of this method is that the rent market prices or the rent markets are not controlled and rent not subventioned by governments. This method cannot be used in Iceland because of the thin and underdeveloped rental market, where the composition of the owner occupied housing stock and the rental market is very dissimilar. The method is used in Denmark, Germany, Netherlands, Norway, USA, Switzerland and Japan[1].
In cases where there are small rental markets the simple user cost method is preferable. This method is used in the Icelandic CPI. The service of living in own house is measured as the cost. Annuity (rent) is calculated of the market price of the house and the imputed rent measured according to a certain real interest rate and depreciation. The real interest rate is based on the required rate of return (opportunity cost) on the capital bound in the property, independent on whether it is own capital or a loan. The wear of the property is taken into account; by depreciation in accordance with the expected lifetime of the house. In addition minor repairs are taken into consideration and public tariffs connected to the house such as sewerage, garbage and water.
5. It is the use of the house that is accounted for and capital gain equal to the long term real interest rate. The price change is measured by all properties sold in the country. The consumer price index is a short time measurement tool for estimating price change and assumed that no substitution between living in own housing and renting is possible which is very clear in small rental markets were places to rent are hard to come by.
6. Some countries calculate their housing as a user cost but none of them except Iceland uses real interest rates in that calculation. In some cases mortgage profiles are used in a similar way as is in the payment approach. Mortgage profiles only reflect the life time of the mortgage not the durable and it is often very difficult to separate financing used for housing from other financing. Some of these countries use market prices of houses to evaluate depreciation or the mortgage rent. The countries that use this method are Finland, Sweden, Iceland, Ireland United Kingdom and Canada.
7. The second method is to capitalize the house and measure the housing net. The net housing cost is the value of new houses in excess of depreciation of the stock. The housing is taken as any other expenditure in the index when it is bought or built and treated equally as other durable goods in the CPI. This method is for example used for cars, electrical equipment; they are capitalized and taken into consideration in the CPI at the point of purchase.
8. The price change is only measured for new buildings. Included are houses that are built by the consumers and also properties that are bought directly from a construction company or real estate agents. In addition it's necessary to take into account properties that are bought directly from other sectors in the economy. This index has many similar properties as a producer price index for buildings2.
9. Each year there is a different amount of new houses built and that is much dependant on the economic cycle in each country. The net change in housing can therefore be negative in some years and the net weight for housing too if calculated in this way. The weights must therefore be calculated as averages over some years. The weights will be more volatile and cyclical when the net method is used than is the case for rental equivalence or user cost and the net weight will usually be lower[3]. The method was used by the Bureau of Labour Statistics for the USA prior to January 1983 and is now used in Australia and New Zeeland.
10. Some countries have used the payment method for measuring owner occupied housing. The payments when buying the house are counted for, on loans, interests, reparations and renovations. This method is similar to the method used in the Icelandic CPI in the years 1988 to 1992. This is a form of a cash flow method but following up on how goods are paid

for is not done in CPI calculation. In it the nominal interest rate is used, that partly reflect the inflation, and the fact that the use of the durable is spread over a longer period of time is ignored (the opportunity cost)[4].

11. Some countries consider housing mainly as investment and argue that it should therefore, similar to other investment, not be taken into the CPI. Often price information about the property market is not available in these countries, making the above-mentioned methods difficult to apply. The owner occupied housing is left out of the CPI[5] in Greece, Italy, Spain, Portugal, Belgium, Austria, Luxembourg and France.

Market price approach to housing

12. Housing weight for the three methods differs. In the case of the rental equivalence some countries use information from the National Accounts. Other use information gathered by asking the owner what rent he would pay if he rented his house. For simple user cost the annuity (rent) of the average property value, with long-term real interest rate and depreciation is used for deciding expenditure shares. Capitalizing the new house makes weights for net aqusition. These weights are in all cases nearly fixed over the lifetime of the index.

13. Price measurement is in all cases done by measuring the change in market prices. In the case of rental equivalence it is the market price of rents for comparable housing. In the case of simple user cost the prices are measured by the price change in the market prices of all properties sold independent of whether they are old or new. Under the net method it would be the market price change of new houses that are used for price measurement.

14. The price measurement is therefore similar based on market prices independent of the method used for aggregation of weights used in each method. It could furthermore be the case that prices for old and new houses moved in similar fashion. Then the house price inflation would be the same but due to the difference in weights the influence on the total index would be different. According to this the influence on the index of changes in market prices are very important element and the development of good and reliable price indices for market prices important in the light of this.

Owner occupied housing in the Icelandic consumer price index

Simple user cost

15. The method to calculate housing as simple user cost[6] and price update it with price changes of all properties sold was adopted in November 1992[7]. In the beginning the prices were only measured in the capital area but since April year 2000 they cover the whole country[8]. The base for the calculation is the real estate value of the house (as estimated by the Land Registry) and that information is collected in the Household Expenditure Survey.

16. The user cost is calculated with real interest rate that is now 4 per cent and depreciation rate of 1.25 per cent of the house's real estate value. The price measurement is monthly updated by price index for properties sold. Owner occupied housing covers imputed rent, minor repairs and other cost, such as tariffs for sewerage, garbage and water. The weight for housing cost comes from the Household Expenditure Survey as an imputed figure and the monthly weight is calculated as a user cost of the real estate value.

17. The value is calculated as an annuity that includes both the real interest rate and deprecation calculated from the same property base value.

(1) $$P_H = A * \left[\frac{(1+r)^N - 1}{r * (1+r)^N} \right]$$

where PH is the present value of an annuity of the property price, r, the real interest rate, N the life time (in years) and A is the annuity[9].
The user cost covers both structure and land but is here calculated in one figure.

Real estate value of the property

18. The Land Registry of Iceland calculates a real estate value for every property in the country. In the middle of the year 2001 the Land Registry revised the estimation method by using hedonic regression after extensive research. The base for the analysis was the capital area and the estimates for other parts of the country were calculated with regional coefficients[10].

19. The value of all properties in the country are measured in a harmonised way based on information about sold properties. This is done with reference to law as "the law about the measurement of the real estate value says that it should be based on the market price of the property. According the first paragraph. of the law no. 6/2001 the estimated value shall be the discounted market value as estimated last November"[11]. This basic information is the same as used in the price measurement of housing in the CPI and the real estate value is therefore well suited as a base for the user cost calculation.

Real interest rate

20. The connection between nominal and real interest rate is often expressed with the Fisher (1896) identity[12]. There the nominal interest rate is designed rt, the real interest rate as r* and the general inflation rate as pt. The expression then is:

(2) $$rt = (1 + r^*) * (1 + pt) - 1$$

It also means that the real interest rate, when it is not known is the difference between the change in the nominal interest rate and consumer inflation. On the other hand the real interest rate can be set and the inflation measured by adding to a real rate the change in the CPI as is the case in Iceland. The real interest rate is therefore set ex ante[13].

21. The long term real interest rate used in the user cost calculation shows the return on investment over the lifetime of the durable. In this way the real rate measures the capital gain[14]. The average long term real interest rate combines two main types of financing, both the part that buyer has to finance by loan and also the required return of his own equity. So when consumers buy properties they finance it partly with own equity and the rest with loans. In this user cost model the division between this two forms are based on the financing as it appears in the sale contracts that are the base for the price measurement. In the calculation the own equity rate is fixed but the mortgage real interest part is variable and the opportunity cost over the lifetime of the durable is measured in this way.

22. This division of financing is used to calculate the real interest rate used in the model. The part of the price of the house that is paid by money, according to the sale contracts, is approximated as the buyers own equity[15] and is covering more than half of the price of the house. The real interest rate is of a long term character such as the investments of pensions funds. The rate for own equity was therefore set as the estimated rate of return for the pension

funds in the country and kept fixed over the durables lifetime. When this calculation method was adopted the long time real interest rate of the pension funds was estimated as 3 per cent and it has been kept unchanged since then[16].

23. Other long-term real interest rates used are variable over time. These other forms of payment are usually new mortgages or mortgages overtaken. The real interest rates used lie in the range of 5.0 to nearly 9.0 per cent. These mortgages are mainly from the Housing Financing Fund or loans overtaken by the buyer from the old State Housing Board. Other financing is mainly originating from the pensions funds or the banks. The largest share of these loans have fixed real interest rates that have been unchanged for the period of this method´s lifetime. Hence, the variability of the long term variable real interest rate has been relatively small over time.

24. The average real interest rate measured monthly in this way has been around 4 per cent since 1992. Increase in the real interest rates have direct influence on the annuity.

(3) $$A = P_H * \left[\frac{r}{1 - (1 + r)^{-N}} \right]$$

An increase in the average real interest rate, when the lifetime is long, will increase the annuity (rent) by almost the same amount as r. The user cost is therefore very vulnerable to real interest rate changes. The value of the property used as the base for calculating the annuity (rent) is also a function of the real interest rate. In calculating the present value of the sale contracts the loans with fixed interest rates are discounted by rate of return reflecting the change in the real interest rate. A rise in the annuity because of increased real interest rate lowers the present value of the property and is likely to offset the increase in the annuity (rent) especially if the increase is big. This fact is also in accordance with the economic reality that a higher real interest rate leads to less demand and lower price of housing. With real interest rate increase the user cost measured by the annuity will be unchanged or lower.

Depreciation

25. It is difficult to measure depreciation that should reflect the tear and wear of property and that measurement is always very uncertain. There are generally three methods used to obtain the rate at which structures depreciate. The first method is to observe the age by making a rough estimate of the life of the durable "and then by assuming depreciation model that seems most appropriate"[17]. The second method is to use cross sectional information to set the depreciation rate and the third method is to use information on rental or leasing prices. In deciding the depreciation rate used in the simple user cost calculation the first method was used. "The first and simplest method is to impose a particular depreciation pattern on the average observed life of structures to derive a depreciation rate[18].

26. The depreciation rate used in the user cost calculation was arrived at mainly by viewing the age of the housing stock. According to the Real Estate Registry the stock at the end of the year 2001[19], divided after the building year, show that 90 per cent of all property is constructed after the year 1940, more than one third in the period 1960-1980 and one third is constructed later. The depreciation rate could therefore to be in accordance with the property stock divided after age or building year.

27. The user cost covers both the property structure and the land it is built on. The depreciation for the property is 1.5 per cent setting the life time of the property to approximately 67 years. Land does not wear over time and is therefore not depreciated. The depreciation is calculated on the value of the building. In the price information used to

calculate the house price index the price of land is never separated. It is therefore convenient to calculate the depreciation of the whole value of the housing stock, both structure and land. The depreciation rate used in the index is 1.25 per cent of the real estate value.

28. There are three most common depreciation methods. Straight line depreciation when the depreciation is divided into equal shares, one hoss shay or light bulb depreciation when the durable is depreciated until it falls apart and geometric depreciation when the durables value declines by constant percentage rate. The depreciation is usually in the form $(1-\delta)^N$, where δ is the depreciation rate and N the lifetime of the durable (number of payments). It means that the depreciation is largest in the beginning. According to the geometric method the durable is never fully depreciated.

29. The geometric form in the annuity formula is a inverted geometric depreciation of the type $(1-\delta)^{-N}$. The depreciation calculated in this way differs therefore from the usual geometric depreciation in that it is small in the beginning but increases as the years go on[20]. In addition the durable is fully depreciated which is not the case with the usual geometric depreciation. It is similar to the one hoss shay method as the depreciation is largest at the end of the durables lifetime and that the durable is fully depreciated.

Measurement of property prices

30. Sales contracts are the base for the calculation of the index of property prices. One of the main reasons for using them is the fact that the contracts are standardised for the whole country. Each contract contains information about the property and owners, the sales amount and complete information about the form of payment. Each property has a standardised identity number that is used in the property database that the Land Registry maintains. This very detailed information is the foundation for the valuation of property sales.

31. The sales information is collected through the Official Registry of Deeds. The formal registry of the change of the ownership is done by the Land Registry and for that the sales contract has to be at hand. Between 8-10 thousand sales contracts are collected each year covering 8-10% of all properties in the country[21].

32. The Land Registry of Iceland has collected the sales contracts for a long period of time. The market prices of properties that are gathered from the sales contracts are used by the Land Registry as the base for their evaluation of all house's real estate value. This information is also used in the calculation of the simple user cost in the CPI.

33. The price concept used in the CPI is cash price. In housing there are different forms of payments used so the price evaluation is more complex. The reason is the fact that there are five different forms of payments when a house is bought. As money received today is not the same as money received at another time in the future there is a need to calculate the present value of the contract each time.

34. The five different forms of payment are:

- Money often paid over the interval of 12-14 month, discounted by the nominal penalty interest rate.
- Housing Bonds[22] acquired most often through property sale. Discounted with the market value of the bond with 0.35 per cent additional premium.
- Other durables[23] (mainly other houses). Discounted by 10 per cent.
- New Housing Bonds. Discounted with the market value of the bond with 0.35 per cent additional premium.

- Overtaken loans. Discounted with the market value

The discount rates varies after the type of payment in accordance with market information. The discounting rate of return is measured monthly and if the change exceed a certain minimum the rate of return is changed[24]. Housing Bonds have the biggest share in housing financing.

35. When the discounting rate is lowered, the present value of the property increases. An increase in the discounting rate of return lowers the present value of the property. This is in accordance with the market influence of lower mortgage rates that lead to higher property prices and in the same way as higher mortgage rates lead to lower house prices.

36. Changes in the market prices and the discounting rate influence the price measurement. The present value of the contract is used for the price updating of properties in the CPI. The price measurement concept is the same as in other parts of the CPI and the prices taken into account are those that the consumer pays in reality for the property. In the long run the nominal and cash house price follow each other but within shorter interval they can part temporarily[25].

Price index for housing

37. The house price index is calculated based on the change in the present value of property prices as measured in the sale contracts. The total price information from all the sales contracts are used for the calculation of imputed rent. The prices used are the average prices for the whole country[26]. In the calculation the combination of the house's size in square meters is kept fixed. The weight is based on the sale's volume in four size categories as it was in the last three years. The calculation is based on three month's moving average with one month's time lag[27]. The sales contracts in April refer to the period January to March and in May for the period February to April e.t.c

38. The main indices are four, for houses and apartments inside and outside the capital area. The price change is measured for following type of housing. Houses (13 per cent share) and apartments (59), for the capital area (total 72), houses (15) and apartments (13) outside the capital area (28). The emphasis is on the price change within groups of properties not between types of properties or between regions and the quantity weight between regions is kept constant.

Property prices in the consumer price index

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39. Sometimes big increase in house prices are taken as a token that a bubble like behaviour of the market could be at hand which could lead to sudden fall in house prices. One of the things often looked at in that connection is the change in house prices against the price increase of rents. A strong connection can be observed between price changes in the rent market in Iceland and the changes in the market prices of housing, i.e. both indices seem to develop in similar way in the longer run even though they can move in dissimilar cycles in shorter time periods. Imputed and actual rent showed similar changes from March 1997 until November 2003[28]. Because of the small size of the Icelandic rent market it can be said that the house prices lead the rent market.

40. The rent and property market can move in dissimilar fashion. That could point to imbalances between these two indicators which need not be the case. One reason being regulation or controlling of rent and another could be a quality adjustment issue.

41. There will also always be difference between the level of market rents and imputed rents. When the rent is set the landlord has to take into consideration the cost incurred[29] such as transaction cost that can be considerable[30]. There is also a quality issue connected to this as owner can adjust their home in any fashion they like unlike tenants that are not allowed to do that.

42. The influence of economic targeting on the simple user cost model can be shown by looking at the influence of the sudden increase in inflation in the year 2001. The rise in inflation led to an increase in the Centralbanks steering rates and an increase both in the short term nominal and real interest rates. The long term real interest rates were on the other hand unaffected so this inflation boom did not influence the user cost weight for own housing. The stability of the long term real interest rates is one of the fundamental details in withholding the stability in the user cost model.

43. This method of measuring price changes in the property market in the consumer price index has been successful[31]. Research done by the Icelandic Central bank showed housing as an important indicator in measurement of future inflation. "On the other hand lot of information is lost if the housing post is taken out of the CPI"[32]. The connection between housing prices and inflation was pointed out. "The significant correlation between housing prices and the CPI for more than two years ahead might indicate that there is unused information about future inflation in the development of housing prices"[33].

44. One of the fundamentals in the simple user cost method is the fact that the long term real interest rate used are stable. A change due to sudden imbalances either in the economy or changes in the housing financing system in the country could lead to a revaluation of the method used. The main question looked at here would be whether these imbalances are likely to influence the long term real interest rate used and the opportunity cost of capital. The answer to this question is not fully clear but is very likely that the long term real interest rate would be looked upon as nearly fixed in the long run.

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[1] This information is based on Boldsen Hansen (2000).
[2] The method has been under study for inclusion in the HICP.
[3] Even half of it (Diewert 2002a) 62.
[4] The case where the payment approach is used but real interst rate taken into account is a complicated user cost approach. Diewert (2003b) 50.
[5] Share of owner occupied housing in these countries is: Greece (75), Italy (78), Japan (78), Portugal (66), Belgium (65), Austria (50), Luxembourg (72), France (54). Boldsen Hansen (2000) 12.
[6] This terminology is due to Diewert (2002) 621 and (2003b) 28 and 53.
[7] Similar user cost method has been used in Iceland in the years after 1980 to measure the profitability of the fishing fleet and fishing industry. In the years after 1980 the inflation in the country was very high
[8] Correction was made for over estimation of price change of houses in April 2000 lowering the CPI by 0.35 per cent. At the same time under estimation of rent was corrected leading to a 0.34 per cent increase in the CPI.
[9] This user cost method is very similar to Steiners (1961) user cost model where he uses the annuity method to arrive at depreciation and interest.
[10] Fasteignamat Ríkisins (2002) 17-22 and Örn Ingvarsson (2002) 259-270.
[11] Örn Ingvarsson (2002) 260.
[12] Diewert (2003a) 21
[13] Indexation of this kind refers only to loans available for five years or more.
[14] The capital gain can be lower or higher than the rate of return used but the average long term real interst rate approximates it.
[15]This share could of course partly be financed with loans.
[16] The long time rate of return for the pensions funds is now in the range of 2.0-3.5 per cent. Long time rate of return according to the liability law is 3.5 per cent.
[17] Diewert (2003b) 23.
[18] Malpezzi, Ozanne and Thibodeau (1987) 373.
[19] Örn Ingvarsson (2002) 261.
[20] The depreciation measured as the amortization of the principal, where N = 80, reaches the 50 per cent level in the 64´th year. In the year 73 it covers two third of the total depreciation. The interest payment equals the depreciation amount in the 64´th year and after that the deprication amount is larger than the interest.
[21] It does not matter wether the number of sales or values are used.
[22] The Housing Financing Board (2003) 3. "The Housing Bond system is not a traditional mortage loan system, but a bond swap system. This means that the homebuyer actually apply for a mortage bond, which is secured against the property to be bought. The Housing finacing Fund buys this bond from the homebuyer and pays for it by issuing to the seller a Housing Bond which can be freely traded in the securities market."
[23] Share of properties and other capital goods in the contracts were nearly 20 per cent of the value in the year 1995 and about 4 per cent in 2001. Fasteignamat Ríkisins (2002) 31
[24] The rate of return was changed four times in the year 2002 and six times in the year 2003.
[25] From november 2003 to November 2003 house prices in the CPI rose by 11.9 per cent. Nearly half of that change is due to the change in cash prices over nominal prices due to the discounting.

[26] This has been in this way since March 2000. The index for the whole country was then calculated back to March 1997.
[27] Contracts from places outside the capital area arrive with two months timelag.
[28] The increase in housing prices from March 1997 to November 2003 is nearly 77.9 per cent and the rent index rose in the same period by 78.2 per cent. At the same time the total CPI rose by 28.5 per cent and CPI less housing cost by 22.7 per cent. The CPI is therefore 4.8 per cent higher than the CPI less housing cost in this time interval.
[29] Diewert (2003b) 46-48.
[30] Economist (2003) 7.
[31]One of the main uses of the CPI is for indexation of long term loans for housing. It is therefore proper that property prices are reflected in that index.
[32] Þórarinn G. Pétursson (2002) 60.
[33] Þórarinn G. Pétursson (2002) 59.