

Chapter 6: Seasonal adjustments to indices, monitoring and publication

The main used-housing price indices have been analysed over the long term and their good quality has been certified by the official “Notaires-INSEE” designation. Prior to certification, they are examined by a Scientific Board, formed under the terms of an agreement between the French notariat and INSEE.⁴⁸ In addition, the French public statistics authority (ASP) has approved the indices for the Paris Region produced by Paris Notaires Services (notice no. 2011-01 by the *Autorité de la statistique publique* on 21 June 2011 on the certification of quarterly statistics on housing prices in the Paris Region). Each of these indices is produced as a gross index and a seasonally adjusted index.

Supplementary indices covering the regions, *départements*, major cities or urban units may be certified as “Notaires-INSEE” indices provided they appear to be stable and rely on a sufficiently large dataset, in accordance with the criteria set out by the Scientific Board of the Notaires-INSEE indices.

Since November 2011, the old series have been replaced by new ones (based on regular updates of hedonic models, with base 100 in the first quarter of 2010).

The indices are monitored regularly by the Scientific Board of the Notaires-INSEE indices, via dashboards.

6.1 Seasonal adjustments to indices

6.1.1 Method for calculating corrections for seasonal adjustments

In version 3, the seasonal adjustment method selected is CENSUS X12. The method used in version 2 was CENSUS X11. With X12, estimates for seasonal adjustment coefficients are improved. In particular, by calculating moving averages the length of series can be shortened. With X12, series can be extended using Arima models to estimate the missing quarters or months. Method X12 is available in the SAS and Démétra software packages. It was the Démétra software that was selected for the seasonal adjustments in the Notaires-INSEE indices.

6.1.2 Taking corrections into account for trading days

The number of trading days that make up the quarters has no notable impact on determining prices. The price indices are not processed in any way to correct for the effect of trading days.

6.1.3 Nature of seasonally adjusted data

The indices are based on one quarter and are published every three months, covering a calendar quarter, for example, the first quarter of 2013 (January 2013, February 2013 and March 2013). “Quarter-on-quarter” indices can also be calculated, based on a quarter, but published every month (covering, for example, the three-month period: February 2013, March 2013 and April 2013). They correspond for a given month to the average of the data for the reference month and the two preceding months.⁴⁹ These calculations are made by the notaries. Seasonal adjustment was designed with this feature in mind: it is applied to quarter-on-quarter indices.

6.1.4 Frequency of calculating seasonal adjustment coefficients

The seasonal coefficients are revised once a year. They are updated in August, once the definitive data from the 4th quarter of the previous year has become available. An annual update of the seasonal adjustment seems preferable to a monthly or quarterly update. In this way, the number of revisions to the coefficients is limited, which is important since they may prove to be somewhat fragile, being estimated from non-definitive data. At the time of the annual revision of the seasonally adjusted coefficients, the Arima models used to extend the raw series are also updated.

The seasonally adjusted coefficients used to calculate indices later than the period of seasonal adjustment are the result of projections. These projections are made over two years.

⁴⁸ See the composition of the Scientific Board for the Notaires-INSEE indices in the agreements concerning the partnership between INSEE and the French Notariat (Appendices 7 et 8).

⁴⁹ Cf. Chapter 3.

6.1.5 Direct or indirect method

The first method is what is called the direct method, where each series is seasonally adjusted, whatever its aggregation level. The indirect method, on the other hand, consists of making seasonal adjustments to the primary series first then aggregating the seasonally adjusted series.

In theory, neither method is better than the other. However, the indirect method does have the advantage, when adapted specifically to the Notaires-INSEE indices, of ensuring coherence between changes in different aggregation levels. The direct method, however, can give contradictory results: it is possible that all the seasonally adjusted components of an aggregate (e.g. the *départements*) change in one direction while the seasonal adjustment of the aggregate (e.g. the region) changes in the other. This would be difficult to express.

We therefore perform seasonal adjustments using the indirect method. For the aggregation, the primary seasonally adjusted indices are weighted by the values of the reference stock at the baseline period $q(t)$ used to chain indices over the reference period $p(t)$.⁵⁰ As a result, the weightings selected are the same as those for the raw indices.

6.1.6 Calculation

To calculate seasonally adjusted coefficients, we can choose an additive or a multiplicative model. With the additive model, we suppose that the components of the series are independent one from the other. Thus the level of seasonal variation is independent of the level of the series. The multiplicative model, on the other hand, supposes that the components of the series are dependent one on the other. For housing prices, it clearly has to be the multiplicative method that is used in all cases because the level of seasonal variation increases and decreases with the level of the series.

Using X12, it is also possible to define the length of the moving average. If seasonality changes rapidly, in particular, it may be preferable to reduce the length of the moving averages.

In concrete terms, two sets of strata are used, the first for apartments and the second for houses. For each type of dwelling, the seasonal adjustments are first made at primary level. The seasonally adjusted indices for the non-primary geographic areas and data sets grouping apartments and houses together are obtained by aggregation.

For apartments, the primary geographic areas are the following:

- *départements* in the Paris Region (8 series);
- all city centres in the Provinces with more than 10,000 inhabitants;
- all suburban towns in the Provinces with more than 10,000 inhabitants;
- all towns in the Provinces with fewer than 10,000 inhabitants and rural municipalities in the Provinces;
- regions of Rhône-Alpes, Provence-Alpes-Côte d'Azur and Nord-Pas-de-Calais.⁵¹

For houses, the primary geographic areas are the following:

- *départements* in the Paris Region, excluding Paris (7 series);
- all of the Provinces;
- regions of Rhône-Alpes, Provence-Alpes-Côte d'Azur and Nord-Pas-de-Calais.⁵²

The number of series to be seasonally adjusted is 28: 15 for the Paris Region and 13 for the Provinces.

⁵⁰ Cf. Chapter 3.

⁵¹ Regional seasonally adjusted indices are not used when calculating seasonally adjusted indices relating to metropolitan France. They are used, however, to calculate seasonally adjusted indices for regional prices of all dwellings.

⁵² Cf. note 51.

Table 6.1 – Seasonally adjusted “Notaires-INSEE” series

Apartments in Paris
Apartments in Seine-et-Marne
Houses in Seine-et-Marne
Apartments in Yvelines
Houses in Yvelines
Apartments in Essonne
Houses in Essonne
Apartments in Hauts-de-Seine
Houses in Hauts-de-Seine
Apartments in Seine-Saint-Denis
Houses in Seine-Saint-Denis
Apartments in Val de Marne
Houses in Val de Marne
Apartments in Val d’Oise
Houses in Val d’Oise
Apartments in city-centres of agglomerations of more than 10,000 inhabitants
Apartments in suburbs of agglomerations of more than 10,000 inhabitants
Apartments in agglomerations of fewer than 10,000 and rural areas
Houses in the Provinces
Apartments in Provence-Alpes-Côte d’Azur
Houses in Provence-Alpes-Côte d’Azur
Apartments in Marseille
Apartments in Rhône-Alpes
Houses in Rhône-Alpes
Apartments in Lyon
Apartments in Nord-Pas-de-Calais
Houses in Nord-Pas-de-Calais
Houses in Lille

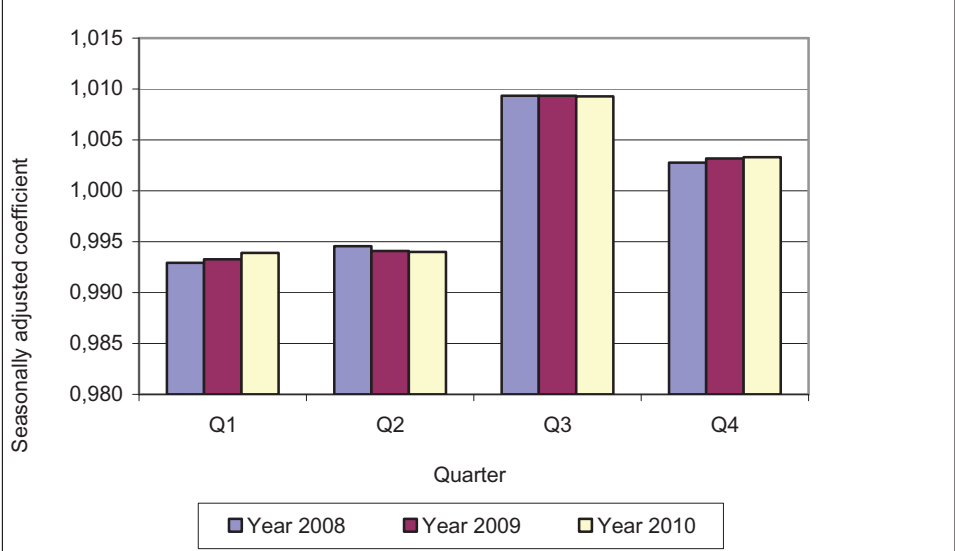
Table 6.2 - Correspondence between primary series and aggregates

Aggregated series	Corresponding primary series
Provinces	
Apartments in agglomerations of more than 10,000 inhabitants	- Apartments in city centres - Apartments in suburbs
Apartments	- Apartments in city centres - Apartments in suburbs - Apartments in rural areas
Apartments and houses	- Apartments in city centres - Apartments in suburbs - Apartments in rural areas - Houses
Apartments and houses: Rhône-Alpes	- Apartments Rhône-Alpes - Houses Rhône-Alpes
Apartments and houses: Provence-Alpes-Côte d'Azur	- Apartments Provence-Alpes-Côte d'Azur - Houses Provence-Alpes-Côte d'Azur
Apartments and houses: Nord-Pas-de-Calais	- Apartments Nord-Pas-de-Calais - Houses Nord-Pas-de-Calais
Paris Region	
Apartments	- Apartments by <i>département</i>
Apartments Paris Region excluding Paris	- Apartments by <i>département</i>
Apartments outer suburbs	- Apartments by <i>département</i> (nos. 77, 78, 91 and 95)
Apartments inner suburbs	- Apartments by <i>département</i> (nos. 92, 93 and 94)
Houses	- Houses by <i>département</i>
Houses outer suburbs	- Houses by <i>département</i> (nos. 77, 78, 91 and 95)
Houses inner suburbs	- Houses by <i>département</i> (nos. 92, 93 and 94)
Apartments and houses	- Apartments by <i>département</i> - Houses by <i>département</i>
Metropolitan France	
Apartments	- Apartments in city centres - Apartments in suburbs - Apartments in rural areas - Apartments in Paris Region by <i>département</i>
Houses	- Houses in Provinces - Houses in Paris Region by <i>département</i>
Apartments and houses	- Apartments in city centres - Apartments in suburbs - Apartments in rural areas - Houses in Provinces - Apartments in Paris Region by <i>département</i> - Houses in Paris Region by <i>département</i>

6.1.7 Results

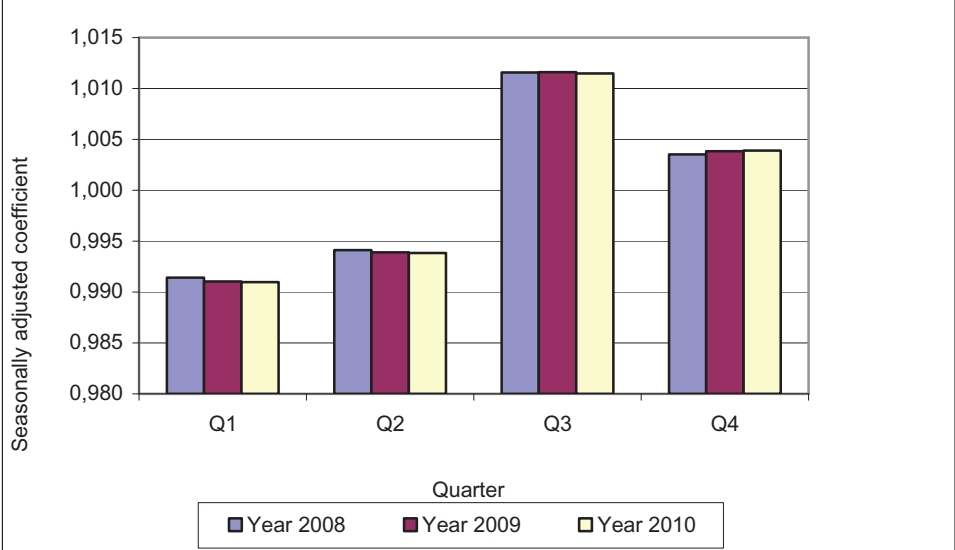
The prices of apartments, just like those of houses, experience seasonal fluctuations. All other things being equal, prices are slightly higher in the third quarter and this seasonal effect is more pronounced for houses than for apartments (Figures 6.1 and 6.2).

Figure 6.1: Seasonally adjusted coefficients of indices for apartments in all of metropolitan France



How to read this chart: apartment prices are highest in the third quarter. Seasonal adjustment changes little over time.

Figure 6.2: Seasonally adjusted coefficients of indices for houses in all of metropolitan France



How to read this chart: as for apartments, house prices are highest in the third quarter. Seasonal adjustment coefficients for houses are also fairly stable over time.

6.2 Dashboard

Each of the quarterly indices is available in the form of raw data and seasonally adjusted data, advance provisional, provisional, semi-final and final data.⁵³

6.2.1 Objectives and composition of the dashboard

The dashboard is designed to comment on the indices, to uncover any possible anomalies and ultimately to validate publication. Because speed is of the essence, INSEE only validates the indices certified with the “Notaires-INSEE” designation.

The principle behind validation is based on the monitoring of the databases (volumes, coverage rates), analysing revisions and changes, and comparing changes in average prices and indices, to detect any structural effects and to find out their cause.

We analyse advance provisional indices and the provisional indices for the current quarter, semi-definitive and definitive indices from the previous quarter, also the corresponding volumes of transactions. The main figures to be checked are those published by INSEE in the *Informations rapides* collection and the macro-economic data-bank (BDM).

6.2.2 Examples of tables

To make it easier to identify suspect data, the dashboard brings together information on the levels of the indices, changes, revisions, contributions to overall changes, contributions to overall revisions, transaction volumes and coverage rates in the form of composite tables.

The contribution of a given area d to quarterly changes in supra-departmental aggregates is given by the following formula:

$$C_{d,t} = \frac{I_{A,t/0}}{I_{A,t-1/0}} * \left(\frac{\delta_d \hat{W}_{d,p(t),q(t)}}{\sum_{e \in A} \delta_e \hat{W}_{e,p(t),q(t)}} \right) * \frac{I_{t/0}(d) - I_{t-1/0}(d)}{I_{t_0/0}(d)}$$

where:

t represents a monthly date after December 2007 which corresponds to year a within the set $\{N, N+1\}$ where N is even,

t_0 the corresponding date in the same month (1st, 2nd or 3rd month of the quarter) of the last quarter of the year $N-1$ where N is even,

$C_{d,t}$: contribution of area d to the change in aggregate A between $t-1$ and t ,

$I_{A,t/0}$: index of aggregate A on date t compared with reference quarter 0 ,

$I_{A,t_0/0}$: index of aggregate A on date t_0 compared with reference quarter 0 ,

$I_{t/0}(d)$: index of area d (or part of area d if the aggregate does not include the entire area) on date t compared with reference quarter 0 ,

$I_{t_0/0}(d)$: index of area d (or part of area d if the aggregate does not include the entire area) on date t_0 compared with reference quarter 0 ,

$\hat{W}_{d,p(t),q(t)}$: value of properties in relation to area d (or part of area d if the aggregate does not include the entire area) traded during the period $p(t)$ estimated on date $q(t)$, $p(t)$ corresponding to years $N-3$ and $N-2$ where N is even and $q(t)$ is the last quarter of year $N-2$ where N is even,

⁵³ Cf. Appendix 11.

δ_d , δ_e coefficients applied to take into account the non-exhaustivity of the notaries' database in the course of year $N-2$ where N is even.

$\hat{W}_{e,p(t),q(t)}$: value of properties in area e (or part of area e if the aggregate does not include the entire area) purchased during the period $p(t)$ estimated on date $q(t)$, $p(t)$ corresponding to years $N-3$ and $N-2$ where N is even and $q(t)$ is the last quarter of year $N-2$ where N is even.

Sets of tables are produced to monitor changes and to monitor revisions, at an aggregate level and at a fine level. From the different contributions made to changes and revisions we can quickly identify the detailed series that are giving rise to marked changes or revisions in certain aggregates (*Table 6.3*).

The summary tables also include the following information:

- quarterly changes;
- contributions to quarterly changes overall;
- revisions;
- contributions to revisions overall.

Table 6.3 – Summary of changes relating to apartments in the Provinces (example shows 3rd quarter 2012)

Area	Weighting (%)	Seasonally adjusted indices		Quarterly variations in seasonal adjustment		Year-on-year changes in seasonal adjustment	Volumes		Change in volumes		Coverage rate		
		Q	Q-1	Q	Q-1/Q-2		Q/Q-1	Q/Q-4	Q-1	Q	Q/Q-1	Q/Q-4	Q-1
France		114.0	113.8	-0.4%	-0.2%	-0.7%						50.3%	42.0%
Provinces	100.0%	107.2	106.6	-0.5%	-0.6%	-1.3%	22,936	15,480	-32.5%	-50.2%		44.5%	34.8%
Rural	9.7%	104.1	104.3	-1.6%	0.2%	-2.3%	2,810	1,871	-33.4%	-46.1%			
City centre	59.7%	107.7	107.2	-0.5%	-0.4%	-1.2%	13,547	9,233	-31.8%	-51.1%			
Suburbs	30.6%	107.6	106.3	-0.2%	-1.3%	-1.3%	6,579	4,376	-33.5%	-50.1%			
31 Nord-Pas de Calais	3.3%	111.4	112.0	1.2%	0.5%	2.5%	734	534	-27.2%	-50.6%	45.3%	41.1%	
82 Rhône-Alpes	22.4%	110.5	110.0	0.3%	-0.5%	-0.2%	5,253	3,850	-26.7%	-45.3%	51.3%	40.8%	
69123 Lyon	5.1%	118.9	118.1	0.6%	-0.6%	1.0%	769	715	-7.0%	-44.2%			
93 PACA	27.4%	105.6	105.1	-1.8%	-0.5%	-2.5%	5,247	3,020	-42.4%	-55.8%	51.2%	34.0%	
13055 Marseille	4.3%	105.5	105.4	-1.2%	-0.1%	-3.7%	798	577	-27.7%	-48.7%			

How to read this chart: The provisional price index for apartments in all of metropolitan France is 113.8 in the 3rd quarter 2012 (seasonally adjusted data). This index is lower in the Provinces (106.6 points). Between the 2nd and 3rd quarters 2012, there was a downturn in prices. The decline was a little more pronounced in the Provinces than nationally. Prices also fell over the year (-0.7% for all of metropolitan France).

PACA= Provence-Alpes-Côte d'Azur

Coverage rates are estimated for France and the *départements* (cf. Chapter 4).

Table 6.4 – Greatest provisional changes in absolute value (at stratum level)

stratum	Name of stratum	Weighting (%)	Index Q-1	Index Q	quarterly variation at date T *	Volumes Q	Contribution to quarterly variation in Provinces at date T
54701	Suburb of Nancy	0.4%	101.5	112.7	11.1%	76	0.000404015
97009	Coastal towns PACA West (dép. 13, 83)	1.0%	102.3	113.2	10.7%	53	0.001073172
97004	Coastal towns Bretagne West (dép. 22, 29)	0.7%	102.8	113.2	10.2%	131	0.000672242
99521	Other municipalities Pays de la Loire, low income	0.7%	97.4	105.3	8.2%	110	0.00056283
99222	Other municipalities Picardie, high income	0.4%	96.8	104.2	7.6%	74	0.000326289
99082	Other municipalities Limousin and Auvergne, high income	0.6%	101.1	108.2	7.1%	78	0.000395908
99431	Other municipalities Franche-Comté, low income	0.5%	102.5	109.4	6.7%	91	0.000342599
74601	Suburb of Annecy	0.7%	113.6	120.4	6.0%	94	0.000423566
97010	Coastal towns PACA East (dép. 83, 06)	1.8%	102.5	108.7	6.0%	123	0.001052136
651	Genève-Annemasse agglomeration (French part)	1.0%	120.2	126.6	5.3%	141	0.000530451
67701	Suburb of Strasbourg (French part)	0.7%	108.1	113.2	4.7%	69	0.000305825
33063	BORDEAUX	1.4%	118.0	123.2	4.4%	237	0.000589698
59350	LILLE	1.2%	116.5	121.5	4.3%	154	0.000508159
99911	Other municipalities South-East (Languedoc-Roussillon and PACA), low income	1.3%	105.3	109.8	4.3%	230	0.000531111
29019	BREST	0.7%	104.4	108.5	3.9%	138	0.000262074
97008	Coastal towns Languedoc-Roussillon South (dép. 34, 30)	0.9%	108.8	113.0	3.9%	189	0.000349547
99933	Other municipalities PACA North, high income	0.7%	104.4	108.5	3.9%	54	0.000251746
99412	Other municipalities Lorraine, high income	0.5%	99.5	103.4	3.9%	125	0.000195157
64445	PAU	0.5%	95.0	98.7	3.8%	67	0.00017471
35238	RENNES	1.2%	112.4	116.7	3.8%	224	0.000461684
...

How to read this chart: The greatest variation between quarter Q-1 and quarter Q is found in the Nancy suburbs (+11.1%). The change in this series makes only a small contribution to the change in the index overall (0.04 percentage points).

PACA= Provence-Alpes-Côte d'Azur

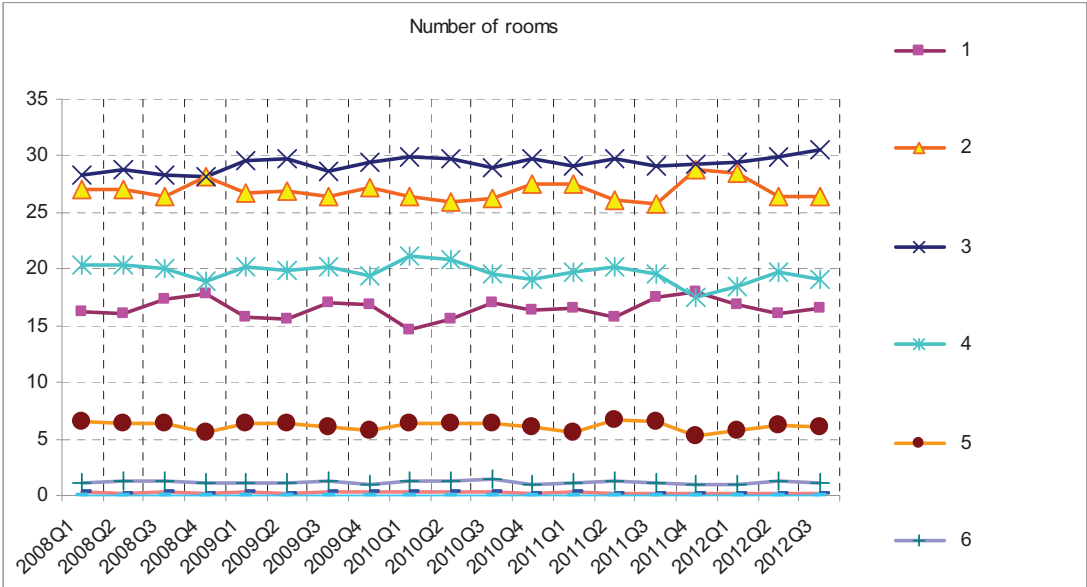
These data are classified in decreasing order of absolute value, to make it easier to see any errors. For example, in the suburbs of Nancy, prices increase by 11.1% compared with the previous quarter. Because of the size of this increase, a check was carried out based on the early provisional indices and the corresponding volumes.

In addition to items for comparison, the dashboard also contains information on the indices by theme, relating to changes, revisions, average prices, volumes, coverage rates and weightings.

The dashboard also contains a page of graphs in order to visualise the Notaires-INSEE indices, showing average price indices, volumes of transactions, coverage rates, etc.

The dashboard can also show changes in the distribution of modalities of the variables used for price estimation. The aim is to detect any possible changes or systematic errors in coding these modalities (see for example Figure 6.3, showing the variable “number of rooms”).

Figure 6.3 – Change in structure of transactions by number of rooms for apartments in the Provinces



How to read this chart: the structure of transactions by number of rooms appears to be relatively stable over time.

6.3 Publication

Since July 2004, the Notaires-INSEE indices have been published four times a year by INSEE in *Informations Rapides*. They can also be found in the INSEE macro-economic databank (BDM) and they are posted on the INSEE website, <http://www.insee.fr>.

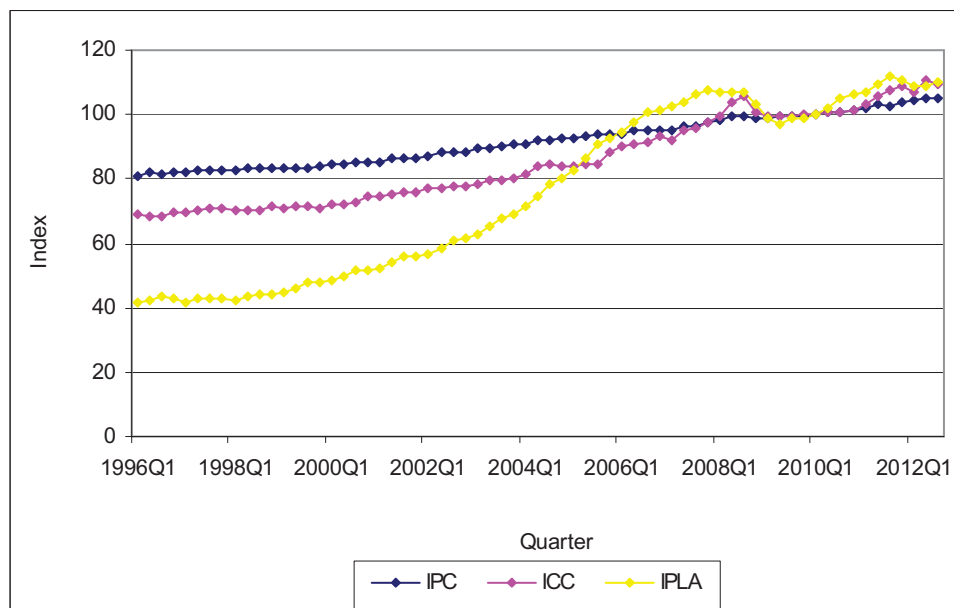
The list of published indices grew in 2011 when the Nord-Pas de Calais indices were published, after tests were carried out and they proved to show good coverage of the region in the notarial databases in previous years.

The indices are also disseminated by notaries on their own websites, <http://www.paris.notaires.fr> for the Paris Region and <http://www.immoprix.com> for the Provinces.

Typically, the indices for a given quarter are published about two months after the end of the quarter. Details of the dissemination criteria and the type of indices published are given in Appendix 12.

The charts below show changes in the main Notaires-INSEE indices since 1996 (when series were first published for metropolitan France).

Figure 6.4 - Used housing price index, consumer price index and cost-of-construction index (France, all property types)



How to read this chart: Between 1998 and 2011, used-housing prices increased much more rapidly than construction costs, which had in turn increased much more markedly than consumer prices.

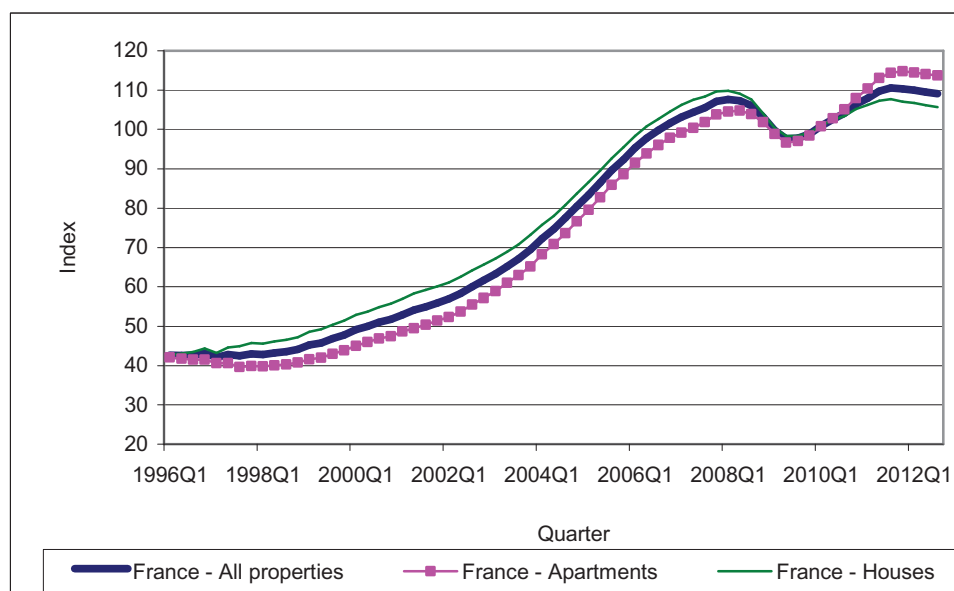
IPLA: used-housing price index

IPC: consumer price index

ICC: cost-of-construction index

Base 100=2010 Q1

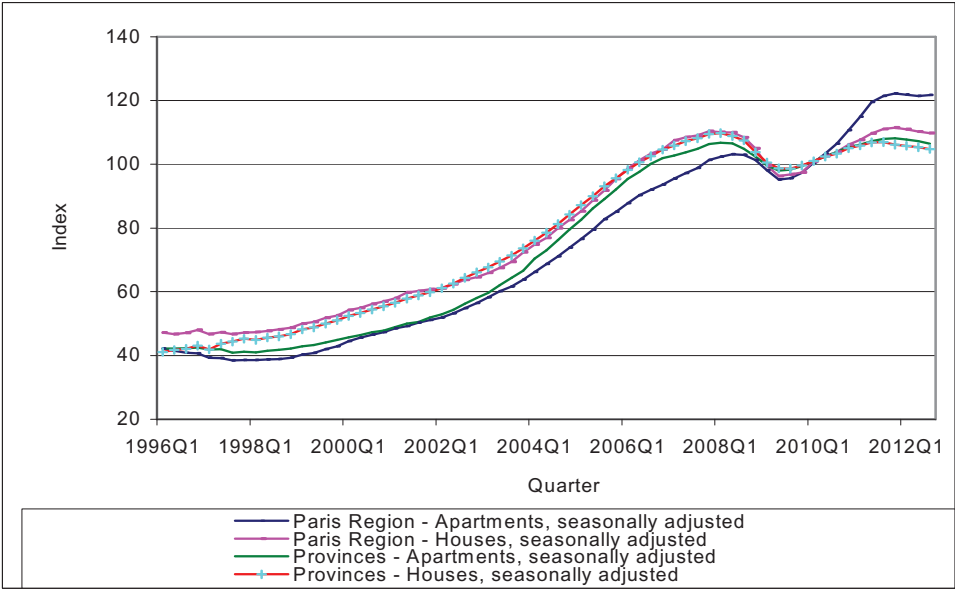
Figure 6.5 - Used-housing price indices by property type (apartments or houses) adjusted for seasonal variations



How to read this chart: between 1998 and 2011, apartment prices increased more rapidly than house prices.

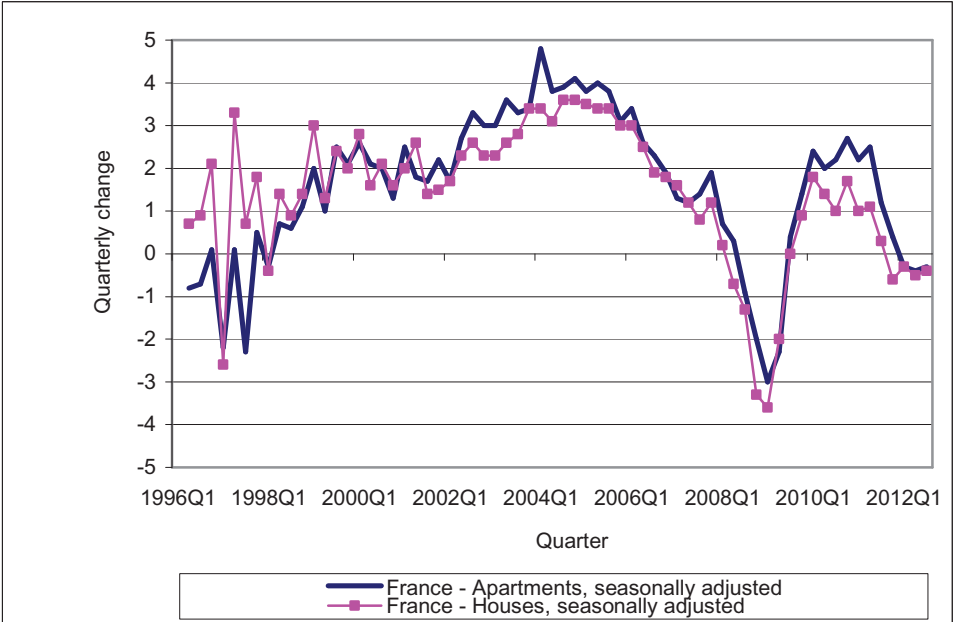
Base 100=2010 Q1

Figure 6.6 - Used-housing price indices in Paris Region and the Provinces by property type (apartments or houses) adjusted for seasonal variations



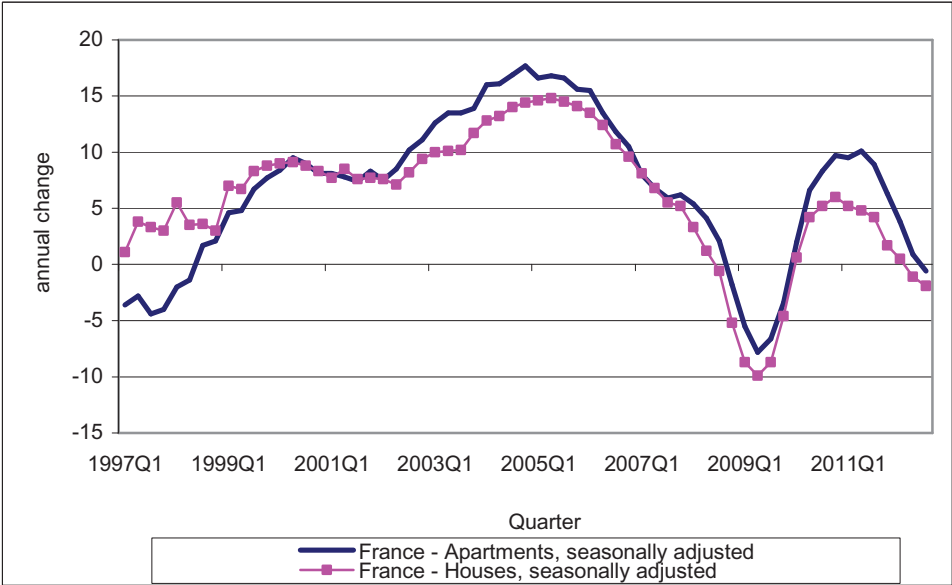
How to read this chart: since 1998, prices of apartments in the Paris Region have increased most. Base 100=2010 Q1

Figure 6.7 - Quarterly change in used-housing price indices by property type (apartments or houses) adjusted for seasonal variations



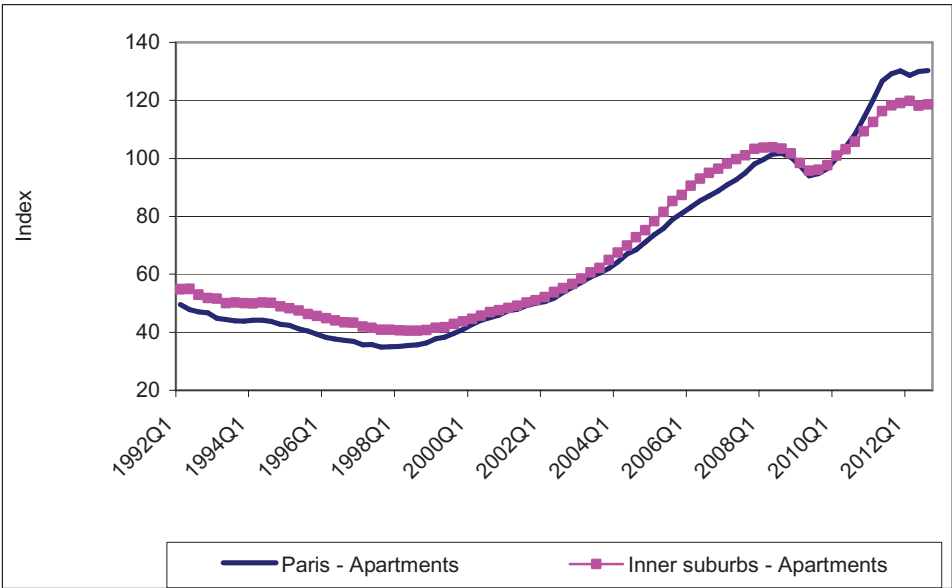
How to read this chart: since 2001, in most cases, quarterly changes in apartment prices have exceeded those of house prices. Base 100=2010 Q1

Figure 6.8 - Annual change in used-housing price indices by property type (apartments or houses)



How to read this chart: since 2001, annual changes in apartment prices have been greater than changes in house prices.
Base 100=2010 Q1

Figure 6.9 - Used-housing price indices for apartments in Paris and the inner suburbs, adjusted for seasonal variations



How to read this chart: between 1998 and 2012, the prices of apartments in Paris increased more quickly than those of apartments in the inner suburbs. Between 2009 and 2011 in particular, the rebound was much more pronounced in Paris than in the inner suburbs.
Base 100=2010 Q1