

## Chapter 7: Comparison of V2 and V3

The methods used to calculate the indices in version 2 are described in Beauvois *et al.* (2005). In this chapter, we compare the indices calculated in version 2 with those in version 3. To do this, we make a breakdown of the different changes that have happened to assess their respective impacts. These changes concern, first, the introduction of new strata (zoning patterns), and second, a number of changes that will be grouped together under the heading of a new method of calculation. These are: new specifications for the models, more regular updating of corrective coefficients, chain-linking indices and moving to aggregation by geometric mean.

Indices for apartments are not very much affected by the new zoning and the change of method. In contrast, the introduction of newly defined areas in the Provinces and of chaining have a significant impact on price indices for houses.

To recalculate indices later than 2007 and revise indices for houses built prior to 2008, we used more comprehensive data than that used originally. This had the effect of accentuating changes in the index in periods of rising prices.

An error was corrected in the coding of the number of garages in houses in the Provinces. This had a significant effect, but was fortunately concentrated in 2010 and 2011.

### 7.1 Different sources of divergence

For apartments, the new method was applied from 2008 onwards, and indices prior to 2008 were linked to the new indices. For houses, indices were also totally recalculated, as there were new specifications relating to living space and surface areas of plots (cf. Appendix 3). Seasonal adjustments were recalculated, with method X11 being replaced by method X12-Arima.

There are four sources of divergence from the indices in version 2:

- “super-definitive” data is taken into account when recalculating the indices: deeds continue to be recorded after the indices are published; “super-definitive” data are data that are available today and which therefore include deeds that did not contribute to the calculation of the index when it was published;
- using a new zoning system: in order to take into account the distortions over time of relative prices of dwelling characteristics, the geographic boundaries of the strata were reviewed. The use of hedonic methods is based on the hypothesis that price changes are homogeneous within the strata;
- applying a new method of calculation: the specification for the econometric models was refined. In addition, in order to better take account of market changes, it was decided to update the coefficients used to calculate the indices more often. This change involved introducing an index chaining procedure. The method used to aggregate the primary indices was also reviewed. A geometric method was selected for use at *département* level. A new method of seasonal adjustment was also introduced.
- correction of an error: the switch to version 3 of the Notaires-INSEE indices coincided with the correction of an error in indices from 2009 to 2011. This error was due to a break in the coding of data from the Provinces concerning one variable, an incident that happened after the introduction of new coding software.

We first look at the overall divergence between versions 2 and 3 (7.2), then concentrate on the effect of each source of divergence.

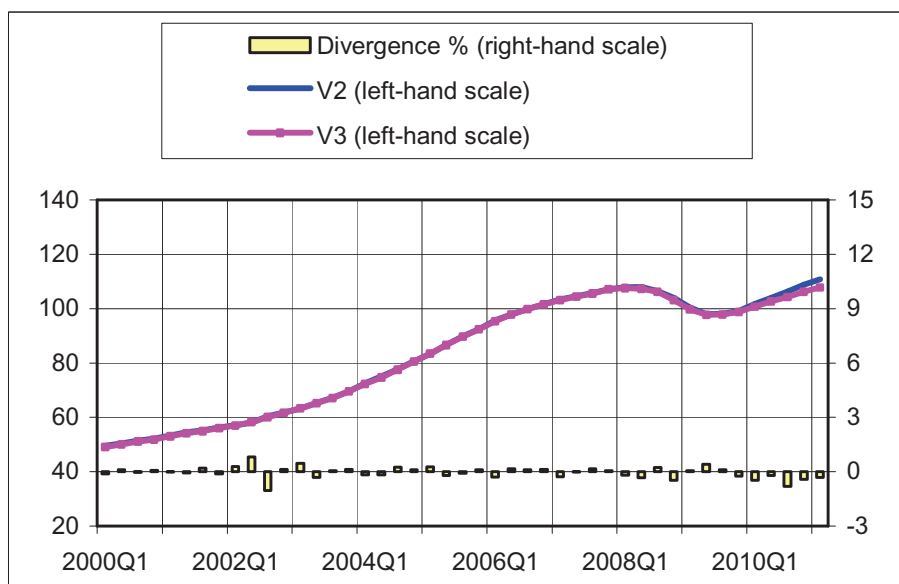
### 7.2 Overall divergence between versions 2 and 3

The switch from version 2 to version 3 had a significant impact on quarterly changes in prices relating to the years 2010 and 2011. Price changes between the fourth quarter of 2009 and the fourth quarter of 2010 were

therefore revised downwards by 2.0 points. Conversely, price changes prior to 2008 were revised only slightly (Figure 7.1),<sup>54</sup> if we exclude the second and third quarters of 2002.

Warning : until the end of this chapter, the differences are calculated as the difference (in% points) between the changes compared to the previous quarter, obtained with each version.

**Figure 7.1 - Seasonally adjusted used-housing price indices for metropolitan France in versions 2 and 3, metropolitan France, base 100=2010Q1**

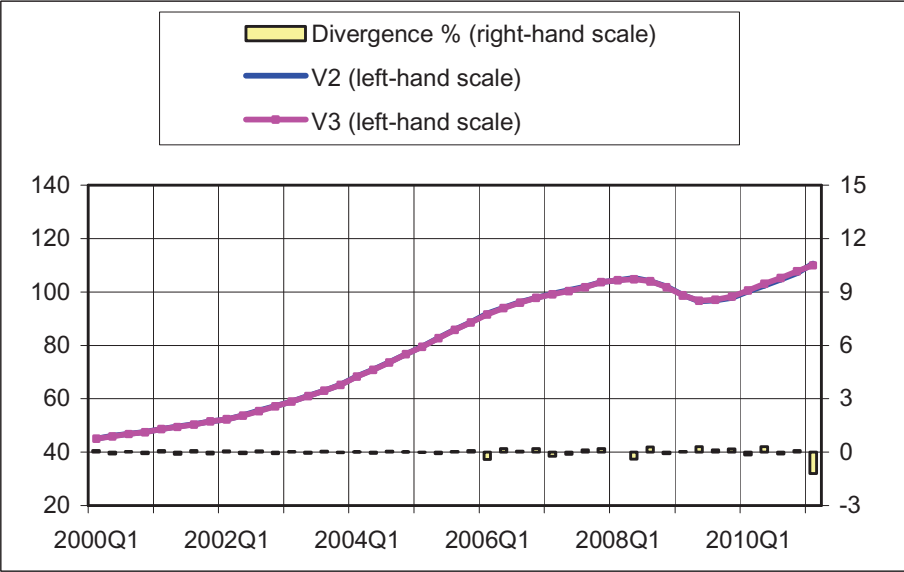


Concerning apartments, only very minor revisions were necessary over the entire period (Figure 7.2). Revisions to pre-2008 prices are simply due to the application of a new method of applying seasonal adjustments (using X12-Arima instead of X11). From 2008 onwards, apart from the new method of making seasonal adjustments, revisions are associated with the use of super-definitive data, the introduction of a new zoning system and the introduction of a new method of calculation (new model, regular updating of coefficients, geometric mean and the use of chain-linking).

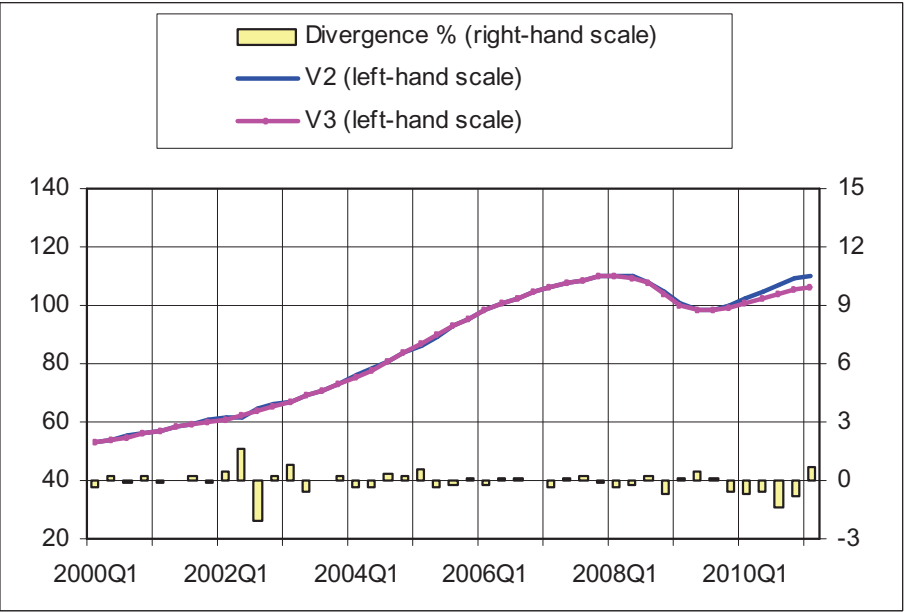
Revisions concerning houses were minor for years prior to 2010, if we exclude the second and third quarters of 2002. However, considerable revisions were necessary for 2010 and 2011 (Figure 7.3). For these two years, apart from the use of the new method for calculating the indices, a new way of adjusting for seasonal variations and the introduction of super-definitive data, revisions were linked with correcting the error mentioned above. Changes in house prices between the end of 2009 and the end of 2010 were therefore revised downwards by 3.7 points.

<sup>54</sup> In order to facilitate comparisons between the version 2 and version 3 indices, Figures 7.1 to 7.9 show “recalculated” indices from version 2. A coefficient multiplier was applied to each series of indices in version 2 so that indices for the 4<sup>th</sup> quarter of 2007 would be equal in both versions. The 4<sup>th</sup> quarter of 2007 was chosen to give a better understanding of the differences due to recalculating the version 2 indices and those due to the transition to version 3.

**Figure 7.2 - Seasonally adjusted used-housing price indices for apartments in metropolitan France in versions 2 and 3, base 100=2010Q1**

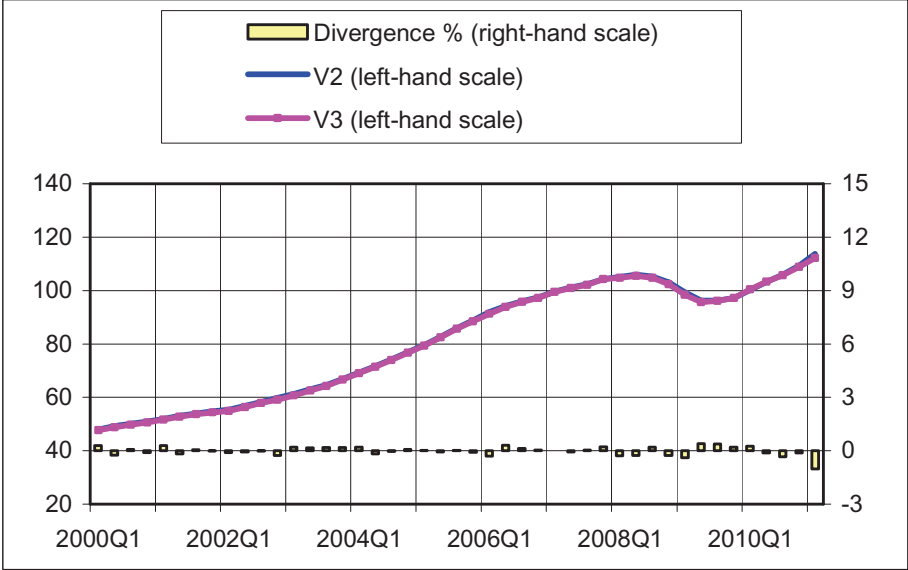


**Figure 7.3 - Seasonally adjusted used-housing price indices for houses in metropolitan France in versions 2 and 3, base 100=2010Q1**

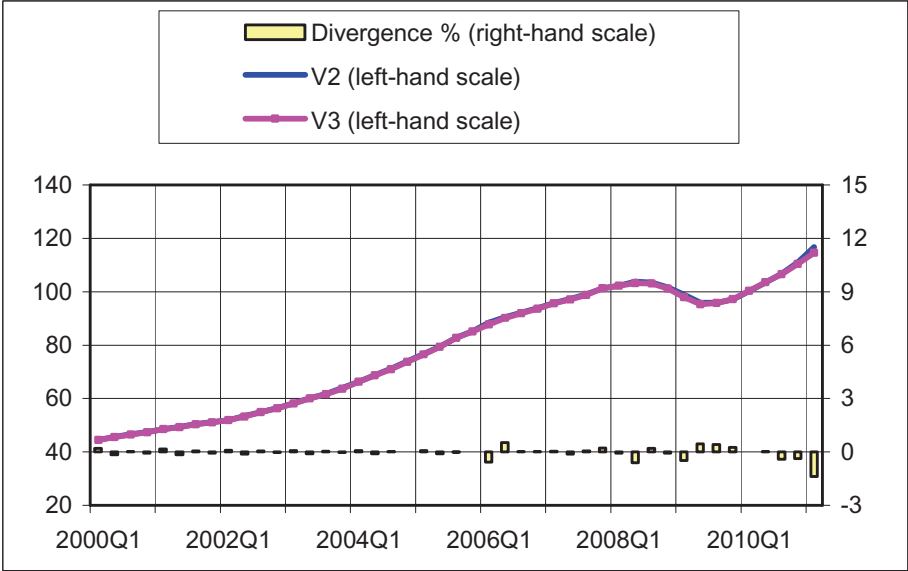


Changes concerning the Paris Region required little revision (Figure 7.4). Revisions relating to apartments were also small (Figure 7.5). Those concerning houses were a little more pronounced at the beginning of the 2000s, due mainly to a change in the specification for the models. Living space and plot size have now been better taken into account (Figure 7.6).

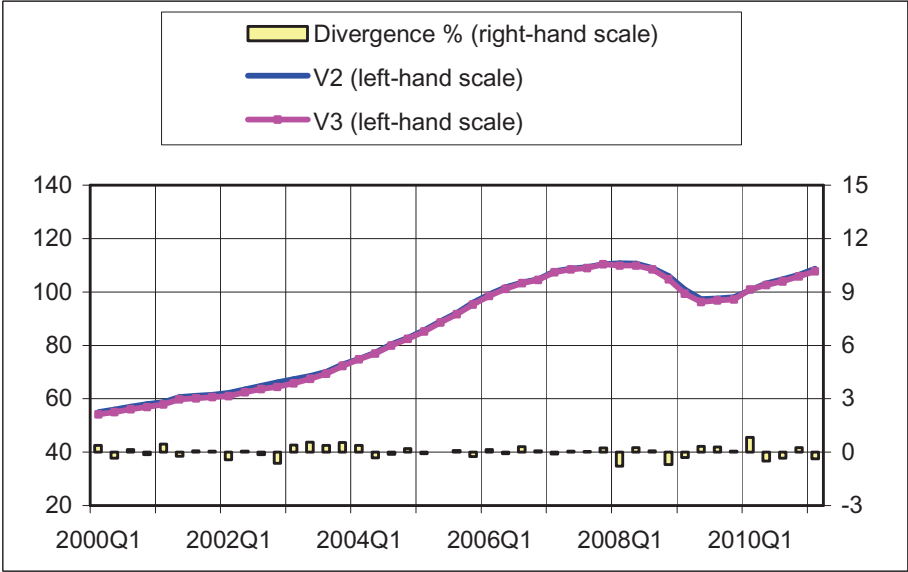
**Figure 7.4 - Seasonally adjusted used-housing price indices for the Paris Region in versions 2 and 3, base 100=2010Q1**



**Figure 7.5 - Seasonally adjusted used-housing price indices for apartments in the Paris Region in versions 2 and 3, base 100=2010Q1**

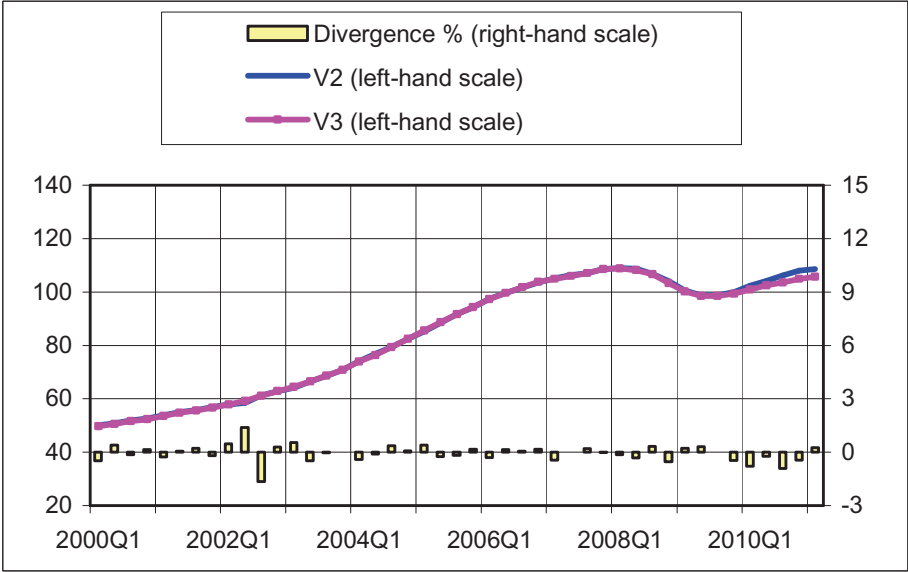


**Figure 7.6 - Seasonally adjusted used-housing price indices for houses in the Paris Region in versions 2 and 3, base 100=2010Q1**

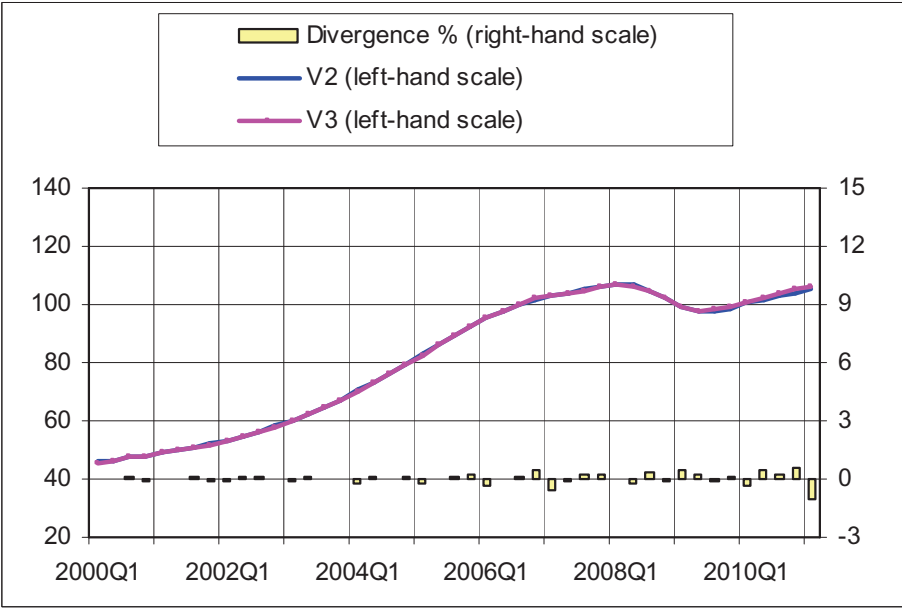


Price changes in the Provinces were revised considerably for 2010 and 2011 (Figure 7.7), as a result of correcting the error in the houses index (Figure 7.9). However, only moderate revisions were necessary in the index for apartments in the provinces (Figure 7.8).

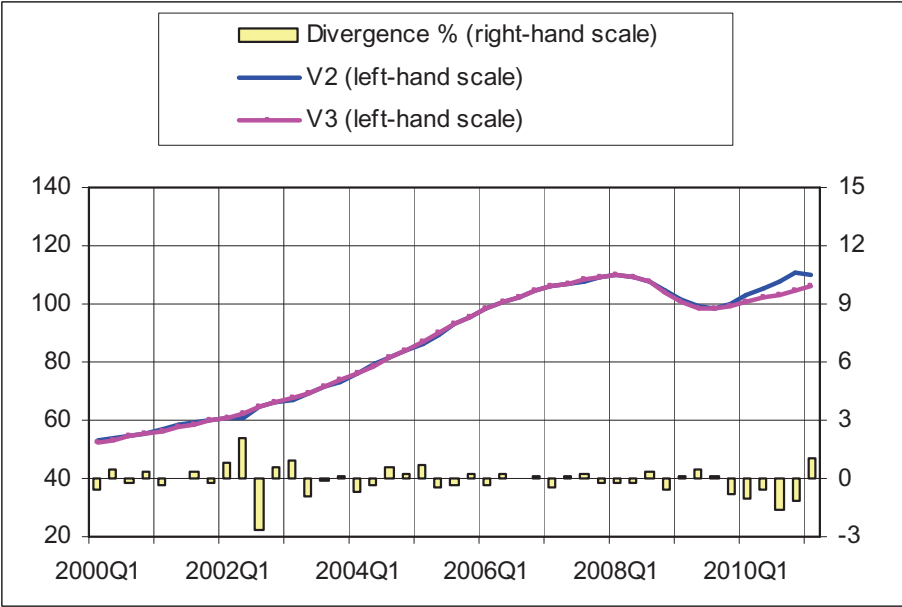
**Figure 7.7 - Seasonally adjusted used-housing price indices for the Provinces in versions 2 and 3, base 100=2010Q1**



**Figure 7.8 - Seasonally adjusted used-housing price indices for apartments in the Provinces in versions 2 and 3, base 100=2010Q1**



**Figure 7.9 - Seasonally adjusted used-housing price indices for houses in the Provinces in versions 2 and 3, base 100=2010Q1**



**7.3 Analysis of divergence between versions 2 and 3**

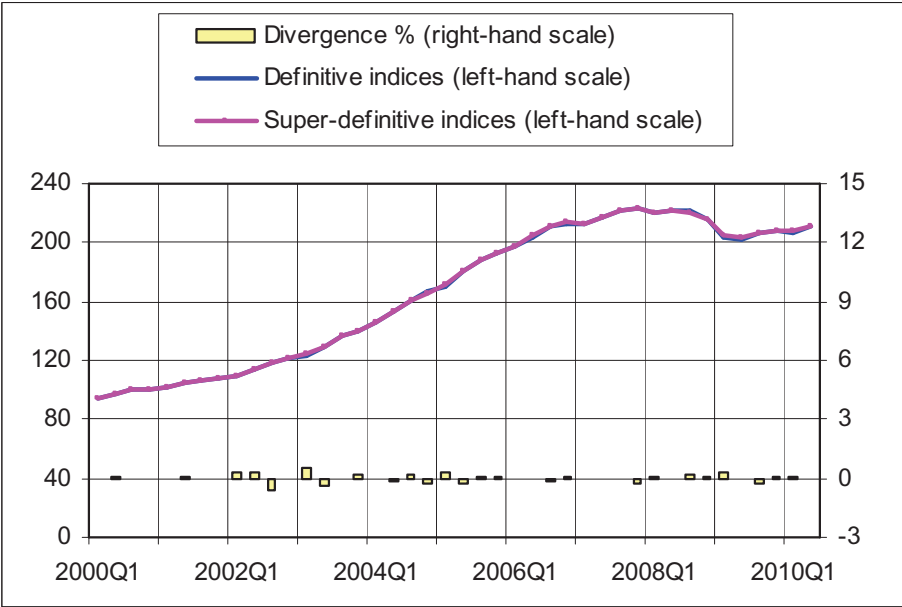
**7.3.1 Divergence due to using super-definitive data**

For apartments, divergence between definitive and super-definitive indices impacted on V3 only from 2008 onwards. In fact, V3 indices prior to 2008 are based on definitive V2 data (the only data available when the indices were calculated). For houses, on the other hand, V3 indices prior to 2008, like the V3 indices later than 2007, were recalculated from super-definitive data.

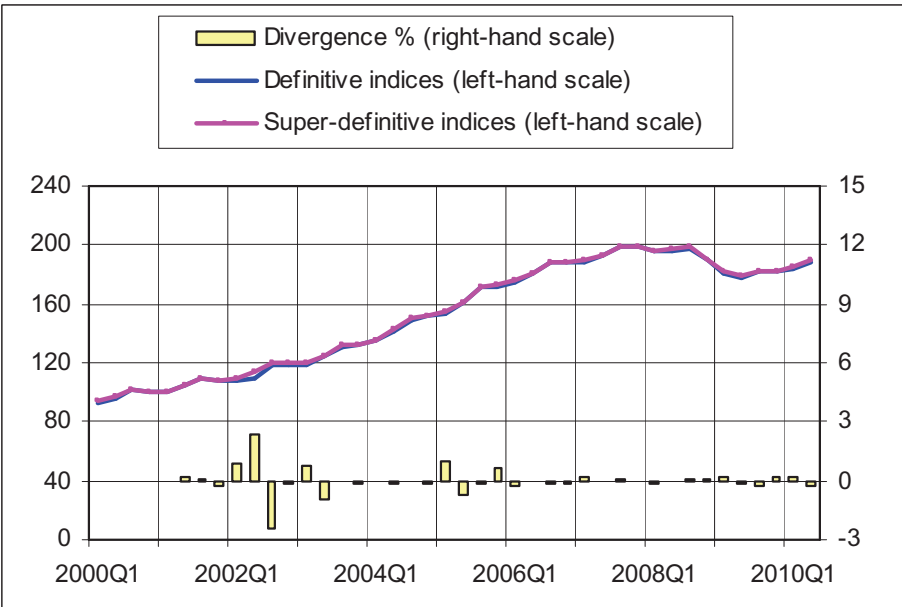
For the Provinces, divergence between definitive and super-definitive indices appears small (Figures 7.10 and 7.11). The average deviation from 2002 to 2009 is 0.1 of a point for apartments and 0.6 for houses. The reason

for this upward impact after the move to super-definitive data lies in the fact that prices rose. As any new deeds being considered were mainly signed towards the end of the quarter, they were at much higher prices than the average quarterly prices calculated from definitive data. The considerable difference between variations from the second to third quarters of 2002 in house prices in the Provinces was due to a great extent to the fact that new data were included in the second quarter 2002 (as a result of problems with data collection at the time: under-estimation in one quarter, catch-up in the next).

**Figure 7.10 - Definitive and super-definitive raw price indices for used apartments in the Provinces in version 2, base 100=2000Q4**



**Figure 7.11 - Definitive and super-definitive raw price indices for used houses in the provinces in version 2, base 100=2000Q4**

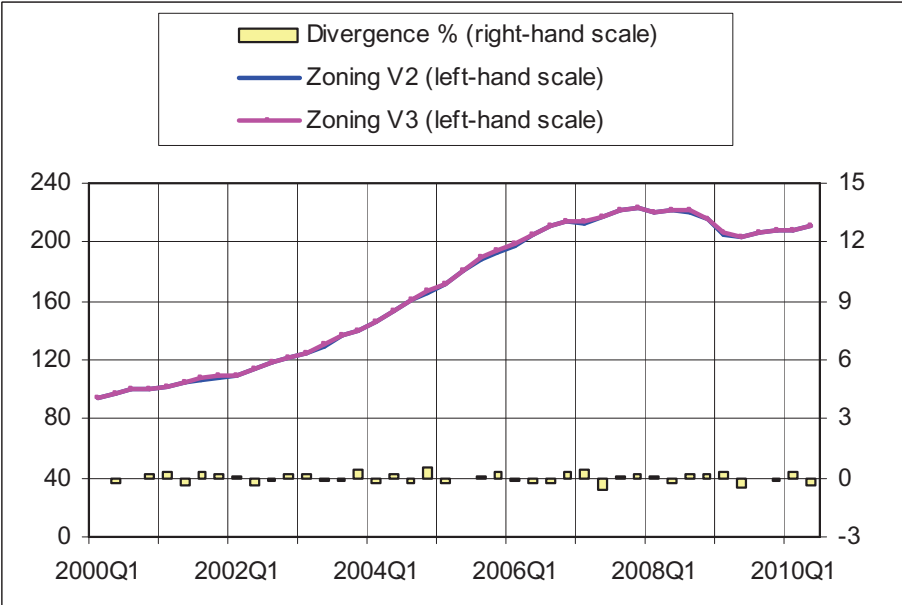


**7.3.2 Impact of updating the zoning system**

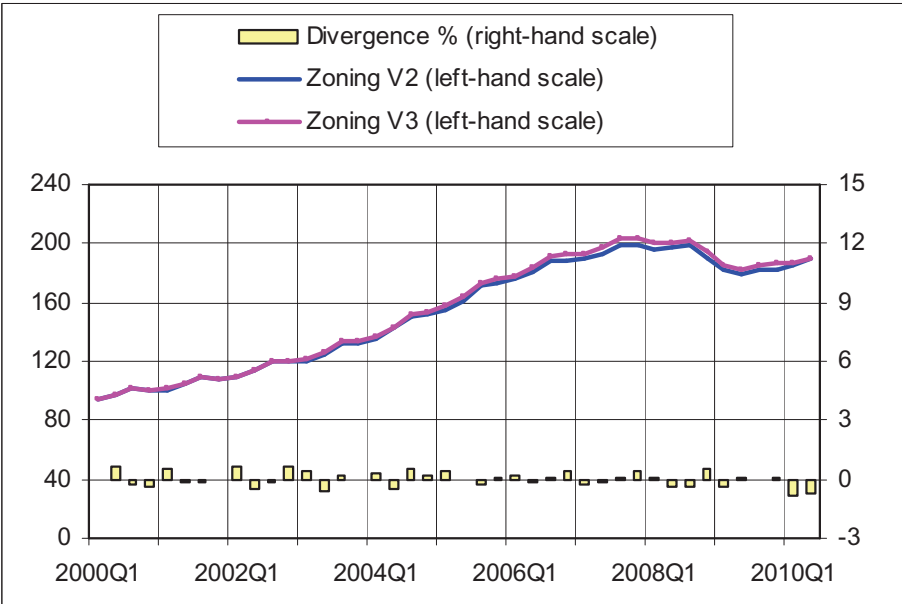
For both apartments and houses, updating the zoning had an impact on V3 indices from 2008 onwards. V3 indices prior to 2008 were based on the zoning in place in V2.

For the Provinces, the impact of updating the zoning system is slightly more marked than the effect of changing from definitive to super-definitive data. Between 2002 and 2009, the average divergence is 0.3 points for apartments and 1.4 for houses (Figures 7.12 and 7.13). In the case of houses in the Provinces in particular, the number of strata increased in version 3.

**Figure 7.12 - Super-definitive raw price indices for used apartments in the Provinces in version 2 with version 2 and version 3 zoning, base 100=2000Q4**



**Figure 7.13 - Super-definitive raw price indices for used houses in the Provinces in version 2 with version 2 and version 3 zoning an, base 100=2000Q4**



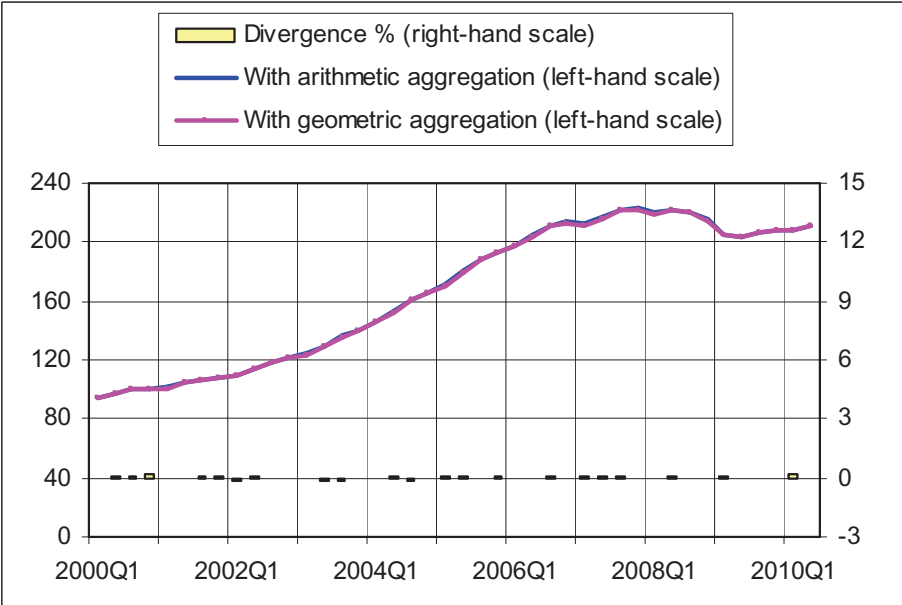
**7.3.3 Impact of the new calculation method**

With the new calculation method, revisions were needed in the V3 indices, mainly from 2008 onwards. For indices prior to 2008, only the specifications regarding living space and plot size for houses were changed.

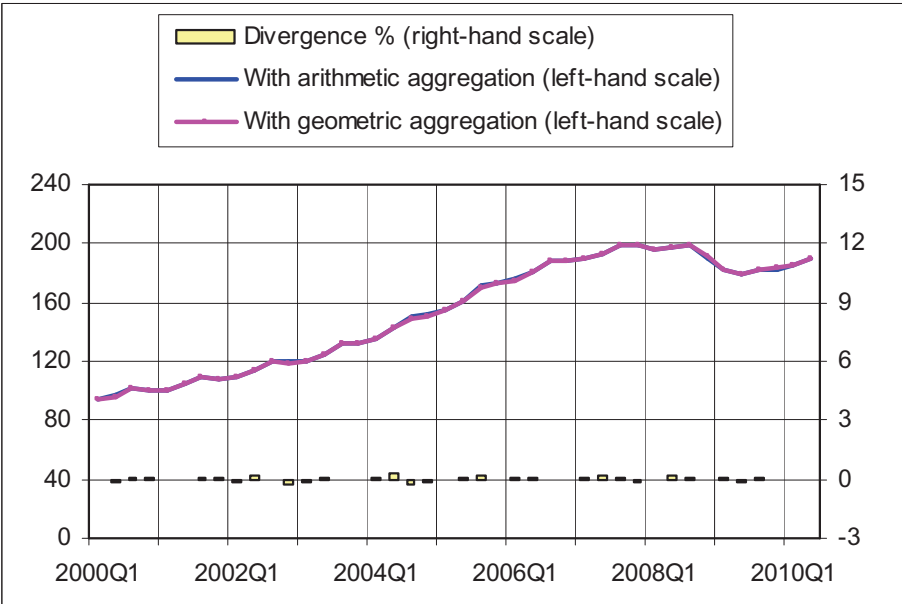


Changing from arithmetic mean to geometric mean had little impact on the results, either for apartments or houses in the Provinces (Figures 7.14 and 7.15). For apartments, all the aggregations were done arithmetically. For houses, data at *département* level were aggregated geometrically while supra-departmental data were aggregated arithmetically.

**Figure 7.14 - Super-definitive raw price indices for used apartments in the Provinces in version 2 with arithmetic and geometric aggregation , base 100=2000Q4**

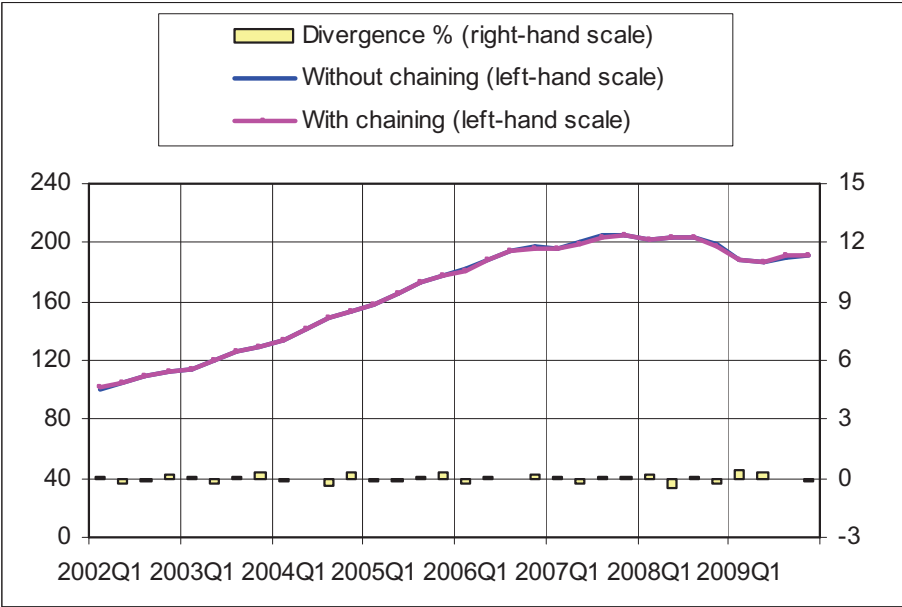


**Figure 7.15 - Super-definitive raw price indices for used houses in the Provinces in version 2 with arithmetic and geometric aggregation, base 100=2000Q4**

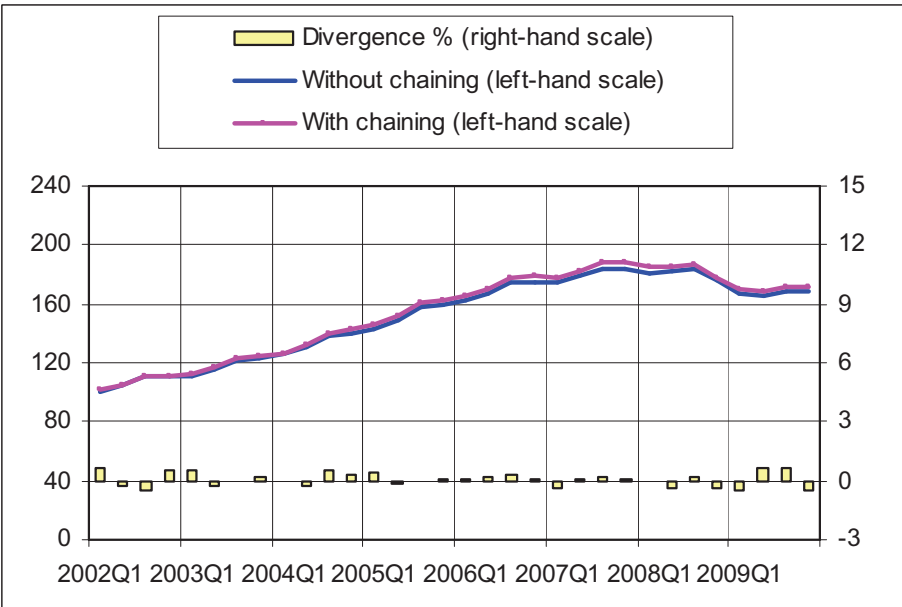


The introduction of chain-linking, on the other hand, which became necessary when correction coefficients were updated more frequently, had a significant effect on price indices for houses (Figures 7.16 and 7.17). The levels of the mean deviation between the chained and non-chained indices from 2002 to 2009 was -0.2 percentage points for apartments and 1.5 points for houses. To calculate the chained indices, the reference and estimation stocks are updated every two years. The indices are aggregated arithmetically. The zoning system used is that of V2.

**Figure 7.16 - Super-definitive raw price indices for used apartments in the provinces in version 2 with and without chaining, base 100=2000Q4**



**Figure 7.17 - Super-definitive raw price indices for used houses in the Provinces in version 2 with and without chaining, base 100=2000Q4**

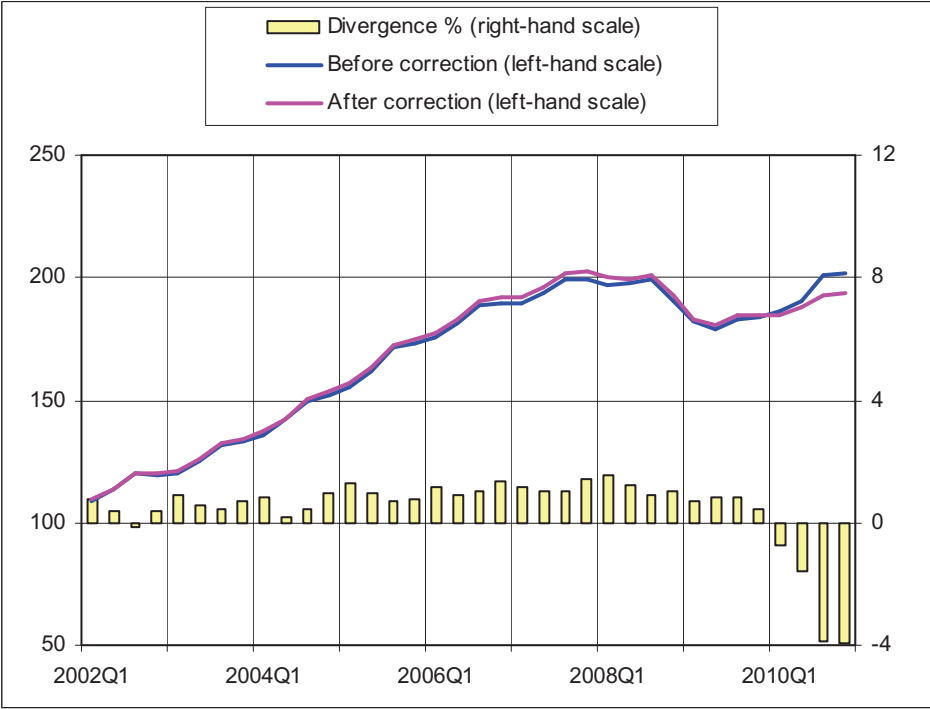


**7.3.4 Impact of correcting an error**

The housing price indices for the provinces published in version 2 were flawed due to the introduction of an error from mid-2009, when there was a break in coding for “number of garages”. The missing data relating to

this variable up until mid-2009 were not recoded, which resulted implicitly in these cases being assigned to the reference modality, i.e. “1 garage”. When new software was introduced, the missing data relating to this variable were replaced using the modality “no garage”. The share of this modality then increased steadily, from less than 5% in mid-2009 to more than 35% by the end of 2010. After the error had been corrected, the change in prices between the fourth quarter of 2009 and the fourth quarter of 2010 was then revised downwards by 4% (Figure 7.18). In fact, the error in applying the imputation led to an under-estimation of the change in house quality.

**Figure 7.18 - Super-definitive price indices for used houses in the Provinces in version 2 before and after error correction, base 100=2000Q4**

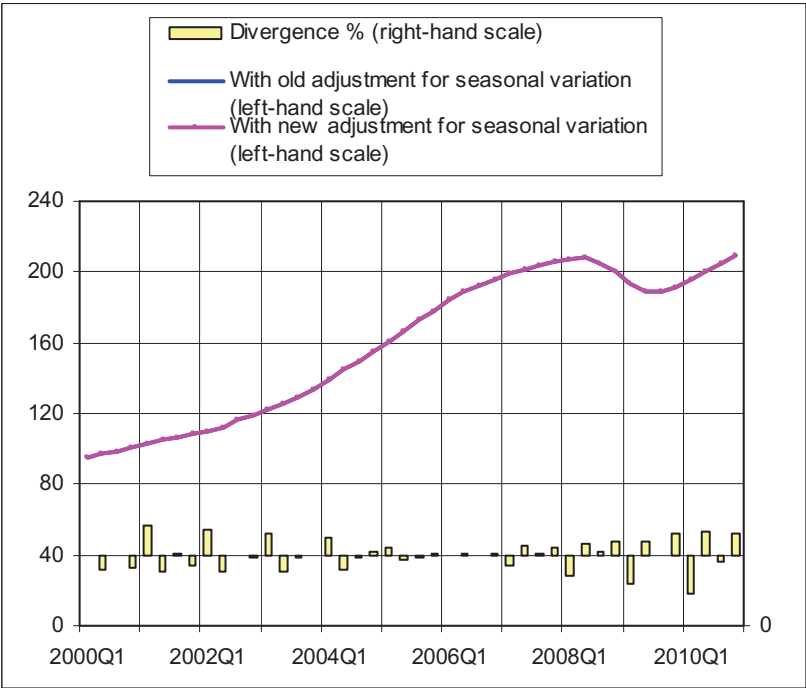


### 7.3.5 Impact of the new method of seasonal variation adjustment

When version 3 of the Notaires-INSEE indices was adopted, the method used to adjust for seasonal variation was improved. We switched from X11 to X12-Arima. A particular feature is that now, before seasonal adjustment, raw data series are extended by Arima models, which means improved estimates of seasonal coefficients.

The move to the new method of seasonal adjustment had very little effect on the indices, with divergences of no more than 0.1 percentage points for all of metropolitan France (Figure 7.19). The differences are highest at the beginning and end of the period, which is consistent with the continuation of the series by the X12-Arima method.

**Figure 7.19 - Housing price indices for metropolitan France in version 2 after old and new adjustment for seasonal variation, base 100=2000Q4<sup>55</sup>**



<sup>55</sup> N. B.: the right-hand scale in this figure is not the same as in the preceding graphs.