The treatment of housing co-operatives in a house price index *

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Abstract

Housing co-operatives, also known as "tenant-owner co-operative housing", provide an alternative to both renting and owning a dwelling. As an indirect form of ownership, it poses some conceptual and practical issues to anyone aiming at compiling a price index covering all forms of own-occupied housing. Starting from the position that these co-operatives provide a type of tenure similar to owner-occupied housing, this paper provides some practical guidance on the way they can be treated in the compilation of a house price index. An empirical bootstrap study, based on advertised co-operative flats in Oslo, supports the proposals done in this paper. To our knowledge, this is the first time such a study is carried out in this context.

Keywords: Housing co-ops, House Price Indexes, Owner-occupied housing, Bootstrap
JEL Classification: C43, E31

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1 Introduction

This paper deals with housing co-operatives and it aims at providing a workable solution for its treatment in a house price index (HPI). The paper is organized as follows. Section two defines housing co-operatives and highlights its importance. Section three addresses the main issues underlying the inclusion of housing co-operatives in the HPI. Section four presents the result of an empirical study using data taken from the Internet on housing co-operative flats in Oslo. A proposal for the treatment of housing co-operatives is provided in the last section of the paper.

2 Definition and importance of housing co-operatives

A housing co-operative is a legal entity that provides to their shareholders an alternative to both renting and owning a home. This type of housing tenure differs from direct ownership in that real estate is owned by the legal entity and not by households themselves. Shares represent the right to occupy and use a certain housing unit in the co-operative and can be used as collateral for loans. Although co-operatives (co-ops) may restrict, at least to a certain degree, the freedom in which transactions are done[1], shares can be traded on the market for a price[2].

When purchasing a share, the buyer is not only acquiring the right to use a dwelling unit in a co-op. In fact, all unpaid mortgage, which is associated to the dwelling, is passed onto the new owner and "purchased" together with the housing unit[3] [4].

Shareholders pay, in addition, a fee to the cooperative[5].This fee aims at covering a wide variety of items that include, besides the financing of the mortgage loans, stairs cleaning, garbage, house insurance and other such-like running costs.

The importance of co-ops varies among countries. In Denmark, Norway and Sweden co-ops represent, respectively, 4%, 15% and 20% of the total housing stock. In Finland and Iceland, housing co-ops are considered to represent a small (or unimportant) share of the housing market.

[1] Examples include reserving the right to admit a new member and limiting the price at transfer.

[2] This price will be labelled in this paper as "Commercial price".

[3] Conversely, the new owner may also acquire savings associated with the position of the share in the housing co-op. This item will be called in this paper "Saved money". This is money that is typically saved if shareholders anticipate property repairs or upgrades.

[4] The total debt on the property per household will be termed as "Joint debt" in this paper.

[5] Hereafter referred as "Monthly fee".

3 Problems posed by the inclusion of housing co-operatives in a house price index

3.1 Housing co-operatives as a type of tenure similar to owner-occupied housing

As a co-op is an indirect form of ownership, it is natural to ask whether or not it should be included in an HPI. Although shareholders do not actually own real estate, they are nevertheless free to occupy and use the housing units in which they live in (very much in the same way an owner occupier would do). In this light, this type of housing tenure should be considered similar to owner-occupied housing and, as such, co-ops should be covered by an HPI.

3.2 Price concept

The first aspect to consider in this section has to do with possible restrictions to entrance and exit in a co-op.

In principle, as stated above, co-ops should be included in HPI compilation. However, if discriminatory preferences are applied in the co-ops housing market in favour of specific groups of potential buyers, then the price index compiler could have good reasons to disregard them from HPI compilation[6].

Social co-ops, available to low income households only, is an example of a possible exclusion. However, if it is found that these restrictions are more of a formal nature, then housing co-ops should be included.

It is up to each statistical office to see whether existing restrictions are more of a formal nature or if, on the contrary, they seriously affect the capability of all agents to have an equal opportunity to access to this market segment.

The second and final aspect to consider is related to the relevant price concept to use in this situation. The HPI should be based on transaction prices (Eurostat, 2011b). The question here is whether or not "Commercial prices" can be regarded as transaction prices. In our view, they are not transaction prices as they do not reflect the unpaid mortgage, which is associated to the dwelling and that is passed onto the new owner when the transaction occurs.

A similar reasoning applies when someone buys a house with the help of a loan. In these

[6] This is in line with HICP guidelines. See, for instance, the guidelines for the treatment of reduced prices in the HICP (Eurostat, 2001).

situations, it is common that the house acquisition cost is partly supported by the buyer and partly financed by the loan. Obviously enough, the transaction price is not the sum of money that the buyer supports with his/her own funds but its sum with the incurred loan[7] [8].

By the same token, considering commercial prices alone opens up the possibility of having situations in which two identical houses, with the same quality-and-location attributes, have different prices simply because the amount of the "Joint debt" is different.

In this context, it is necessary to adjust "Commercial prices" so that they could reflect true transaction prices. The next section presents two possible ways of tackling this issue.

3.3 Two possible ways of dealing with housing co-operatives in a house price index

In principle, the problem mentioned in the previous section can be tackled through two approaches. Both of them assume that "Commercial prices" need to be subject to some treatment as they do not reflect the prices of a dwelling with similar characteristics, had it been transacted without unpaid mortgage.

The first approach assumes that the price correction is done by adding to the "Commercial price" (CP) the "Joint debt" (JD) of the co-op housing unit. Thus, for the ith housing unit, we have

$$P_i = CP_i + JD_i \tag{1}$$

The relevant price index would be calculated assuming that the price of the ith co-op unit is a function of its characteristics (X_i). This is to say that

$$P_i = f(X_i) \tag{2}$$

A second possible approach sees the "Monthly fee" (MF) as a price-determining characteristic of the co-op housing unit "Commercial price". Thus,

$$CP_i = g(X_i; MF_i) \tag{3}$$

[7] It should be remembered, in passing, that the way the debt is labelled (i.e. as common or private) does not hinder the above reasoning. In the case of co-ops, a "common debt" exists and is passed onto to the new buyer. This cost is also present in the "Monthly fee" that a new shareholder will have to support. This view is consistent with the treatment of housing co-ops by national accounts.

[8] This sum, when referred in this paper, will be termed as "Total price".

Having these approaches in mind, it would be interesting to know if a price index using (2) shows a different price behavior from an index compiled on the basis of (3).The next section provides an empirical example that attempts to shed some light on this issue.

4 Empirical comparison of the two approaches

4.1 Data

The data was taken from a Norwegian web portal, Finn.no[9], which covers most of real estate offers in Norway.

The internet data collection was carried out on a single day and covered information on advertised apartments (*Leilighet*) in housing co-ops in Oslo. As in any typical site aiming at promoting real estate businesses, transaction prices are not available. However, an estimated market/commercial price is provided for each apartment (*Prisantydning*)[10]. In addition, it is possible to obtain information on the total debt on the property per household (*Fellesgjeld*) and on the Monthly fee (*Felleskostnader*) for each apartment. To our knowledge, this is the only source available of data that contains information on all these variables.

A total of 507 observations, containing information on ten variables[11], were collected. The table below provides the descriptive statistics of the drawn sample.

Table 1: Descriptive statistics on variables of the drawn sample

	TP	**ECP**	**JD**	**MF**	**SM**	**UA**	**NR**	**NBR**	**FL**	**PC**
N	474	507	475	500	365	506	392	467	432	507
Min	700,000	120,000	989	192	59	13	1	0	1	1
Max	5,996,971	5,950,000	3,480,000	15,036	91,626	139	6	4	14	12
Mean	2,243,024	1,905,434	373,317	3,797	17,526	60	3	2	3	-
CV	0.34	0.46	1.53	0.60	0.82	0.33	0.34	0.44	0.64	-
Missings	33	0	32	7	142	1	115	40	75	0

Summary statistics do not reveal abnormal (low or high) prices and suggest that the sample fall within expected values for apartments in Oslo. The "Joint debt" and "Saved

[9] www.finn.no.

[10] The price estimations are done by the real estate agent or the seller or both, usually based on the appraised value. This is a sort of a reference for potential buyers and can thus differ from real transaction prices.

[11] The variables are "Total Price" (TP), "Estimated commercial price" (ECP), "Joint Debt" (JD), "Monthly Fee" (MF), "Saved Money" (SM), "Usable Area" (UA), "Ner of Rooms" (NR), "Number of Beedrooms" (NBR), "Floor Level" (FL) and "Postal Code" (PC). The first five variables are expressed in Norwegian Krone. Usable area is expressed in square meters. An eleventh variable – "address" - was also collected. This variable was used, together with all remaining variables, to identify duplicate records in the database.

money" variables show higher dispersions around their mean values. The latter variable also displays the highest number of missing values and will be disregarded from our analysis. Collected information on usable area, number of rooms and floor level also display expected values. As compared with the "Number of bedrooms", the "Number of rooms" variable displays a lot more of missing values, perhaps suggesting that the former is more relevant from a buyer perspective than the latter variable[12].

The table below presents the correlations among the nine non-categorical variables included in the sample.

Table 2: Correlations among variables

	TP	**ECP**	**JD**	**MF**	**SM**	**UA**	**NR**	**NBR**	**FL**
TP	1	0.76	0.21	0.25	0.26	0.70	0.65	0.54	-0.03
ECP		1	-0.47	-0.35	0.15	0.62	0.50	0.43	-0.05
JD			1	0.88	0.13	0.01	0.13	0.06	0.05
MF				1	0.21	0.17	0.23	0.17	0.06
SM					1	0.22	0.29	0.24	0.08
UA						1	0.85	0.81	-0.11
NR							1	0.94	-0.11
NBR								1	-0.028
FL									1

The correlations show expected signs. Somewhat unsurprisingly, the highest correlation is found between Number of rooms and Number of bedrooms (0.94). More interestingly, it is worthwhile to pinpoint the high correlation between "Joint debt" and "Monthly costs" (0.88). Although low, the correlations of "Estimated commercial price" with "Monthly fee" and "Joint debt" display the expected signs (-0.35 and -0.47, respectively). Moreover, the "Total price" variable is more correlated with usable area than the "Estimated commercial price" (0.70 against 0.62). Finally, it should be noted that the "Total price" and "Estimated commercial price" show high correlation (0.76).

[12] A similar reasoning could be applied to the "Estimated commercial price" and "Usable area" variables, which have the lowest number of missing values.

4.2 Design of the empirical exercise

The empirical exercise was based on the application of the bootstrap resampling method to the dataset described in the previous section [13].

The exercise implied the following steps:

1. Choose a functional form for (2) and (3) and estimate its regression parameters with the complete dataset;
2. Using the imputation method[14], calculate two index numbers and find the difference between them (this would be the test statistic);
3. Divide the dataset into two separate (fictitious) time periods with approximately the same number of observations;
4. Draw, for each time period, one thousand new samples of the same size as the original sample using simple random sampling with replacement;
5. Apply the functional forms, found in step 1 above, to (2) and (3) in each of the two (fictitious) time periods[15];
6. Reproduce step 2 for each resample and obtain one thousand differences;
7. Sort the differences by its result;
8. Pick the results that are in the 25^{th} and 975^{th} positions (these will be the estimated critical values).

Under step 1, several specifications for (2) and (3) were tried out. The following specifications passed the robust Reset test (Wooldrigde, 2002) and were used in the calculations.

Thus, for (2) we have

$$Log(TP_i) = \alpha + \beta_1 . \log(SZ_i) + \beta_2 . NR_i + \beta_3 . central_i + \beta_4 . rich_i + \beta_5 . Floor_i + \epsilon_i \quad (4)$$

and for and (3) we used

$$Log(Comm_i) = \eta + \alpha_1 . \log(SZ_i) + \alpha_2 . central_i + \alpha_3 . rich_i + \alpha_4 . Floor_i + \alpha_5 . \log(MF_i) + \xi_i \quad (5)$$

were,

[13] A classical reference for the bootstrap is Efron and Tibshirani (1993).

[14] See Eurostat (2011a: 50-3) for details.

[15] As the design of the exercise covers two periods and two functional forms, it means that, in practice, four regressions had to be estimated.

$Log(TP_i) =$	natural logarithm of the "Total price" of the ith housing unit;
$Log(Comm_i) =$	natural logarithm of the "Estimated commercial price" of the ith housing unit;
α,$\eta =$	intercepts;
$\log(SZ_i) =$	natural logarithm of the usable area of the ith housing unit;
$rich_i =$	dummy=1 if the "Postal code" is located in a "rich" area and zero otherwise;
$\log(MF_i) =$	natural logarithm of the "Monthly fee" associated with the ith housing unit;
$Floor_i =$	floor level of the ith housing unit;
$central_i =$	dummy=1 if the i^{th} housing unit is located in a central place and 0 otherwise;
$NR_i =$	Number of bedrooms;
ϵ_i,$\xi_i =$	error terms.

The regression outputs that were obtained for step 1 are available at the end of this paper. The next section shows the results of the simulation study.

4.3 Result of the empirical study

The computation of the test statistic used 374 out of the 507 observations available in the sample. Around 26% of the observations were drop out from the exercise because they had at least one variable with a missing value.

The value found for the difference between the two approaches[16] was -0.044 percentage points for the original sample (test statistic). The estimated bootstrap 95% percentile interval was 0.001 and -0.109 for the 2.5^{th} and 97.5^{th} percentiles, respectively[17].

As such, the null hypothesis of having no difference between the results provided by the two approaches is not rejected.

[16] i.e. index number found for (2) minus index number found for (3).

[17] The data, the SAS code of the experiment and the results can be provided upon request.

5 Proposal and final remarks

Several points are worthwhile to be mentioned. First, this paper reinforces the idea that, as a rule, housing co-ops should be included in an HPI. However, each statistical office should analyze possible exclusions based on existent discriminatory entrance and exit restrictions. Secondly, "Commercial prices" should be adjusted to reflect the true transaction price of housing units. In order to tackle this, two possible approaches were presented. The results of the empirical study suggest that both of them show similar results and, as such, are both proposed as possible solutions in the housing co-ops context.

Finally, it should not be forgotten the limitations of the present empirical study. Although providing some empirical evidence supporting the present proposal, it should be emphasized that the study does not completely discard the idea that the two approaches could be different.

Following this line of reasoning, it would be interesting to obtain empirical results from studies applied to other geographical contexts, to datasets containing real transaction prices and with more variables than the ones that were used in this paper and with a sufficient number of months to estimate the impact of the two methods over time [18].

[18] The estimation of the impact could be done using HICP's minimum standards for revisions as a guideline. These standards are defined in Commission Regulation (EC) No 1921/2001 of 28 September.

References

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Annex: Regression results

Model (2)

Parameter estimates

Variable	Parameter Estimate	Standard Error	t value	Pr > |t|	Variance inflation
Intercept	12.27180	0.17536	69.98	<.0001	0
lg_sz	0.53437	0.04866	10.98	<.0001	2.48478
NR	0.04684	0.02114	2.22	0.0273	2.41290
Rich	0.13491	0.04158	3.24	0.0013	1.37581
Central	0.21653	0.04282	5.06	<.0001	1.42165
Floor	0.01024	0.00558	1.83	0.0675	1.02591

n = 376; $R^2 = 0.537$; Adju $R^2 = 0.531$.

Model (3)

Parameter estimates

Variable	Parameter Estimate	Standard Error	t value	Pr > |t|	Variance inflation
Intercept	14.54511	0.25841	56.29	<.0001	0
lg_sz	1.04747	0.04143	25.28	<.0001	1.11716
Rich	0.08865	0.05671	1.56	0.1187	1.41565
Central	0.26065	0.05890	4.43	<.0001	1.46864
Floor	0.01669	0.00739	2.26	0.0244	1.03320
lg_mf	-0.55818	0.02931	-19.05	<.0001	1.07246

n = 425; $R^2 = 0.666$; Adju $R^2 = 0.662$.