Statistics Netherlands

Price index of existing own homes

Method description

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Content

Summary: Statistics Netherlands and the Dutch Land Registry Office have been publishing the price index for existing own homes since 24 January 2008. The index is based on the sale price appraisal ratio method. This report provides a description of the scope of the index, the underlying method and a step-by-step explanation of the process.

Key words: price index of existing own homes, sale price appraisal ratio method

1. Introduction

1.1 Reason for the report

In May 2005, the Dutch Land Registry Office (*Kadaster)* started publication of the house value index (WIK). WIK data are calculated according to the repeat sales (RS) method. With its introduction, it became evident that the WIK provides a valuable contribution to insight into price developments on the housing market, but that there was room for improvement and expansion of this index.
Statistics Netherlands and the Land Registry Office both made an effort to improve the index for existing dwellings. Statistics Netherlands participated in a pilot study started by Eurostat to figure out the best way to integrate the housing costs of owner-occupiers in the harmonised index of consumer prices (HICP) [1]. Eurostat is interested in an independent price index for existing dwellings. After the first publication in May 2005, the Land Registry Office and the research institute OTB/TUDelft continued their joint research with the objective to improve and expand the WIK [2].
This resulted in the price index of existing owner-occupied dwellings (PBK), based on the sale price appraisal ratio (SPAR) method. The PBK is a joint publication by Statistics Netherlands and the Dutch Land Registry Office, which was first published in January 2008. This report provides a description of the calculation method of the PBK.

1.2 Objective of the PBK

The price index of existing own homes (PBK) aims to evaluate *price* changes in *the stock of existing own homes.* The dwelling is located on *Dutch* territory and sold to a private buyer.

1.3 Abbreviations

The following abbreviations are used in this report:

HICP	Harmonised Index of Consumer Prices
PBK	Price index of existing own homes
RS	Repeat Sales
SPAR	Sale Price Appraisal Ratio
WIK	house value index of the Dutch Land Registry Office
WOZ	property assessment act

2. Calculation method of the PBK

2.1 Sale Price Appraisal Ratio Method

The calculation of the PBK is based on the so-called Sale Price Appraisal Ratio (SPAR) method. Bourassa et al. (2006) [3] and De Haan et al. (2008) [4] provide a description of the SPAR method, and various countries already use it to calculate a price index for existing dwellings. The method uses *matched pairs*, i.e. it combines (officially) estimated selling prices with actual selling prices. Formula (1) reflects the SPAR method:

$$I_t = \frac{\sum_{j=1}^{n_t} S_{jt} \Big/ \sum_{j=1}^{n_t} A_{jp}}{\sum_{i=1}^{n_p} S_{ip} \Big/ \sum_{i=1}^{n_p} A_{ip}} * 100 \quad , \qquad (1)$$

where I_t represents the price index over the period t, S_{jt} the selling price of dwelling j in period t, A_{jp} the appraised selling prices (*appraisal*) of dwelling j at reference moment p and n the number of transactions. Due to the fact that the selling prices of most dwellings sold in a particular period are unknown in the base period, selling prices are estimated by using *appraisal* data. The numerator reflects the price developments of dwellings sold in a particular month relative to the *appraisals* from the base period of these dwellings. The denominator corrects for under and overestimation of the *appraisal* compared to the actual selling price in the reference period. Formula (1) is a *weighted* method [3]. This implies that more weight is attributed to expensive dwellings than to cheaper dwellings.

2.2 Characteristics

A big advantage of the SPAR method is the use of (nearly) all data, because the base prices of all dwellings in the base period are known. If a dwelling is sold, it is *matched* with the *appraisal* of the same dwelling and it is included in the calculation. An additional advantage is the absence of revision, i.e. historical data are not subject to change caused by the addition of new data in the next period. Moreover, the SPAR method corrects for changes in the 'quality mix'. The average quality of sold dwellings within a set may vary in each period. However, in the SPAR method the selling price of a dwelling is *matched* to the *appraisal* of the same dwelling, thus eliminating the problem of the 'quality mix'.
As dwellings may change in quality over time due to renovations, it is imperative in the SPAR method to adjust the *appraisals* if a dwelling is renovated. If the *appraisals* are not adjusted, a quality change is reflected in the price increase, which is not the objective of the PBK. Quality changes as a result of conversion carried out between the reference date and the moment of appraisal are reflected in the Dutch WOZ value used for the calculation of the PBK (see section 2.3.2). However, the PBK does not correct for changes in the quality of a dwelling in the period between the WOZ evaluation and the dwelling's selling moment. This effect is assumed to be fairly limited.
Finally, transparency and simplicity are two advantages of the SPAR method.

2.3 Data

For the calculation of the PBK based on the SPAR method, selling prices as registered by the Dutch Land Registry Office are used, and for the *appraisals* the WOZ values from the most recent period are used.

2.3.1 Selling prices

The Dutch Land Registry Office has a legal obligation to register all changes in property ownership. Once the deed of conveyance is signed at the notary, a copy of this Act is registered at the Land Registry Office and the data be included in the Land Registry transaction database. The Office also registers selling price, address, type of dwelling and transfer date. As from January 1993, all property ownership changes in the Netherlands are recorded in the Land Registry transaction database.
The seller of a dwelling may be a private individual or, for instance, a housing corporation; the buyer is invariably a private person. The selling price is the outcome of the negotiation between seller and buyer. The selling price includes the land on which the property stands, unless this land is leased. The selling price does not include additional costs (notary, estate agent and surveyor services and transfer tax). Moveable property, like household effects, is also excluded.
Table 2.3.1.1 shows the number of existing own homes sold and the average price for a range of years. It shows that in the year 2006 most transactions were recorded. Since 2009 the number decreased considerably and is lower than in the first years of registration.

2.3.1.1 Annual number and average selling price of all dwellings sold

Year	Number	Average selling price (€)
1993	145,792	81,037
1994	155,538	88,846
1995	154,568	93,750
…		
2000	189,358	172,050
…		
2005	206,629	222,706
2006	209,767	235,843
2007	202,401	248,325
2008	182,392	254,918
2009	127,532	238,259
2010	126,127	239,530
2011	120,739	240,059
2012	117,261	226,661
2013	110,094	213,353

Source: CBS and Dutch Land Registry Office

The Land Registry Office divides existing own homes into five types and the category ‘type unknown’:

1. Multi-family dwellings: apartments
2. Single-family dwellings: corner houses
3. Single-family dwellings: terraced houses
4. Single-family dwellings: semi-detached houses
5. Single-family dwellings: detached houses
6. Type of dwelling unknown

Table 2.3.1.2 shows all dwellings sold in 1995 and 2012, broken down by province and type of dwelling relative to the total dwelling stock of January 2012. All other years show a similar distribution. The figures show that in the province Utrecht, Noord-Holland en Zuid-Holland relative more dwellings are sold proportional to the stock of existing own homes. For the dwelling types, apartments are sold more, while detached houses are sold less.

2.3.1.2 Percentage of all dwellings sold in 1995 and 2012 by province and type of dwelling (in relation to the dwelling stock on 1 January 2012)

Province	dwellings sold in 1995	dwellings sold in 2012	stock of existing own homes on 1–1–2012
	%		
Groningen	3.6	3.2	3.5
Friesland	4.4	3.4	4.3
Drenthe	3.3	2.9	3.3
Overijssel	6.2	6.7	6.8
Flevoland	1.8	2.2	2.4
Gelderland	11.2	10.9	12.1
Utrecht	8.0	8.1	7.3
Noord-Holland	14.3	17.9	14.6
Zuid-Holland	23.4	21.2	19.7
Zeeland	2.6	2.9	2.9
Noord-Brabant	15.2	14.1	15.6
Limburg	6.1	6.4	7.4
Totaal	100.0	100.0	100.0
Type of dwelling	**dwellings sold in 1995**	**dwellings sold in 2012**	**stock of existing own homes on 1–1–2012**
	%		
Apartment	21.0	28.0	15.2
Terraced house	32.6	32.0	34.7
Corner house	13.2	13.8	14.8
Semi-detached house	12.5	11.2	14.4
Detached house	14.1	11.8	19.4
Type unknown	6.6	3.1	1.5
Total	100.0	100.0	100.0

Source: CBS and Dutch Land Registry Office

2.3.2 WOZ data

Since 1995, the Act on Property Assessment (WOZ) [5] obliges municipal authorities to assess the value of all immovable property at regular intervals. Section 17, paragraph 1 of this Act requires that ‘all immovable property should be evaluated’. Paragraph 2 indicates how the evaluation should be conducted: ‘the value is determined based on the value attributed to the immovable property, if the full and unencumbered ownership thereof could be transferred and the new owner should be able to forthwith bring the property into full use in the current state.’ The evaluation must be done in accordance with the law and for a nationwide reference date. Till 2007 there were four nationwide value reference dates (see table below). From 2007, the value reference date is annually.

2.3.2.1 Value reference dates immovable properties

Value reference data	Dwelling stock of	Provisional	Final
1 january 1995	1 january of 1997–2000	End of 1997	january 1999
1 january 1999	1 january of 2001–2004	End of 2001	january 2003
1 january 2003	1 january of 2005–2006	End of 2005	january 2007
1 january 2005	1 january of 2007	End of 2007	january 2009
1 january 2007	1 january of 2008	End of 2008	End of 2010
...			
1 january 2012	1 january of 2013	End of 2013	End of 2015
...			

The economic value of all immovable property is known at the time of the preliminary determination. According to section 18, paragraph 1 'the value of property is based on the value of the property on the value reference date'. However, according to section 19, paragraph 1, the value is adjusted, 'if the property is changed as a result of extension, rebuilding, improvement, demolition or destruction in the year after the value reference date.' The WOZ value includes the land belonging to the property, even if the land is leased. A requirement of the SPAR method is that *appraisals* (i.e. the WOZ values) should be representative for selling prices, or rather: a fixed relationship between the selling price and the WOZ value is essential. The WOZ values used to calculate the PBK deviate on average from the selling prices of property sold during the value reference data, but the average relationship between the selling price and the WOZ value approaches the ideal value of 1. Moreover, the deviation from the average is stable for the last years (see table 2.3.2.2). This also counts for the years after the crisis in 2009. Because the SPAR method corrects for under and overestimation of the *appraisals* (see section 2.1) and also because outliers are not included in the calculation of the PBK (see section 2.4.1), the quality of WOZ values is sufficient to calculate the PBK.

2.3.2.2 Data selling price and WOZ value per value reference date

Reference date	Average selling price around April[1)] in thousand €	Average WOZ value in thousand €	Average relation price/WOZ	Standard deviation price/WOZ relation
1 january 1995	93.2	89.2	1.055	0.161
1 january 1999	136.8	135.5	1.010	0.125
1 january 2003	201.7	201.4	1.004	0.106
1 january 2005	216.9	217.7	0.998	0.095
1 january 2007	241.5	240.1	1.005	0.090
1 january 2008	249.9	248.6	1.003	0.086
1 january 2009	236.8	240.3	0.983	0.088
1 january 2010	235.8	239.5	0.983	0.087
1 january 2011	239.0	242.5	0.983	0.085
1 january 2012	232.2	236.2	0.982	0.084

Source: CBS and Dutch Land Registry Office

1) Because the period is about 2 to 3 months between the provisional contract (the moment the price is set) and the moment the sale is registered by the Dutch Land Registry Office, the sales of the months around April are chosen. The sale price of dwellings registered in or around the month April, should represent the price level of January.

2.4 Calculation PBK

The calculation of the PBK based on the SPAR method is performed in 4 steps:

1. Determining and filtering the database
2. Stratification
3. Calculation of subseries per stratum
4. Linking and weighting of subseries

2.4.1 Step 1 – Determining and filtering the database

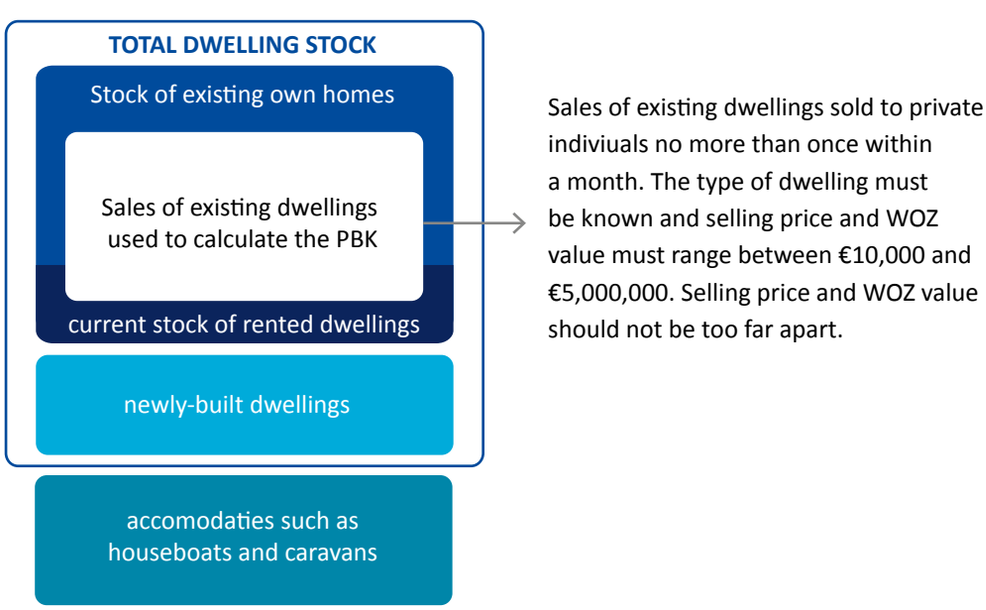
First, the transactions are selected that are related to the target population of the PBK. The PBK includes all sales of current residential property in the Netherlands sold to private buyers (see figure 2.4.1.1). This also implies inclusion of sales by housing corporations to private buyers. Hence, the following two categories of dwellings as defined in the Act on Property Assessment, are taken into account for the calculation of the PBK:

Code 10 Dwelling serving as main accommodation
Code 11 Dwelling with office space and mainly used for residential purposes
Code 12 Recreational dwellings and dwellings where primarily a profession is practised (e.g. farms)

These categories refer to dwellings for single or multi-person households. Houseboats and caravans are excluded since they do not belong to the category immovable property. Newly-built dwellings and rented dwellings which are not sold to a private buyer are excluded. Then all unreliable data are removed from the transaction database of the Land Registry Office and the WOZ files, in order to rule out negative effects on the PBK. In total, six selection criteria are used to obtain a reliable database (see figure 2.4.1.1). Dwellings are not included if they match one of the following characteristics:

1. type of dwelling unknown;
2. sold more than once within a month;
3. selling price below €10,000 or above €5,000,000;
4. WOZ value unknown;
5. WOZ value below €10,000 or above €5,000,000;
6. unrealistic ratio between selling price and WOZ value.

2.4.1.1 Existing dwellings used for the PBK in relation to the total dwelling stock



The last selection criterion requires further explanation. The PBK calculation is based on the ratio between selling price and WOZ value of all dwellings sold in a particular month. If there is no plausible relationship between the two entities, this may result in a huge, unrealistic price change. Such examples, which can cause bias in the PBK, are rare. The introduction of a minimum value of €10,000 and a maximum value of €5,000,000 eliminates questionable transactions to a great extent.
Furthermore, the selling price – which is adjusted for price changes - is not permitted to be less than half or more than double the WOZ value used. In other words, the transaction will be removed if it satisfies equation (2) or (3)

$$\frac{S_{jt} / A_{jp}}{I_{NL}^{t-1} / I_{NL}^{p}} < 0{,}5 \qquad (2)$$

$$\frac{S_{jt} / A_{jp}}{I_{NL}^{t-1} / I_{NL}^{p}} < 2 \qquad (3)$$

where S_{jt} refers to the selling price of dwelling *j* in period *t*, and A_{jp} refers to the WOZ value of dwelling *i* at reference date *p*. The quotient to the right of the slash reflects the relative change in the index for the Netherlands as a whole between the previous period and reference moment *p*. Dividing the ratio by this quotient causes an adjustment of the selling price for incremental changes in the price level.
After applying all selection criteria, approximately 90 percent of all sales of existing dwellings in the Land Registry transaction database fit the requirements for calculating the PBK. The most transactions are removed because of selection criteria 4 and 5. After selection criterion 1 to 5, the removed outliers (equation 2 en 3) account for less than 2 percent of the number of sales per month.

2.4.2 Step 2 - Stratification

Sold dwellings used to calculate the PBK are broken down by province (12) and type of dwelling (5), resulting in 60 strata. As a result the set of sold dwellings becomes more homogeneous.

2.4.3 Step 3 - Subseries

The PBK series begins in January 1995, because from this date on the WOZ value is available. Each new WOZ period causes a reference shift. Therefore the PBK is composed of several subseries starting every new WOZ period. The current dwelling stock (dark blue parts in figure 2.4.1.1) is stable between two successive value reference dates. Dwellings which enter the current housing market in the period between two value reference dates are included after the new value reference date.

Table 2.4.3.1 provides an overview of the various calculated subseries and the WOZ values that were used to calculate these subseries.
When the publication was launched, definite WOZ values with value reference dates January 1995, January 1999 and January 2003 were available. Therefore definite WOZ values are used for the period 1995–2005. After that, provisional WOZ values are used. The definite WOZ values are available after four years and the difference between provisional and definite WOZ values is minor. This procedure does not lead to different results.

2.4.3.1 The use of WOZ values in various subseries

Period beginning	Period end	WOZ reference date
January 1995	January 1999	1 January 1995
January 1999	January 2003	1 January 1999
January 2003	January 2005	1 January 2003
January 2005	December 2008	1 January 2005
December 2008	December 2009	1 January 2007
December 2009	December 2010	1 January 2008
…	…	…
December Y	December Y+1	1 January Y-1

From the end of 2008, a new subset starts each year. In order to calculate these subseries WOZ data are used with reference date 1 January, dating two years back.
The different subseries are calculated separately for the different strata.

2.4.4 Step 4 – Linking and weighting

Aggregated index series arise when weighted *sub*series per stratum are added. The weighting factors indicate each stratum's share relative to the total value of the stock[1)] of existing own homes in the base period. The calculation per stratum is the sum of all WOZ values per stratum divided by the sum of all WOZ values throughout the Netherlands (see formula 4).

$$W_s = \frac{\sum_{j=1}^{n_s} A_{jp}}{\sum_{j=1}^{n_{total}} S_{jp}} \qquad (4)$$

in which $\sum_{j=1}^{n_s} A_{jp}$ and $\sum_{j=1}^{n_{total}} A_{jp}$, are respectively, the sum of all WOZ values of dwellings *j* in stratum *s* (*s* = 1,2…60) on 1 January of a base period and the sum of all WOZ values of all dwellings on 1 January of a base period. N.B. the weighting factors add up to 1:

$$\sum_{s=1}^{60} W_s = 1.$$

After the *sub*series of the strata, required for a particular aggregated index series, have been weighted and added up, the weighted *sub*series of the overlapping months are linked. As a result, an uninterrupted (chain) index set is created.
Finally, all index series are rescaled to base year 2010 (2010 = 100) according to European directives. As a result international comparison of the index series is easier.

1) This counts from 2007 onwards. Before 2007 the weighting scheme is based on the stock of all dwellings, as the difference between rented and owner-occupied dwellings is not known earlier.

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[4] Haan, J. de, Wal, E. van der & Vries, P. de, (2008). The measurement of house prices: A review of the Sale Price Appraisal Method.

[5] Wet Waardering Onroerende Zaken, last update January 28th, 1999, Stb 30

Explanation of symbols

.	Data not available
*	Provisional figure
**	Revised provisional figure (but not definite)
x	Publication prohibited (confidential figure)
–	Nil
–	(Between two figures) inclusive
0 (0.0)	Less than half of unit concerned
empty cell	Not applicable
2013–2014	2013 to 2014 inclusive
2013/2014	Average for 2013 to 2014 inclusive
2013/'14	Crop year, financial year, school year, etc., beginning in 2013 and ending in 2014
2011/'12–2013/'14	Crop year, financial year, etc., 2011/'12 to 2013/'14 inclusive

Due to rounding, some totals may not correspond to the sum of the separate figures.

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