The effect of House Market downturn on House Price Index

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Abstract

Downturn of housing markets is a fact leading to falling prices and lower volume of sales. In the Icelandic case this has led to problem because of fewer contracts and missing prices. This has caused difficult measurement problems that are outlined. This paper descripes also the Icelandic house price index, the development of housing sales and prices 2000-2009 and falling prices and lower sales volumes.

1.   Framework of house price indexes

The production of houses varies with the economic cycle and it must be taking into account that the time for preparation and the construction is usually long. All changes in the economic environment influence this process and can in the most difficult cases lead to housing bubbles. Sales of housing both old and new are also connected to the economic situation and can lead to contraction of sales of both old and new housing and the timeframe of the sale and therby the price measurement of housing. House price indices are also affected by this fact.

Houses also differs widely in quality, they are not homogeneous goods and are often produced as one of a kind; are unique durables (Diewert (2003b) p. 24). Under the matched model method the price changes of the same good is measured between periods. As houses may differ when traded, matching often fails. This is especially the case under housing crises when the volume of trade falls, fewer houses are sold and the quality differ videly. Maintenance and depreciation of houses vary over time so matching is difficult and quality adjustment of some sort is necessary. Houses do not appear on the market in exactly the same condition as they were when last purchased or produced so the matched model methodology fails and a quality adjustment of the house price index is needed.

Sales of houses are random and do not necessarily reflect the value or the composition of the housing stock. The indices suitable for use in the CPI are usually of the transaction kind but the methods, which are used when the housing stock is valued, are value estimates.

2.   Approaches to house price indexes

There are four main methods suggested for constructing constant quality adjusted real estate price indexes (Diewert (2006), p. 6-18).

The *repeated sales method* uses houses that are sold more than once (Baily, Muth and Nourks (1963)). The method has been developed in a weighted form (Palmquist (1980)) and that method can be interpreted as a hedonic method where the characteristic is the house sold. The problem with this method is the risk of bias, e.g. when major renovation or other changes have been made on the house which increase the quality or if the wear of the house has been high causing a decrease in the quality. Such changes are not captured by this method. There are insufficient numbers of repeated sales on the Icelandic housing market in order to calculate such an index.

The *assessment method* is based on a comparison between valuation of a house, often official, and its salesprice. In that case information on housing characteristics is not needed. It is an unweighted transaction index using the arithmetic mean as an estimator. Compared to the repeated sales method all housing transactions are used in the calculations. Examples of such indices are found in New Zealand, Denmark, Sweden and the Netherlands (de Vries et. al. (2008)). If detailed information on the property characteristics is available, stratification can be used and geometric estimator and superlative weighting could also be applied improving the method. The quality of this approach depends to large extent on the methods

used in the house valuation. Those methods should be homogenous and not show systematic difference in quality at the point of valuation.

The *stratification method* sorts information into fixed groups, or strata, in terms of housing characteristics. Then average (Duot) or median sales prices are calculated for each stratum. On the other hand the estimator could just as well be geometric (Jevon). These indexes can be either weighted or unweighted. The method is used in the Icelandic house price index for the calculation of the simple user cost model in the Icelandic CPI. The method is also used in Australia (Olczyk and Neideck (2007)).

The stratification method used in the Icelandic house price index compilation keeps fixity on, category sizes, property types, location in the country and location inside the capital area by the age of the properties. The estimator used in the calculation is geometric and the index is calculated superlatively (using the Fisher index in this case) (Guðnason and Jónsdóttir (2006, 2008 and 2009)).

The *hedonic method* measures the prices of characteristics of houses and in that case the correct functional form is crucial. There is a considerable amount of studies available in this field, (Diewert (2003c), (2003d), (2004), (Haan (2004)), (Li, Prud'homme and Yu (2006)).

3.   The Icelandic house price index.

The house price index used in the Icelandic CPI is based on market prices for houses obtained from sales contracts that the Land Registry collects. They are suitable for this purpose because they are standardized throughout the country. Every sales contract contains information on the property, its owners and the sales price, along with precise details on payment terms. Every property has a special, distinctive number which is used in the register of the Land Registry. These detailed data form a basis for the aggregate real estate value and form the grounds for measuring the market price of real estate in the consumer price index. Since the contracts are gathered through the offices of the District Commissioners upon being registered by the Land Registry, almost every concluded real estate agreement is obtained. It is not only in the interest of buyers that a contract is being registered but also a condition for credit services from the Housing Financing Fund and the commercial banks.

In the period until 2007 roughly 8–10 thousand real estate sales contracts were made annually, which means that around 8–10% of all the housing in the country was bought and sold. The sales fell to 4000 in 2008 and estimated to be only 2000 properties in 2009. The price concept is the same as for other price measurements in the CPI as the price used for computation is the one the consumer actually pays for goods and services, the price of the goods in cash. A sales contract details how payments are arranged; in fact, that information enters into figuring its present value. The basic reason for applying the present value is the fact that the value of money paid today is different from the value of money paid in the future.

The housing price index is computed from changes in the present value of real estate as declared in sales contracts. The greater part of the sales contracts serve in producing the imputed rent and are used in calculating the weighted national average since March 2000. The

price changes for real estate is calculated as a three-months moving average, with a one-month delay. April includes contracts from the period January to March, May contracts from the period February to April.

A stratification method is used in the Icelandic house price index and the index is transaction based weighted superlatively (the Fisher index in this case) and subindices are produced by this method. Transaction effect the average value of the housing stock which might lead to an increased divergence between quantity and value weights especially in periods of high house price inflation. Value weight are therefore used in the house price index as they better reflect market changes then the number of dwellings sold.

The value weights used in the house price are covering three years period and are changed monthly by adding one month and leaving out one month. The quantity vectors are now for the Laspeyres index (2008) covering the years 2005-2008 and for the the values of the Paasche index (2009) for 2006-2009.

Figure 1 Weights in the house price index in March 2009
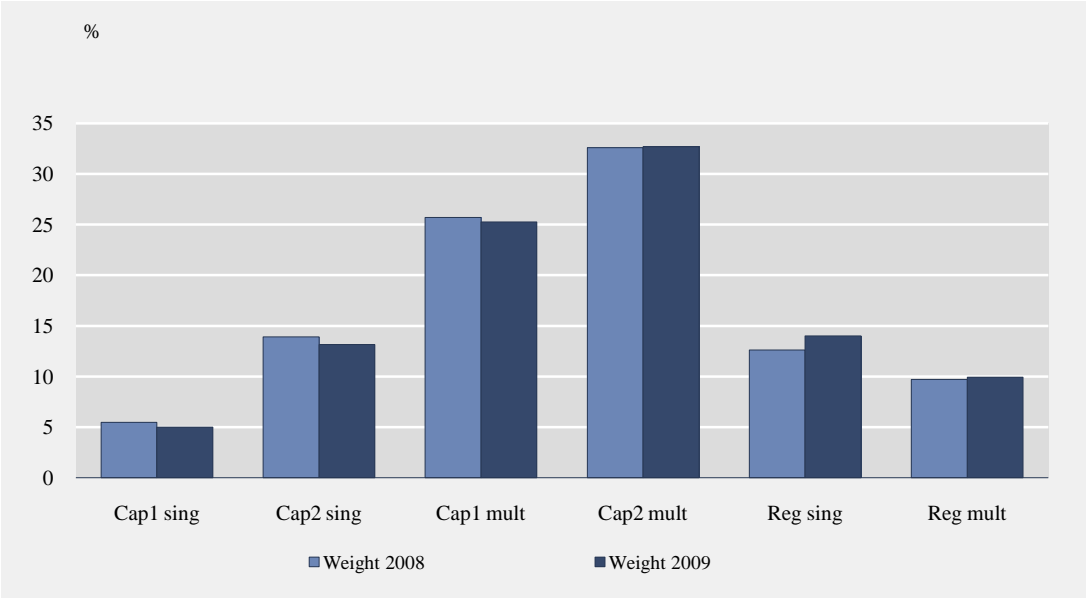
Note: Weight 2009 refers to March 2006-2009, weight 2008 to March 2005-2008. Cap1 is the inner part of the capital city area, Cap2 is the outer part, Reg is housing outside the capital area. Sing are single-flat houses, mult are multi-flat houses.

The biggest share of the weights is for multi-flat houses in the capital area. Single-flat houses in the capital area have similar share as housing outside the capital area. Since 2006 when this index was adopted there have been changes in the weightshares. Housing outside the capital area has bigger share of the total now but the share of single-flat houses in the capital area is lower.

The geometric mean is used when averaging house prices within each stratum at the elementary level. This is in line with the calculation method used at the elementary aggregate level in the Icelandic CPI. The geometric mean is also used in hedonic calculations and the

geometric mean is a typical matched model estimator (Diewert (2003b) p. 32 and (2003c) p. 334), (Haan (2004) p. 431).

In the compilation of the index fixity is kept on following details:

- Category sizes.
- Types of properties; multi-family housing, single-family housing.
- Location in the country; capital area, outside the capital area.
- Inside the capital area by age of the houses; older/inner and younger/outer. Properties are separated in that way by age/depreciation.

Following the increased activity in the housing market efter the year 2004 changes were made to the Icelandic property index in March 2006 aimed at improving the calculation in respect of measuring quality change. They were based on research on housing sales data over the period January 2000 to April 2006. In that period there were 57,200 properties sold, approximately 35,000 multi-family housing nearly 6,500 single-family houses, in the capital city area and 7,700 multi-family housing and 8,000 single-family houses outside the capital city area.

The capital area was split into two strata, an inner/older and an outer/newer where nearly 30% of the single-family houses sold belong to the inner/older area. There are 8 categories for properties size, giving after these changes altogether 18 subindices for housing in the capital city area and 8 indices by size category for property outside the capital city area. From both of these sets of indices, 4 overall indices are calculated for multi-family housing and single-family houses, inside and outside the capital city area. Hence 30 subindices are used when calculating the aggregate index for real estate prices. Emphasis is placed on comparing price developments within housing categories, not among types of property or among the different regions of Iceland.

4. The activity in the housing market 2000-2009

The main methodological difficulty is that the properties vary in quality. In the case of increase in sales many of the properties traded could be of lesser quality than before. In the case of sales decrease there are similar worries that better properties were sold and there could be bias in the trade.There could also be changes in the sizes and geographical spread that have to be closely monitored for the house price index.

In the years 2000-2004 the sales contracts in Iceland compiled were on the average approximately 8,600 per year. The sales contracts used on the average in the index calculation in this period amounted to 25,000 yearly. In the period 2005-2007 the number of sales went up in the boom following the private banks entering the housing loan market in 2004. On the average the numberof properties sold at this time vas 10.400 culminating in the sales of nearly 12.000 poperties in the year 2005, downturn to 8000 in the year 2006 and approximately 11.000 properties sold in 2007.

Table 1 Number of sales contracts used in the house price index 2000-2009

| Year	Cap 1 mult	Cap 2 mult	Cap 1 sing	Cap 2 sing	Reg mult	Reg sing	Total
2000	2.518	1.950	263	603	1.070	1.150	7.554
2001	2.400	2.015	267	632	895	1.039	7.247
2002	2.714	2.326	300	657	932	1.050	7.979
2003	3.005	2.746	336	830	985	1.273	9.175
2004	3.211	3.706	377	867	1.214	1.504	10.879
2005	3.217	3.451	316	804	2.224	1.837	11.849
2006	2.271	2.460	226	603	1.276	1.212	8.048
2007	3.073	3.814	339	442	1.582	1.570	10.820
2008	1.141	1.023	99	278	734	718	3.993
2009	438	512	80	148	360	440	1.978

Note: Cap1 is the inner part of the capital city area, Cap2 is the outer part, Reg is housing outside the capital area. Sing are single-flat houses, mult are multi-flat houses.

Compared to the average for the year 2000-2004 the sales in the year 2005 were 38.3% higher and in the year 2007 26.3% higher. The number of sales contracts fell rapidly in the beginning of the year 2008 as the crises in housing market started and and went further down after the bank crash in October 2008. The total number of houses sold in 2008 was around 4.000. The drop in housing sales in 2009 continued and in the first four months nearly 500 properties were traded, yearly equivalent to a sale of 2.000 houses.

This contraction from the average volume in the years 2000-2004 for multi flat housing in the capital area went down by 80-84%, the lowest value for this category 89% and the highest 65%. For single flat houses in the capital area the change is in the interval 74-79%, lowest value within a stratum being 70% and the highest 82%. For housing outside the capital area the values are similar (63-65%) and the variance is in the interval of 60-69%.

The fall in sales started in the beginning of 2008 and the trend is still increasing.

Figure 2. Number of sales contracts used in the house price index 2007-2009
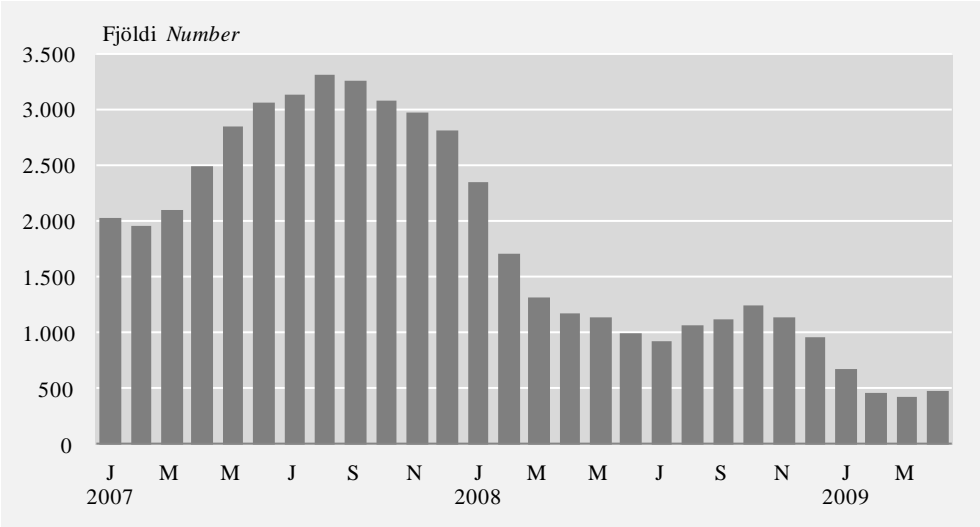
As the index results are calculated as a three-month moving average nearly 2800 sales contract were used in the compilation of the house price index in each three month interval for the year 2007. In 2008 the numbers had fallen down to 1300 on the average. In December 2008 to April 2009 the average numbers of contract that were used in the calculation of the house price index were around 500.

5. Housing prices 2000-2009

House prices started rising in the years 2003-2004 culminating in a 28.5% rise in the year 2005 and for single flat houses the prise rise was nearly 43%. Price change was lower in next years and to April 2009 there was a prise fall of 11.1% and in real terms by -21%.

Table 2. House prices development 2000-2009

Year	Cap mult %	Cap sing %	Reg total %	Total %	Cap Real mult %	Cap Real sing %	Reg Real total %	Total Real %
2001	7.9	9.6	2.2	6.7	1.1	2.7	-4.3	0.0
2002	3.3	3.2	9.7	4.8	-1.3	-1.4	4.9	0.2
2003	12.1	9.5	11.7	11.7	11.3	8.7	10.9	10.9
2004	11.2	13.7	7.0	10.5	8.9	11.4	4.8	8.2
2005	30.5	42.9	15.0	28.5	29.3	41.6	13.9	27.3
2006	15.4	19.8	18.8	16.8	10.1	14.3	13.3	11.4
2007	8.6	8.5	12.8	9.4	6.1	5.9	10.1	6.7
2008	6.3	7.2	5.3	6.2	-5.3	-4.5	-6.2	-5.3
2009	-10.1	-11.1	-12.0	-11.0	-20.5	-21.0	-21.8	-21.0

Note: Real is real price change and prices are deflated by CPI less housing cost. Cap1 is the inner part of the capital city area, Cap2 is the outer part, Reg is housing outside the capital area. Sing are single-flat houses, mult are multi-flat houses.

The turning point in the price development occurred in the middle of the year 2008. Then prices started to fall and in October 2008 there was a decline in the twelve month rate of change for the first time since the stratified model was introduced in March 2000. This trend has continued in the year 2009. In April 2009 the twelve month rate of change was -12.2%, the prices were11,8% lower for multi flat houses and 10.8% lower for single flat houses in the capital area. Outside the capital area the prices fell by 14,3%.

Figure 3. Housing prices, annual rate of change January 2008-April 2009
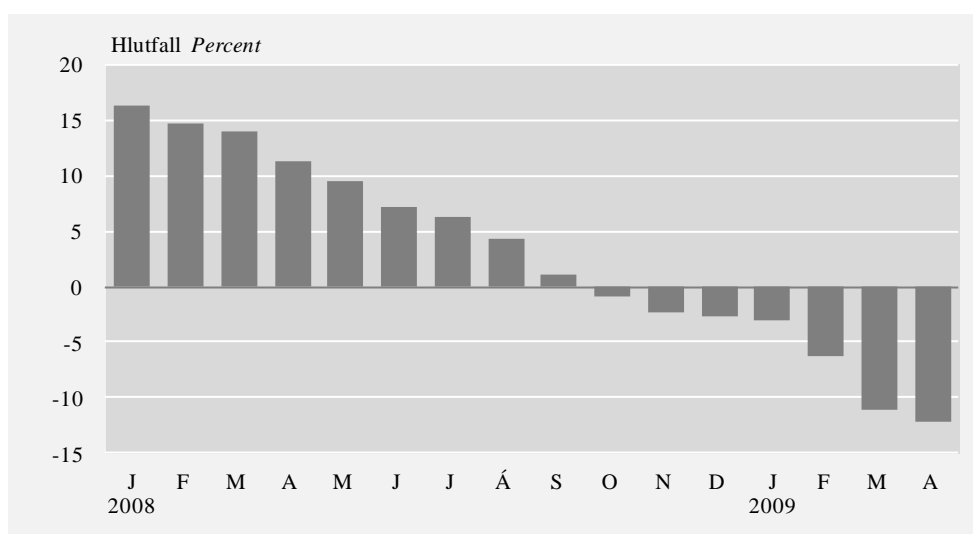
There has been considerable house price inflation in Iceland in recent years. In real terms, house prices (deflated by the CPI less housing cost) in the period 2000 to April 2009 have increased by 38% for multi-flat houses and 59% for single-flat houses in the capital area. For houses outside the capital area, the average price change in the same period was 22%. The average price change for the whole country was about 36%.

For houses in the capital area, the average price change 1993 to April 2009 in real terms was 76%, for multi-flat houses in the capital area 72% and single-flat houses in the capital area 97%.

In the period 1993–1998 house prices were stagnant or fell slightly. In the period 1998 to 2000 there was a 24% increase in house prices in the capital area in real terms and 17% outside the capital area in the same period. In the period 2000–2004 the average prices in the whole country rose by 20%. The average house prices rose in the period 2004-2006 by 42% and fell by 20% in the period 2006-April 2009.

7. Economic downturn and measurement problems in housing

There are mainly two problems connected to the recession in the housing market. Firstly the falling prices and secondly there is an increase in sales contract where a part of the payment is non monetary.

Following the downturn of the housing market the price observations (number of contracts) used in the calulation of the house price index are fewer. Compared to the period 2000-2004 the obserations have decreased by 65-85% influencing the calculation strongly. Still the stratification (by type, location and size) in the index is kept fixed in the calculation as earlier stated using a superlative approach.

In housing trade, real estate or liquid assets may constitute a part of the payment for the purchase of a dwelling. Such non monetary payment are found in approximately one third of the contracts and the present value of the contract is then calculated by a rate of return reflecting the risk of such trade. These contract are a part of the price building in the market and have to be taken into account.

7.1 Effect of fall in sales and missing prices

There are three strata used in the calculation of the house price index, by location, by the type of housing; multiple or single flats and by and size classes. When facing a large drop in the sales of housing it happens that few contracts are used for different strata and the composition of properties in each cell (stratum) can vary between months causing high volatility in the results. That raises questions about quality issues that can be difficult to deal with within the model. The current situation might challenge the suitability of the geometric mean as estimator.

There are two main ways to treat this problem. In the case that no sale occurs in a cell the price is kept unchanged at least for three months. This is a similar method as used in other parts of the CPI when when goods or services are not available. It is also well in line with the

concept for the user cost model used in the compilation of owner occupied housing in If very few contracts are available in a cell the rule used is that there should be at least five contracts available in the calculation. If there are fewer than five contracts available older prices are added to new ones to reach the minimal number of prices required in each month.

In 4% of cases in 2008 there were less than five prices available and similar figure to April 2009 were 15%. Missing prices were nearly 1% in 2008 and 4% in 2009. The total of this is 5% in 2008 and 19% 2009. It means that nearly one price in five is effected by the economic situation. The results differs between strata in 2009 as in the case for single flats in the capital area where this figure reaches 70%, compared to only 9% for multiple flats in the capital area and 16% for housing outside the capital area.
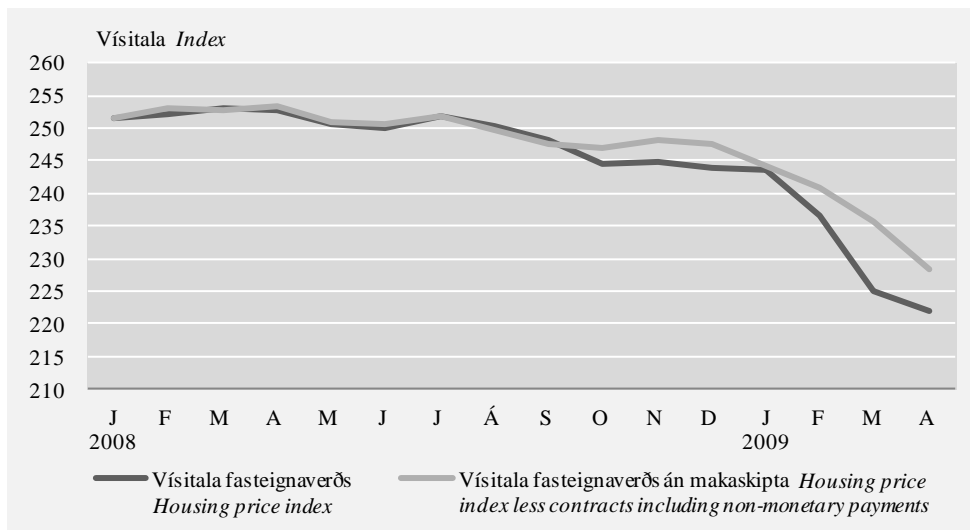
7.2. The effect of non monetary payments

Non monetary trade in housing occur when real estate or liquid assets may constitute a part of the payment for the purchase of a dwelling. A sales contract includes payment arrangement details; this information is used for computing the present value of the sales contract.

The Icelandic housing price index is computed from changes in the present value of real estate sales and the price changes for real estate are calculated as a three-month moving average, with a one-month delay. This method has been applied in the calculation from November 1992 when the user cost method was adapted.

Around mid-year 2008, these types of housing transactions became increasingly common. From May 2008 the share of housing purchase contracts involving non-monetary payments constituted 17% of all housing purchase contracts, for the capital area the share was 22% and outside the capital area 14%. In the first four months of 2009 this trend has strengthened and the total number of non monetary transactions rose to 28%, for the capital area to 40% and outside the capital area to 18 %. The biggest share of these transactions is for single flat houses in the capital area where the share of this type of transactions was 38% in 2008 rising to 54% in the period January to April 2009.

Figure 4. Effect of non-monetary payments on housing price index January 2008–2009

Vísitala *Index*

Legend:
— Vísitala fasteignaverðs *Housing price index*
— Vísitala fasteignaverðs án makaskipta *Housing price index less contracts including non-monetary payments*

As the non montary transaction became more common the required rate of return for such transactions was revised each month and figured out by using the highest long term real interest rates available in the banking system and with inflation also taken into account. In March 2009 the real interest rates were 8%, the inflation rate 15.2%, and thus the total rate of return used was around 23%, which entails that the nominal value of the real estate used for payment in housing purchases was reduced by nearly one quarter when calculating the present value of the sales price.

The method used lowers the value of the contract when calculating the present value. The main uncertainty connected to using the method is the question when the property, taken as a payment, can be sold and at what price. It is still considered necessary to include these contracts as they reflect market situation and in times of deep recession they can be considered as a precondition for sales to take place[1].

If the non monetary transactions had not been taken into account in the calculation the house price index would have been 2.9% higher in April 2009 than the published index including those transactions. The difference is highest in the case of multi flat housing in the capital area 4.8%. This difference is lowest in the case of single flat houses outside the capital area -7.9%.

There is a difficulty regarding the effect of non monetary transactions on the market price of housing. This is a complex measurement issue regarding how to include these transactions in the calculation of the present value of the contract when there are no standardised methods available.

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[1] The Icelandic Land Registry calculates its own house price index for the capital area leaving these transactions out of their calculations. They have tested non monetary transactions in their hedonic evaluation model indicating that the rate of return is in the interval of 15-20%.

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