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House prices in a Swedish CPI perspective

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Abstract. House prices play a role in present development plans for price indices in Sweden, including both the national Consumer Price Index (CPI) and an experimental index for owner occupied housing (OOH) within the framework of the Harmonised Indices of Consumer Prices (HICP). Separate house price indices already exist in the country, both a Building Price Index (BPI) for newly constructed dwellings, and a Real Estate Price Index for existing dwellings.

Those existing indices provide a valuable basis, with quality adjustment by hedonic regression for the BPI and by the Sales Price over Appraisal Ratio (SPAR) approach for the Real Estate Price Index. Nevertheless there are some difficulties, notably that the BPI covers only collectively built houses and is available only with some delay. Thus probably an approach has to be used involving to some extent other sources for nowcasting and perhaps for proxy measurement for under-coverage.

The role of house prices in CPIs

In some approaches to treating owner occupied housing (OOH) in a Consumer Price Index (CPI), a crucial component is constituted by a price index for newly created owner occupied dwellings. Notably this is the case for what is known as the *(net) acquisitions* approach to OOH, as described by Diewert (2004, Sect. 2), Eurostat (2008, Sect. 2), and ILO et al. (2004, Sect. 10.39-10.50).

The acquisitions approach to OOH, or specifically the net acquisitions approach, has become of urgent interest in recent years. Namely, this approach is prescribed for the possible future treatment of OOH in the Harmonised Indices of Consumer Prices (HICPs); cf. Eurostat (2008).

A price index for newly created owner occupied dwellings may be needed as a sub-component also in other approaches to OOH. This is so for a new approach developed by Klevmarken (2009), also described by Ribe (2007a, 2007b). The latter approach has been developed as an alternative for a possible re-engineering of the treatment of OOH in the national Swedish CPI, in view of past discussions (cf. Ribe, 2004, 2007b; SOU 1999:124; Swedish Government, 2001).

The Swedish Building Price Index (BPI)

Providing a price index for newly created dwellings has some particular challenges compared to most consumer products. Notably, dwellings are

more or less unique objects, and thus newly created dwellings cannot be conveniently followed longitudinally over time in the index, like most consumer goods and services can. Quality adjustment is thus crucial here, preferably by hedonic regression (cf. Eurostat, 2008).

In Sweden a Building Price Index (BPI) has existed since around 1970 (SOU 1971:79; Norberg & Ribe, 2001). The BPI is an output price index for the prices of newly built dwellings. It is used for analysis of productivity and profitability in the construction industry, and for purposes of the national accounts. Before 1999 it was also used in the CPI, for measuring depreciation of owner occupied houses (cf. Statistics Sweden, 2001).

The BPI has one series for dwellings in multi-dwelling buildings, and one for collectively built one- and two-dwelling houses. It thus leaves aside one- or two-dwelling houses built on their own as separate projects.

Hedonic quality adjustment in the BPI

The BPI follows the price per square meter, specifically the price to be due at the completion of the construction, as anticipated at the start of the construction. The price includes both construction cost and other costs, for administration, connection of electricity, etc. The index for the price per square meter is hedonically adjusted, to account for the varying location, type and quality of the houses.

Technically the quality adjustment of the price index is carried out using a quality index measuring the quality development by means of a hedonic regression model. Thus the unadjusted price index, obtained as a ratio of average prices per square meter of primary utility floor space, is divided by the index of quality development, to yield a quality adjusted price index.

The exact form of the computation has changed somewhat from time to time, due to changes in the conditions. Until recently an administrative data source was available for the index computation. It contained lots of quality variables useful for the hedonic adjustment, such as location, floor space, equipment standard, construction of joists, roof and outer walls, heating system etc. This includes both dummy variables for various characteristics, and continuous variables for floor space etc.

It may be noted that many variables were used in the regression model but not adjusted for in the index, such as details on bearing structure, facing, ventilation, roof covering, type of contract, etc. These were characteristics possibly affecting the price but not of direct concern for quality understood as user functionality; cf. further SOU 1971:79.

Recent changes in the BPI methods

From 2006 some major changes have been made in the BPI computation. Due to de-regulation, the mentioned administrative data source no longer exists, and the data for the BPI has to be collected by a special survey for the purpose. Then the number of quality variables has had to be reduced substantially, to keep the respondent burden within a reasonable bound.

Nevertheless the remaining quality variables should suffice to capture the main variations in quality.

The regression equation is now of semi-logarithmic form, while previously a plain linear regression equation was used. The dependent variable in the regression equation is thus the logarithm of the price per square meter. The regression coefficients are re-estimated annually.

Unfortunately the data collection has proved to be somewhat slow in the survey on which the BPI now rests, entailing considerable delays in the production of the BPI.

A further difficulty is that the construction of new dwellings in Sweden has been on relatively low levels for quite a few years recently, giving room for random fluctuation to disturb the estimates.

Controlling for location by a variable on mean price

An improvement in the recent changes of the BPI methods concerns the control for location in the hedonic regression. Previously dummy variables for a coarse geographic subdivision were used. In the new approach, the hedonic equation instead includes an explanatory variable reflecting average house price in the municipality concerned.

The latter variable is based on statistics on prices in recent transfers of ownership of existing houses. The use of this municipality average price as an explanatory variable gives a more effective control for location, as this single continuous variable essentially captures the differences in consumer value of location quality.

It should be noted that in the quality adjustment, the values of this variable throughout pertain to the price reference period. Thus price changes over time do not unduly disturb the quality adjustment. For the future it could be desirable to go further along the lines taken here, perhaps using taxation values on a lower geographical level to control for micro-location, if this could be made feasible.

Controlling for location quality by a price variable is used also by Shimizu (2009), who controls for land price in a hedonic regression for rents. As was noted by Erwin Diewert in discussion on that paper, it may be somewhat unusual to use a price variable to control for in hedonic regression practice, where otherwise physical characteristics are used for this (cf. also ILO et al., 2004, Ch. 21; Triplett, 2006). Nevertheless location is a quality feature of primary importance in housing, and a price variable reflecting location should be able to serve as an effective proxy for this. The approach may be seen as an extension of the idea of SPAR (Sale Price over Appraisal Ratio; see Bourassa et al., 2006; De Vries et al., 2007; Eurostat, 2008, Sect. 5.3).

Drawbacks of the Swedish BPI for CPI use

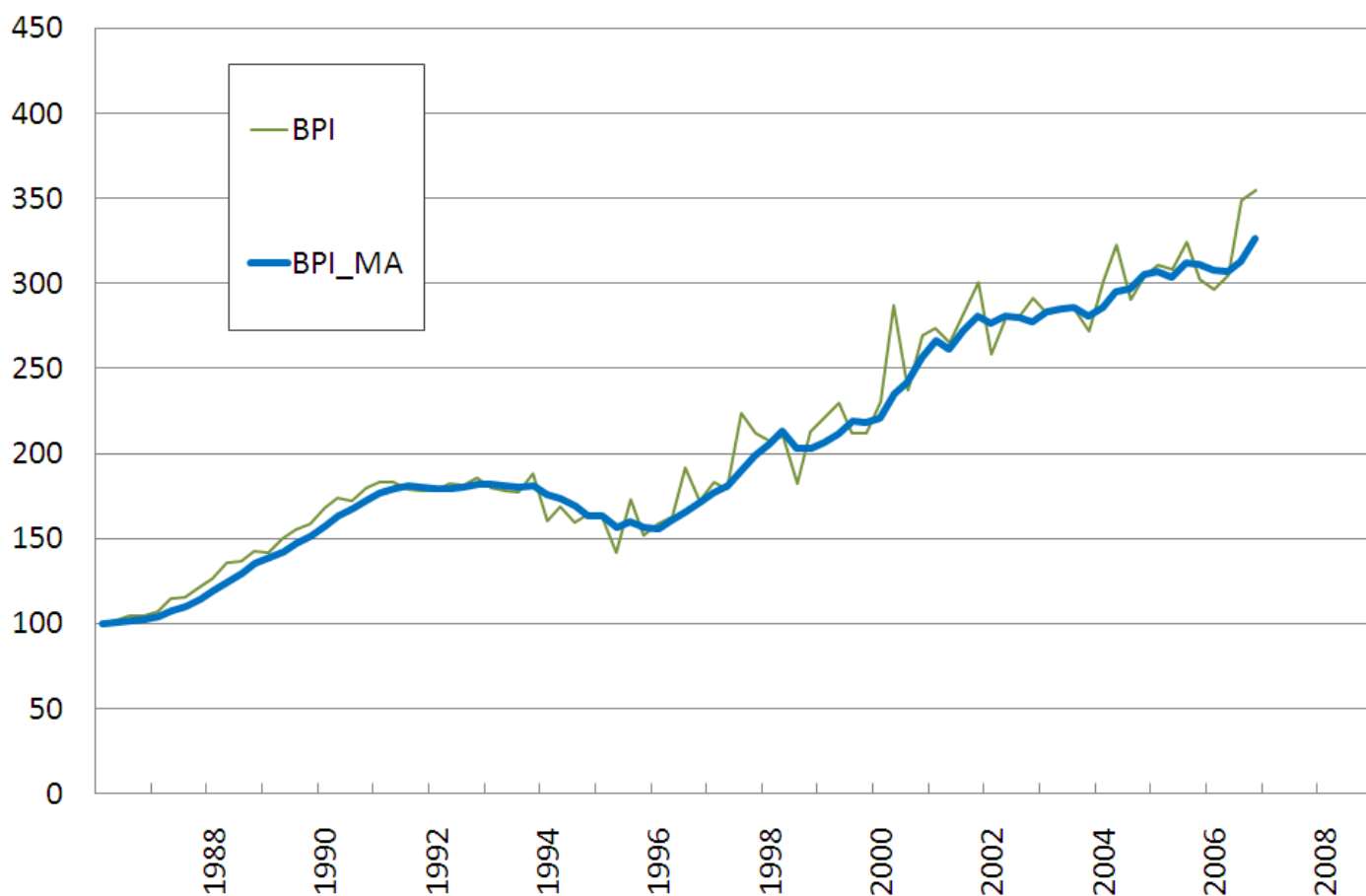
The Swedish BPI thus has a rather ambitious approach with hedonic quality adjustment. Nevertheless the Swedish BPI also has some drawbacks:

- (i) It covers only collectively built houses, thus not the entire market.
- (ii) It can practically show annual price movements only (at best).
- (iii) It comes with a rather long delay.
- (iv) The price concept employed may not be quite precise.

These points call for some discussion.

(i) The collectively built houses, reflected in the BPI, constitute only some 30-40 percent of the market for newly built dwellings in one- and two-dwelling houses. Obviously this is not quite ideal from the point of view of representativity. Nevertheless no part of the country is excluded, and this should meet a requirement apparently considered essential in the HICP setting. As often in price statistics, one may like to trust that market competition should make the price movements similar throughout the entire market. This would make the deficiency in coverage appear less disturbing. The sacrifice in coverage here also seems needed for a crucially effective quality adjustment by hedonic regression.

(ii) Although the BPI is formally produced on a quarterly basis, it can practically be used only to show annual changes. The following graph shows the development of the quarterly BPI itself and a (retrospective) four-quarter moving average of it (here denoted BPI_MA), re-based to 1986Q1=100.



The vivid quarterly variations seen in the original BPI series are obviously quite haphazard and most likely say nothing about real tendencies in the market. They should apparently be seen as essentially a consequence of the fact that new building projects are relatively scarce, giving much room for random fluctuation.

(iii) By various causes, the data collection is rather slow for the BPI, and this has proved hard to remedy. However, an advantage here is that the requirements for the HICP work are somewhat less demanding than the original BPI target, as far as timing is concerned. Namely, the BPI aims at capturing the anticipated price for the construction work, when this is about to start, while the HICP aims at entering the price into the index when the new dwelling is ready for the owner-occupier's moving in. The time of moving in is approximately one year after the start of the construction work, so a lag of one year should be allowed for in the use of the BPI. Even so, the BPI is too late for unadjusted use in the CPI or HICP, as it appears more than a year after the end of the year concerned. Thus some nowcasting has to be used.

(iv) Apparently, the price collected for the BPI may in some cases be the price paid by the owner-occupier herself, but in other cases a price paid by a broker who in turn sells the dwelling to the owner-occupier. So the price concept used seems a little vague in this respect, as well as with respect to the proper timing (as was just noted).

In spite of these drawbacks, it seems questionable if one could really do so much better on the BPI as such, with realistic efforts. Apparently the real-world conditions pose some rather tough problems here, and likely one has to be content with less than ideal solutions.

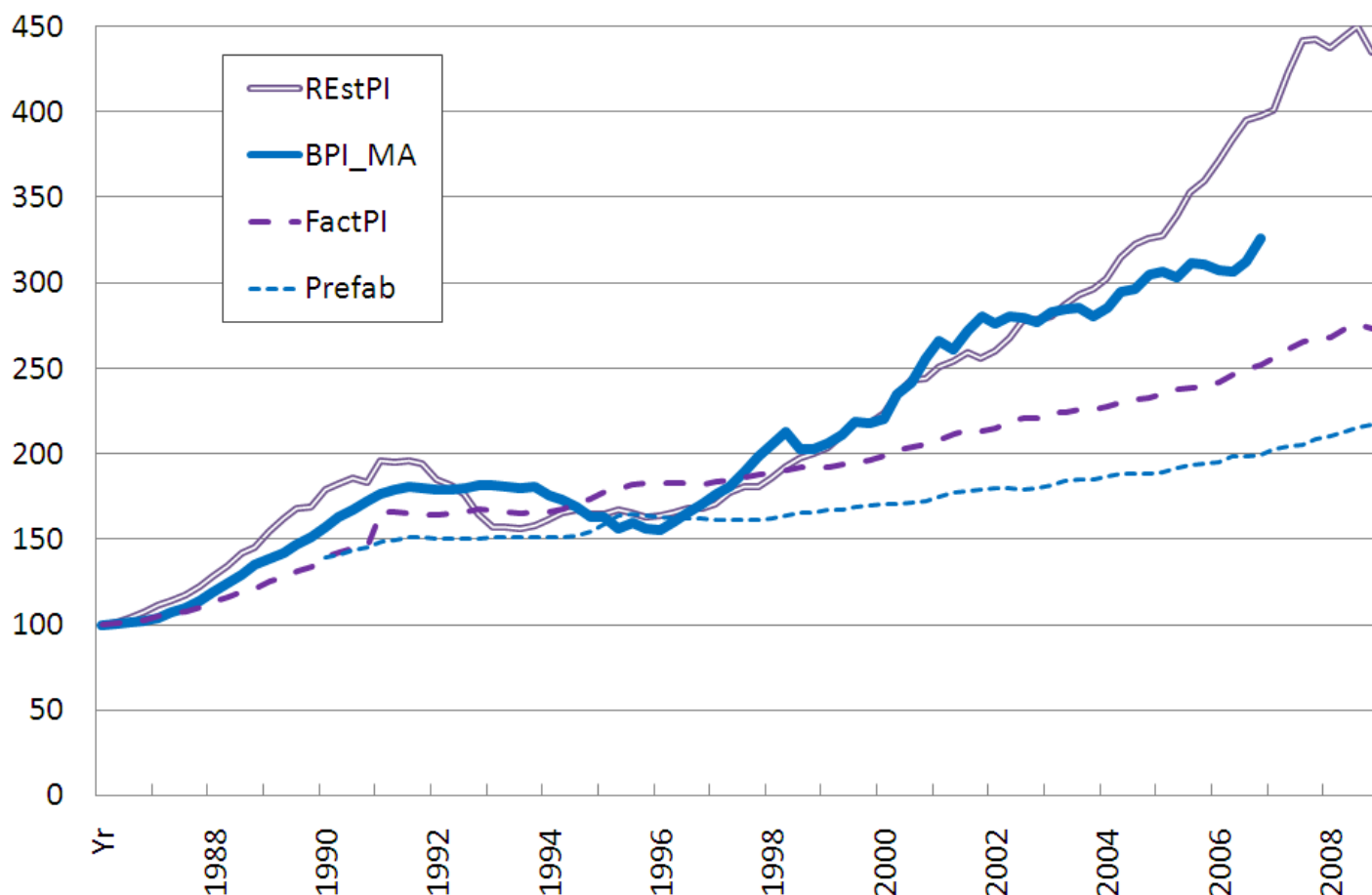
Possible proxy indices for the BPI

In view of the mentioned drawbacks, it seems necessary to supplement the BPI with some proxy index or indices. A proxy index may be useful in two respects:

- For nowcasting the BPI to the current month or quarter.
- Possibly also for attempting to fill in for under-coverage of the BPI.

Three potential candidates for such proxy indices are shown in the following graph (together with the four-quarter retrospective moving average of the BPI, denoted BPI_MA). They are

- (i) REstPI – Real Estate Price Index
- (ii) FactPI – Factor Price Index
- (iii) Prefab – Producer Price Index for Pre-fabricated houses



The index series shown in the graph are re-based to 1986Q1=100, except that the one for “Prefab” is linked to “FactPI” in 1990Q1. Some explanations and comments may be given.

(i) The Real Estate Price Index (here denoted REStPI) shown here pertains to one- and two-dwelling houses. This is an index for prices at which existing houses change owner-occupiers, not for prices of newly created dwellings. It is based on transaction prices, geographically re-weighted so as to better reflect the asset value of the stock of houses (Elffors & Grünberger, 1984). The computation is supported by taxation values by a Sale Price over Appraisal Ratio (SPAR) approach, which controls for quality differences.

This index might still be potentially useful as a proxy for the BPI, as existing and newly created dwellings compete with each other in the market and may thus be a priori expected to show similarities in their price developments. On the other hand, existing and new dwellings may not be perfectly comparable with each other, due to differences in location etc.

(ii) The Factor Price Index (here denoted FactPI) shown here pertains to construction materials and labour. Conceptually this index also does not perfectly match the BPI, as this is an input index from the point of view of the construction industry, while the BPI is an output index. Thus, the prices followed by the BPI effectively include the profit margins in the construction industry, while those followed by the Factor Price Index of course do

not. Furthermore, the weights used in the Swedish Factor Price Index have not been regularly updated.

(iii) The Producer Price Index (PPI) series for Pre-fabricated houses of wood (here denoted Prefab) is shown as a further potential alternative. These prefabricated houses are not really complete dwellings, but rather the basic structures of the houses. There is actually some overlap between this index and the BPI, in the coverage of the universe (not in price collection).

As can be seen in the graph, at least in some periods the potential proxy indices shown have had developments notably different from that of the BPI. These differences are hardly entirely surprising, in view of the conceptual discrepancies just noted.

A conclusion apparently is that in the use of a proxy, it has to be accepted that this is likely to entail deficiencies which have to be kept in mind in interpretation of the figures.

Timeliness of proxy indices

The mentioned possible proxy indices do not suffer from as long delays as the BPI does, so they may obviously open ways to meet the timeliness problem, in spite of the differences just noted. Even so, these indices still lag behind by some month or so, which may not seem quite up to usual CPI standards of timeliness.

Grünewald et al. (2009) suggest a faster alternative to the Real Estate Price Index as such. This would update the Real Estate Price Index by use of another series from Real Estate statistics, very similar to the Real Estate Price Index, but produced faster.

For the Factor Price Index, on the other hand, it seems largely appropriate to use it with some lag, considering that there has to be some lag in the impact of input prices on output prices in the construction industry.

Nowcasting the BPI

Considering nowcasting for HICPs, some care has to be taken, as the rules state that HICPs shall be produced from observed prices (Commission of the EU, 1996, 2007). Nevertheless, in view of the problems inherent in treating OOH, this principle apparently has to be interpreted in a realistically possible way. Then it may obviously be argued that some nowcasting has to be accepted, if it is based on observed prices in a reasonable way.

Technically the nowcasting of the BPI may be formed as a chaining of the BPI with a chosen proxy index, for the period from the end of the available BPI series up to the current quarter or month. Probably preferably, the chaining should be made over a moving four-quarter period.

In the choice of a proxy index for the nowcasting, one has to acknowledge that all available choices have their deficiencies. The Factor Price Index is

perhaps the most conservative choice, not more than necessarily leaning on daring models or assumptions.

Potentially a proxy could otherwise perhaps be formed from weighting together e.g. the Real Estate Price Index and the Factor Price Index, but it may be hard to theoretically support and to explain such a solution.

For the computation technique in the nowcasting, a possible more advanced alternative than the plain chaining just mentioned may be to supplement the chaining with some simple time-series model. Such a model could be designed to correct for the difference in trend coefficient over a recent relatively short period, between the proxy series and the BPI. This would need further consideration, not least on possible robustness problems at trend-shifts.

Treating the under-coverage of the BPI

For representing the under-coverage of the BPI, two alternatives could be recognised:

- To represent the under-covered part by the nowcasted BPI (just as for the covered part).
- To represent the under-covered part by a suitably weighted average of the nowcasted BPI, the Real Estate Price Index (or some similar series), and the Factor Price Index.

The first alternative seems attractive in view of its apparent practical clarity, in spite of its obvious deficiencies. The second alternative would need further considerations and will not be discussed here.

Other uses of price statistics for existing dwellings

In the HICP and CPI contexts, the mentioned Real Estate Price Index, pertaining to existing dwellings, is relevant also for other uses than as a possible proxy for the BPI.

Namely, in the HICP plans there is explicit demand for a “Stand-alone House Price Index” on all household purchases of dwellings, both new and existing; cf. Eurostat (2008, Sect. 4.5). This is in addition to the acquisitions-based OOH index. Another use of a house price index is as a factor in price indices for brokerage fees etc. (cf. Eurostat, 2008, Sect. 6.2).

The Stand-alone House Price Index has to be essentially weighted together from the nowcasted BPI and the Real Estate Price Index, to reflect purchases of both new and existing houses. Here the Real Estate Price Index may possibly be used in an “un-weighted” form, to represent transfers rather than stock (cf. Eurostat, 2008, Sect. 2.4.3).

In the possible approach for the CPI developed by Klevmarken (2009), there is a role for the Real Estate Price Index in the treatment of mortgage interest. The form for this is still a topic for discussion (cf. Ribe, 2007b).

Disclaimer

The views expressed in this paper are those of the author solely.

References

- S.C. Bourassa, M. Hoesli, J. Sun (2006), A simple alternative house price index method, *Journal of Housing Economics*, 15, 80-97.
- Commission of the EU (1996), Commission Regulation (EC) No 1749/96, (Reprinted in *Compendium of HICP Reference Documents*, Eurostat, 2001, pp. 207-212).
- Commission of the EU (2007), Commission Regulation (EC) No 1334/2007, amending Regulation (EC) No 1749/96.
- P. De Vries, G. Mariën, J. de Haan, E. van der Wal (2007), A house price index for the Netherlands: A review of the SPAR method, *Conference on Sustainable Urban Areas*, in Rotterdam.
- E. Diewert (2004), The treatment of owner occupied housing and other durables in a consumer price index, *CRIW Conference on Price Index Concepts and Measurement*, in Vancouver, <http://www.ipeer.ca/CRIW.htm>
- C. Elffors & J. Grünberger (1984), *Fastighetsprisindex*, Report, Statistics Sweden [in Swedish].
- Eurostat (2008), *Technical Manual on Owner-occupied Housing*, Draft by INE of Portugal for Eurostat, Working Group “Harmonization of Consumer Price Indices”, Document HCPI 08/604.
- O. Grünewald, O. Lundin & H. Allansson (2009), *Snabba priser i långsam statistik*, Memo to the CPI Board, Statistics Sweden [in Swedish].
- ILO/IMF/OECD/UNECE/Eurostat/The World Bank (2004), *Consumer Price Index Manual: Theory and Practice*, Geneva: International Labour Office, www.ilo.org
- N.A. Klevmarken (2009), Towards an applicable true cost-of-living index that incorporates housing, *Journal of Economic and Social Measurement*, to appear; an earlier version was presented at the Meeting of the Ottawa Group in 2006, in London.
- A. Norberg & M. Ribe (2001) Hedonic methods in price statistics: Swedish applications, *Wiesbaden Symposium on Hedonic Methods*.
- M. Ribe (2004), Swedish re-considerations of user-cost approaches to owner occupied housing, *Statistical Journal of the United Nations ECE*, 21, 139–146.
- M. Ribe (2007a), Owner occupied housing in CPI, *The Swedish Economy – Statistical Perspective*, First Quarter, Statistics Sweden, pp. 28-31, www.scb.se
- M. Ribe (2007b), Current Swedish discussion on housing in the CPI, *Meeting of the Ottawa Group*, in Ottawa.
- M. Shimizu (2009), Hedonic approach for house rents in Japan, *Meeting of the Ottawa Group*, in Neuchâtel.
- SOU 1971:79, *Byggnadsindex för bostäder*, Delbetänkande av Byggnadsindexkommittén, Stockholm [in Swedish].
- SOU 1999:124, *Konsumentprisindex*, Betänkande från Utredningen om konsumentprisindex, Stockholm, <http://www.regeringen.se> [in Swedish, with summary and annexes in English]
- Statistics Sweden (2001), *The Swedish Consumer Price Index, A Handbook of Methods*, by J. Dalén, <http://www.scb.se>
- Swedish Government (2001), *Nya riktlinjer för konsumentprisindex*, Bilaga 4 till Budgetpropositionen för 2002, Prop. 2001/2002:1, Stockholm: Regeringskansliet, <http://www.regeringen.se> [in Swedish].
- J. Triplett (2006), *Handbook on Hedonic Indexes and Quality Adjustments in Price Indexes*, Paris: OECD.