Euro area residential property prices: the aggregation of non-harmonised national data

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The European Central Bank (ECB) regularly compiles an indicator for euro area residential property prices from non-harmonised national data and has recently established target definitions to improve the information. Main criteria used for selecting national components into the aggregate are geographical and market coverage, quality adjustment, and reliability of source data. In the absence of better quality harmonised indicators, it is difficult to precisely assess the reliability of the current index. Results from aggregating different national price series and using different country weights may, however, at least illustrate the potential error margins of the index. These margins are, compared to other euro area statistics, considerable, though it may be assumed that the price trend is correctly reflected and plausible. The most important and desirable improvements concern the quality of the primary statistics (coverage, quality adjustment) and the publication frequency of the euro area aggregate (from annual to quarterly).

1. Introduction

This paper discusses the euro area[1] residential property price indicator which has been published by the ECB since 2001. It begins with a discussion of the residential property price aggregates that are relevant for ECB use and a presentation of the series currently compiled for the euro area and the national sources used. It then tries to address the question of how reliable the euro area indicator is by analysing the methodological differences between the national data and the impact on comparability. The final section looks into the question of which weights should be used for the aggregation of national series from both a conceptual and a practical point of view.

2. Why are residential property price developments relevant for ECB use and what are the statistical requirements?

The buying or selling of a dwelling is typically the largest transaction a household enters into. Changes in house prices are therefore likely to influence substantially the budget plans and saving decisions of the prospective house buyers and sellers. House price changes will also have an impact on the wealth of owners of dwellings given that the dwelling is the largest asset in their portfolio. Further, to the extent they affect market rents, house prices also affect consumer price indices; in 2003, rents had a weight of 6.4% in the euro area harmonised index of consumer prices (HICP), which is the measure used by the ECB to define price stability in the euro area. Another reason to monitor these price developments is that owner-occupied housing costs are not yet covered in the HICP. Housing prices may also have an effect on residential construction investment, which accounted for 5.0% of gross domestic product (GDP) in the euro area in 2002. Finally, housing prices are used for financial stability analysis, since sharp increases and declines in prices can have a detrimental impact on financial sector health and soundness by affecting credit quality and the value of collateral.[2]

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[1] The euro area consists of the 12 EU member states currently participating in monetary union: Belgium (BE), Germany (DE), Greece (GR), Spain (ES), France (FR), Ireland (IE), Italy (IT), Luxembourg (LU), the Netherlands (NL), Austria (AT), Portugal (PT) and Finland (FI).

[2] See ECB (2003a, pp 8-14) and IMF (2003, Chapters 9 and 14).

How can these uses of property price statistics be translated into statistical requirements? First, as euro area statistics are compiled from national results, a sufficient degree of *comparability* between the national data is important. Second, in order to be useful in the current monitoring of price developments, *quarterly frequency* of the results is desirable. Third, the degree to which residential property price indices are able to eliminate the effect of *quality differences* between different dwellings compared over time is important. Fourth, property price data for the euro area is needed for the following breakdowns. For the *geographical breakdown*, given the substantial dispersion of developments across countries, results are needed for each individual euro area country in order to understand the trends in the euro area aggregate and form an assessment about its future development. In addition, a certain regional disaggregation of national data is often useful (eg West Germany compared to East Germany), since the regional developments may vary considerably. In addition, a distinction at national or euro area level dividing between price developments in urban areas (and/or capital cities) and non-urban areas may be very informative. For the prices for *different housing types*, the breakdown between new and existing dwellings is the most used distinction.

These and other breakdowns are further explored in Sections 3 and 4 below.

3. What aggregates are currently compiled by the ECB?

The ECB compiles a residential property price index for the euro area which is calculated as the average of the annual growth rates of national indicators weighted by 2001 GDP shares. The index is published in the *ECB Monthly Bulletin*.[3] The national components of the overall euro area index are detailed in Annex 1. The series from the four largest euro area countries, which together contribute to 79% of the euro area index, are shown in Graph 1. The selection of national components is based on the degree of market and geographical coverage, the methods used for quality adjustment, the quality of the data source and the sample size. These issues are discussed in detail in Section 4.

The euro area index is calculated when at least 80% of the national data are available. As all euro area countries produce some data on residential property prices the country coverage is close to 100% for most of the length of the euro area series. Where country data are missing at the start or end of the series, the weight is set to zero with the implicit assumption that the missing country follows the same development as the average of the countries for which data is available.

Also important for an indicator used for monetary policy are the frequency and timeliness of the data. The timeliness ranges from one month (Ireland, the Netherlands, Portugal, Finland) to between three to six months in the remaining countries. The euro area aggregate with a coverage of over 80% is available with a delay of around three months, with some countries' latest data being estimated using alternative sources. Since German data are currently available only at annual frequency, a euro area average with a high country coverage can be compiled only at annual frequency. A semiannual indicator can be compiled, but excludes Germany and Luxembourg. Quarterly or even monthly indicators are currently not possible, since, in addition to Germany and Luxembourg, Italy and Austria would not be covered.

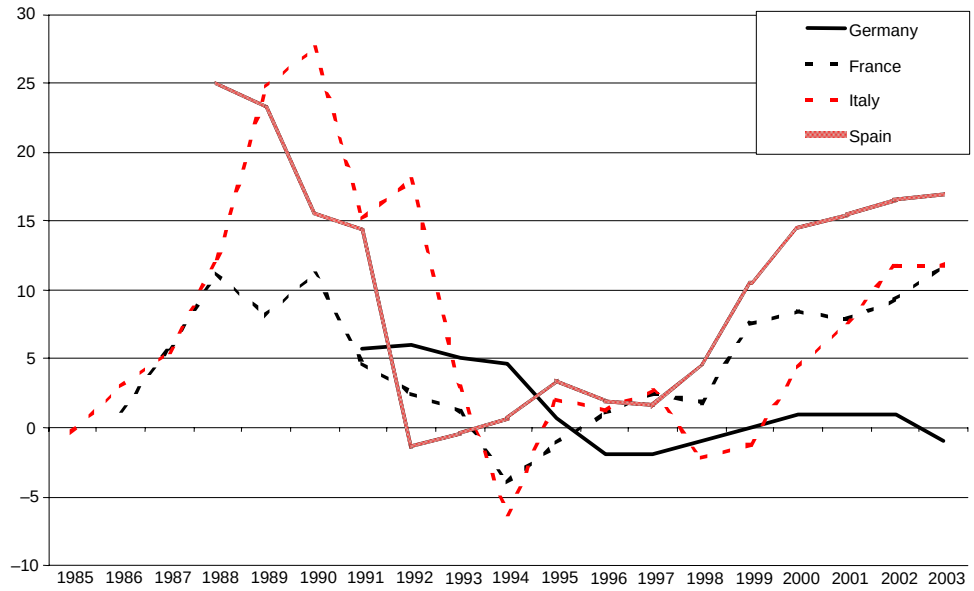
Recent efforts by the ECB and the EU national central banks have attempted to improve the homogeneity of the index and provide some additional breakdowns at both euro area and national level via the adoption of some target definitions of the desired market coverage of residential property price indicators. This work is based on *existing* sources, because EU central banks currently do not collect primary statistical information on house prices. However, the central banks have tried to use existing sources to match the target definitions as closely as possible. This has allowed the creation of breakdowns for new dwellings, existing dwellings and residential property price developments in urban areas of the euro area (Graph 2). Despite these improvements, much work remains to improve the quality of the national data and thereby of the euro area aggregate.

[3] See Box 3 in the *ECB Monthly Bulletin* of October 2002 for the most recent data; at the time of writing, an update was planned for the December 2003 issue.

Graph 1

Residential property prices in the four largest euro area countries

Annual changes, in per cent

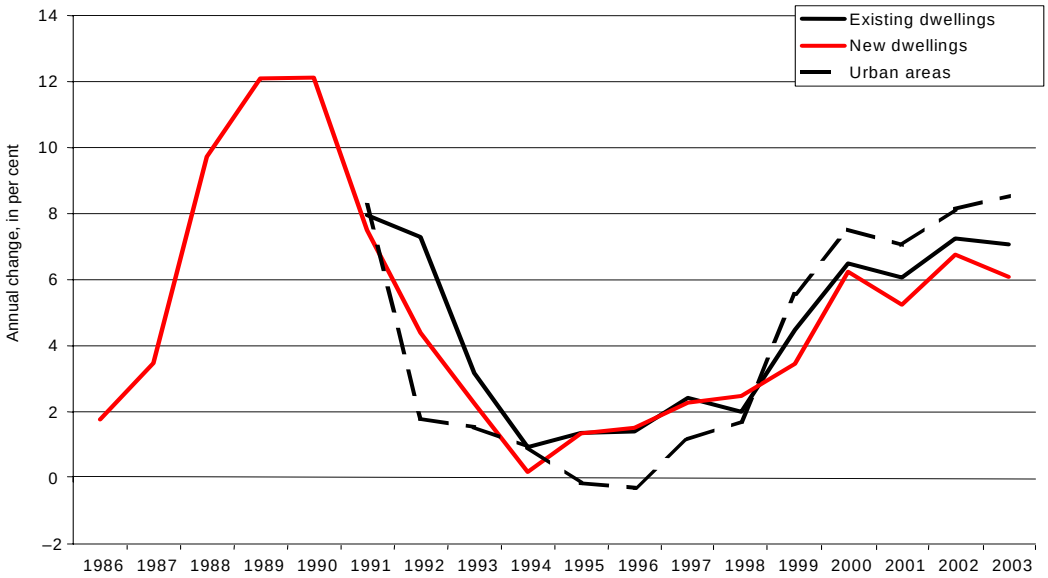


Note: The indicators are those which are included in the euro area aggregate. Germany: for 1991-95, West Germany only.

Sources: National sources; ECB calculations.

Graph 2

Residential property prices in the euro area



Source: ECB.

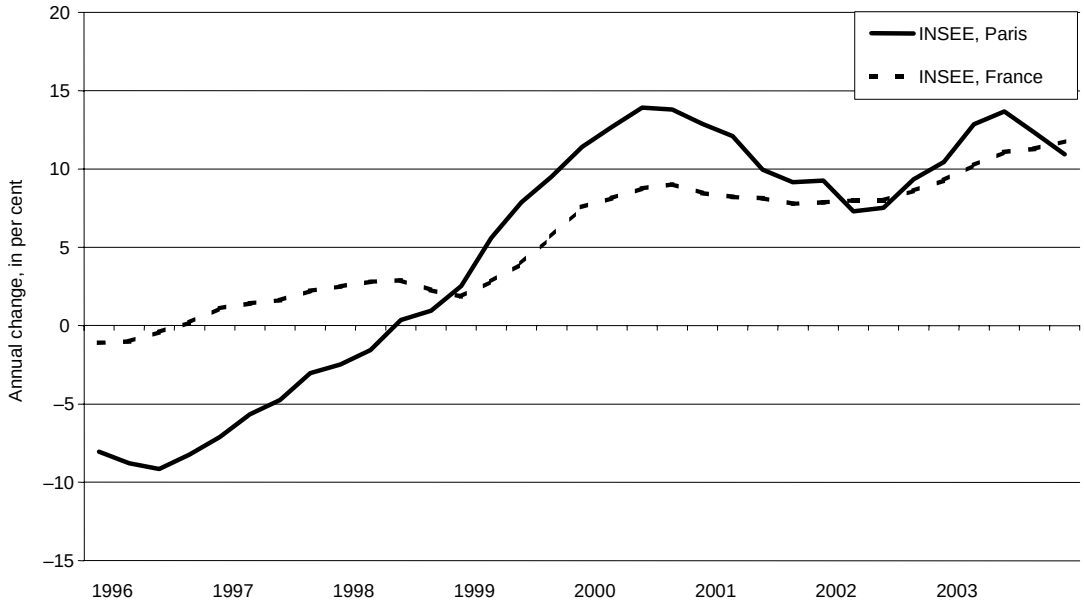
4. How reliable is the aggregation of non-comparable national data?

The methods employed for the compilation of house price indicators vary considerably *between* countries, and even between alternative sources *within* individual countries. A key question with regard to cross-country aggregation is which national series should be used and, given the high degree of heterogeneity between countries, how reliable the resultant index will be. The differences between the available house price indices concern almost every aspect: geographical coverage; market coverage (type of property, mortgage/cash transactions); quality adjustment; data source (tax records, mortgage applications, estate agents, newspapers); index construction; weighting. Each of these differences adds to the likelihood that the non-price factors will affect the aggregate price index and cloud interpretation by users.

Graph 3

Prices of existing dwellings in Paris/France as a whole

Annual changes, in per cent



Source: INSEE.

4.1 What are the differences and what might be their effects?

4.1.1 Geographical coverage

National data

Housing markets tend to be highly segregated between geographical areas. Factors such as population distribution and regional income levels and changes may lead to wide divergence in house price levels, and differing price developments. Many of the local and regional effects on housing markets may cancel each other out in a national aggregate, but this assumes that the national aggregate is a representative average of all regional markets. National sources which provide data on large/capital cities in addition to comprehensive national figures tend to show that city data are more volatile than national averages and sometimes follow different dynamics. Graph 3 shows the annual growth rates of existing dwellings in Paris compared with France as a whole. Whilst there is a high degree of co-movement between the two series (Paris is clearly an important component of the whole of France), the Paris series is more volatile. Even larger differences between local markets were

observed, for example, in Germany. Residential property price changes for flats in the two largest German cities (Berlin and Hamburg) in the period from 1995 to 2002 differed substantially from prices in other large cities (eg Frankfurt and Munich) and from the national average (Deutsche Bundesbank (2003)). Reliance on the results for the two largest cities would signal a significant and continued price decline, and would be a misleading indicator for Germany as a whole. It is therefore important that the geographical coverage of national aggregates be as broad as possible and that over-reliance on large cities as a proxy for national data be avoided.

Euro area data

For euro area data similar arguments hold. Since the divergence of national price changes is high, coverage of the euro area aggregate must be high in order to produce a reliable aggregate. In 2002, annual growth rates of the five largest euro area countries varied between –0.2 and 16.6%. This implies that missing national data, or forecast errors for missing national data, may affect the quality of the euro area aggregate. Therefore, a coverage level of 80% of the euro area is considered as the threshold for compiling the aggregate.

4.1.2 Property type

Price developments may also differ between types of property, for instance between new and existing dwellings or between houses and flats. Purchasers are able to substitute between new and existing dwellings and therefore one might expect similar price dynamics. However, newly constructed dwellings may offer both advantages and disadvantages compared to existing dwellings and these may be valued differently according to societal preferences in different countries. Differences may also be due to taxation and subsidies, and regional differences due to a lack of land for construction in urban areas. New dwellings may differ considerably from the existing stock in terms of architectural and technical features as well as location. Prices for new dwellings are, at least in the short term, influenced by construction costs. The empirical results for the euro area countries are, however, not fully clear in this respect and suggest that the differences may be more important in some countries (Ireland, Germany) than in others (Italy, Spain).[4]

Many national sources distinguish between houses and flats, which may broadly represent upper and lower ends of the market. Given that these market segments behave differently under different property market conditions and at different points in the business cycle, the breakdown between houses and flats is useful, and it is important that both are represented in the national overall index. In the euro area aggregate our approach has been to use data which include both new and existing dwellings and both houses and flats. Where a combined aggregate is not available, data for existing dwellings are used as they usually account for a larger proportion of the transacted dwellings. Separate series for houses and flats are aggregated using weights of the respective shares in the housing stock, when available.

4.1.3 Quality adjustment

Price comparisons over time require the availability of comparable housing objects in the two periods under consideration. However, due to heterogeneity of housing markets and infrequent transactions, traditional “matched model” methods for price statistics fail. Quality adjustment is needed to ensure the comparison of “like with like” and to avoid long-term bias in the series. This bias could arise, for example, due to improving living and housing standards, or to new dwellings built further from city centres.

Very basic methods, such as unit value indices of square metre prices, attempt to adjust for the size of the dwellings in each period while still allowing other changes in the composition such as location, amenities, quality of housing, etc, to affect the index. Mix adjustment (or the “classification approach”) defines a classification of dwellings by the characteristics for which it intends to adjust. Individual price indices are then calculated for each cell in the classification, and the overall index is calculated as the weighted average of these subindices. The number of characteristics included in the classification is

[4] German data for new and existing flats differed by 3.7 percentage points in 2002, whereas the corresponding figure for Italy was 0.9 percentage points.

often limited by the number of observations that can regularly be found for each cell. The most advanced form of quality adjustment used is the hedonic regression approach, which uses a regression model to isolate the value of each of the chosen characteristics and thereby adjust the observed prices according to a standardised housing unit. It is sometimes used together with a mix adjustment. An additional method used in US indices is the so-called repeat sales technique, which matches pairs of transactions of the same dwellings over time. This requires a huge database of transactions and is not used by any of the European data producers. The crucial question for all quality adjustment procedures is whether the chosen characteristics used for adjustment are the main determinants of price differences. While some of these are easy to measure (eg size), other important factors (location) are often difficult to capture.

In practice, national indicators used for the euro area aggregate use a variety of techniques to adjust for quality and compositional changes. In three cases, the available measures are simple unit value indicators, ie which do not control for changes in composition and quality (Ireland, Luxembourg, the Netherlands; see Annex 1). In most other cases, quality adjustment tends to be rather basic, using measures such as square metre prices for individual cities or regions aggregated to a national total. For Germany, the data collection is limited to "good-quality" dwellings, which might imply a built-in measurement problem, since it is unlikely that the market definition of "good quality" is independent of the general increase in housing standards over time. Only two countries (France and Finland) use hedonic regression. These differences and shortcomings in the quality adjustment of national data are considered to be the most important deficiency of the euro area aggregate.

4.1.4 Cash/mortgages

In many countries, mortgage lenders are the main data source for house price indices. The databases of mortgage lenders can be a rich source of timely information; however, they exclude cash purchases. Research in the United Kingdom has indicated that cash buyers, who account for around 30% of the UK market, tend to purchase at the extremes of the market, ie very cheap and very expensive properties, and that dwellings purchased by cash follow a different development to those financed by a mortgage (Statistik Austria (2001)). It is not clear whether there is any bias in the house price data from other European countries where cash purchases are not included (Belgium, Spain, Ireland) as no alternative source is available.

4.1.5 Timing

The process of selling a house often takes place over a period of several months or more and the particular stage in this process at which the price is entered into the index varies, often depending on the source of the data, and has consequences for the comparability of the data. National indices used in the euro area aggregate include data at the following stages:

- As soon as the property is on the market. Typical data sources: newspapers, estate agents;[5]
- Mortgage approved. Typical data source: mortgage lenders;
- Signing of binding contract. Typical data source: lawyers;
- Transaction completed. Typical data sources: land registries, tax authorities.

Ideally a house price index would show actual transaction prices at the time when the property is first taken off the market. The signing of the first binding contract fits this requirement best; however, in practice the point at which a contract is binding, and what is considered as binding, differs between countries. The effect of the heterogeneous recording of the available data is likely to be limited in an annual frequency aggregate, but will become more significant as we move towards a quarterly index. For the euro area index it is clear that, whilst aiming for the ideal, compromises must be accepted.

[5] Although not related to the issue of timing, a disadvantage of advertised prices and mortgage approvals is that not all of the prices included end in transactions, and in the former case, the price will tend to be higher than the final negotiated transaction price.

4.1.6 Choosing amongst the available national sources

Table 1 gives an overview of the correlation coefficients of the main alternative time series which have been considered for inclusion into the euro area aggregate. Graphs of the series compared are shown in Annex 2. The correlation coefficients vary considerably between 0.6 and 0.99. Generally, the series in which the *same* source provides breakdowns of different market segments show relatively high correlation. However, correlation coefficients for series with similar definitions but different sources are in most cases significantly lower. Differences between sources are particularly relevant in the short term, while the long-term trend of the time series is mostly similar.

This suggests that, as measured by the available data, the geographical and market coverage is less important than the choice of the source data and the methodology employed. It underlines the importance of relying on national expertise when selecting property price series for the purpose of compiling euro area aggregates.

Table 1

Correlation coefficients of alternative national sources

Country	Series	Correlation coefficient	Time period
DE[1]	Five largest cities vs 60 largest cities[2] (both Bulwien AG)	0.902	1991-2002
	New vs existing flats (both Bulwien AG)	0.818	1991-2002
	GEWOS vs Bulwien[2]	0.802	1991-2002
	RDM vs Bulwien[2]	0.790	1991-2001
	GEWOS vs RDM	0.585	1991-2001
GR[3]	BoG including[2] vs excluding Athens (same source)	0.910	1998 Q1-2002 Q4
ES[4]	MdF new vs existing dwellings (same source)	0.948	1988 Q1-2002 Q4
FR[5]	INSEE France, existing dwellings[2] vs INSEE Paris, existing dwellings	0.950	1995-2002
	ECLN France, new flats vs ECLN France, new houses	0.725	1995-2002
	INSEE France, existing dwellings[2] vs ECLN France, new houses	0.718	1995-2002
	INSEE France, existing dwellings[2] vs ECLN France, new flats	0.710	1995-2002
IE[6]	DoE new vs existing[2] dwellings (same source)	0.898	1997 Q1-2002 Q4
	TSB new vs existing dwellings (same source)	0.873	1997 Q1-2002 Q4
	DoE existing dwellings[2] vs TSB existing dwellings	0.714	1997 Q1-2002 Q4
	DoE new dwellings vs TSB new dwellings	0.584	1997 Q1-2002 Q4
IT[7]	Nomisma new dwellings vs existing dwellings (same source)	0.987	1989 H1-2002 H2
	BoI new dwellings[2] vs existing dwellings (same source)	0.952	1989 H1-2002 H2
	BoI new dwellings[2] vs Nomisma new dwellings	0.873	1989 H1-2002 H2
	BoI existing dwellings vs Nomisma existing dwellings	0.847	1989 H1-2002 H2

Note: Coefficients calculated from annual growth rates.

[1] Bulwien AG and GEWOS are private research institutes; RDM is a federation of estate agents. [2] Indicates series used in overall euro area aggregate. See also Annex 2. [3] Both series are compiled by the Bank of Greece (BoG) on the basis of data from a private research institute. [4] Both series are from the Ministerio de Formento (MdF, Ministry for Infrastructure and Urban Planning). [5] INSEE is the National statistical institute of France; ECLN (Enquete sur la commercialisation des logements neufs) is a survey run by the Ministry of Equipment, Transport and Housing. [6] DoE = Department of the Environment and Local Government; TSB = Permanent TSB mortgage bank. [7] Nomisma is a private research institute; BoI = Bank of Italy.

Source: ECB.

4.2 The effect of these differences on the euro area aggregate

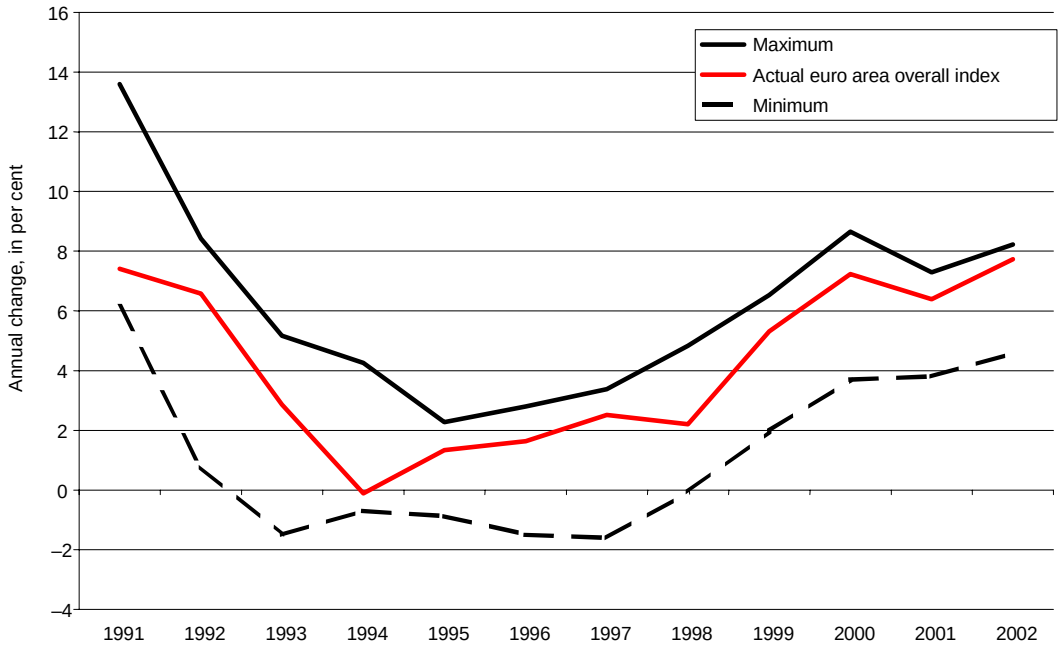
From the available evidence it appears that the differences between the available national data may have a significant effect on comparability, although there may be some cancelling-out at the euro area

level. Without true harmonised data for comparison it is impossible to be certain of the real effect. We may, however, look to the possible margins of error in aggregation of the existing data. In order to investigate this, we have taken for each of the countries where we have at least one alternative source (Germany, Greece, Spain, France, Ireland, Italy) the highest and lowest reported annual growth rate for each observation period from all the alternative series and then created a "minimum" and a "maximum" euro area aggregate. For countries where only one reasonable national source exists, we have used the same series in both aggregates. The results are presented in Graph 4 together with the actual ECB euro area overall index. The results show that there is a significant gap between the maximum and minimum series which corresponds to between 3 and 7.5 percentage points. This confirms that the choice of national components for the aggregate is important and that there is potentially a rather large margin of error. However, the distance between the actual euro area aggregate and the simulated two extremes is relatively stable and the trend over the past 12 years is broadly consistent in all three series. This confirms the ECB's view that while the euro area residential property price index may be used to analyse trend developments, both smaller short-term changes in the index and the level of annual growth rates have to be treated with a considerable degree of caution.

Graph 4

Maximum and minimum boundaries of euro area aggregate

Annual changes, in per cent



Source: ECB.

5. The effect of alternative country weightings on euro area totals

Having selected the most representative and homogeneous available national indicators, the question of which country weighting scheme should be used for aggregation is still open. In principle the problem is no different from the decision on weights in a representative national index, which is often calculated as the weighted average of regional indices. The decision is limited to a much greater extent at the international level by the availability of coherent and harmonised structural indicators which may be used for weighting purposes. The construction of good-quality weights requires level data which have uniform coverage of markets in any country. For example, data on the stock of properties that include commercial properties will obviously overstate the weight of a country when

compared with data for residential properties in other countries. The sources for such data within the European Union are scarce.

Conceptually there are two main decisions that must be taken in choosing a weighting scheme for cross-country aggregation; first, whether the indices should be weighted by the flow of transactions or the stock of all dwellings; and second, whether the weights should refer to the value of housing (ie in euros) or the volume (ie the number of houses).

5.1 Transaction vs stock weights

Whereas it is clear that the only observable prices that normally enter house price indices are for those transacted, it is less clear whether house price indices should *represent* only these transactions or whether the observed transactions should be used to produce an estimate for the change in the existing stock of dwellings. This choice has a significant impact on the relative country weights for several reasons. First, structural differences mean that some EU housing markets are much more active than others. In Germany, for instance, over the past decade only about 1.7% of the stock was transacted annually, whereas in Ireland and the United Kingdom the figure was closer to 5.5%.[6] Second, transactions are more volatile than the stock and so the share given to a particular country will depend on the state of the housing market in that country in the base period. There were, for instance, more than twice as many transactions in Greece in 1997 as there were in 1991. Third, some types of dwelling are likely to be transacted more frequently and at different stages in the property price cycle than others. Therefore, at any one time, it is unlikely that the make-up of transacted properties is a representative sample of the stock. Finally, the weight given to the subindex for new dwellings would be dramatically different under the two concepts. In Finland, for example, approximately 15% of transacted dwellings are newly constructed, whereas gross fixed capital formation in residential construction in 2002 was only 4.3% of the stock of residential buildings (as recorded in the national accounts balance sheets).[7]

If the house price index is to accurately represent the actual market conditions, ie the price changes faced by a potential house buyer, then a weighting according to the characteristics of transacted dwellings would be expected. As noted above, the price developments for new dwellings are often, at least in the short term, different from those for existing dwellings. However, the weight of new dwellings in a stock-based index would be negligible. Therefore, a transaction-based approach may be preferred on the grounds that it is more representative of the actual market situation.

Different considerations arise from the point of view of a property price index used as an asset price index. Most asset price indices, such as equity prices, are constructed according to market capitalisation. The reason for this approach is that a particular stock should not receive a higher weight in an equity price index because it is heavily traded in a particular period, as investors are interested in the value of their portfolio.

It would seem that the choice of the weights depends on the use of the index. A transaction-weighted index may be useful for analysis of the current market situation, analysis of the demand for credit, analysis of the realised gains by households of the appreciation of house prices, or for use as the owner-occupied housing component in a consumer price index considering housing as a durable good. In contrast, a stock-weighted index may be more appropriate for analysis of housing as an asset. This may include analysis of the influence of house prices on consumer behaviour via wealth effects, use of house price data as a financial soundness indicator (as the index should be representative of the houses used as collateral for securing loans), or comparison of property price data with other asset price indices.

5.2 Nominal vs volume weights

Independent of the decision on whether to use transaction or stock weights is the decision on whether the weights should be nominal (eg expressed in euros) and thus influenced by relative price levels in

[6] Number of transactions as a share of stock of dwellings (source: European Mortgage Federation).

[7] Source: Statistics Finland.

each of the euro area countries, or non-monetary, volume weights (eg expressed as the number of houses or transactions). In between these two options are nominal weights corrected for differences in purchasing power. As with the decision on transaction versus stock weights, the current choices made by the producers of the available data differ between and within countries.

Nominal weighted indices consider that property price levels may vary greatly between regions and countries. For inflation analysis in the single currency area, nominal weights appear appropriate. The same applies for the analysis of wealth effects, because it would be counterproductive to eliminate the effect of different price levels of dwellings from a measure which is used to monitor the development of nominal wealth. There appears to be only one reason to use simple volume indicators for weighting purposes, and this is to use them as proxies in the absence of adequate nominal weights.

Volume weights are used in many of the national indices - eg Italy uses the size of dwelling space in square metres in various regions, Finland uses the number of houses in each cell and Germany and Spain use population weights for aggregating regional indices, although population is clearly a proxy weight in the absence of more appropriate measures.

5.3 Potential sources for the euro area country weights

The currently used weighting scheme for compiling the ECB euro area index is based on GDP results, mainly due to the availability of complete and comparable results for all EU countries. Moreover, GDP is the broadest monetary measure of economic activity and a frequently used indicator to aggregate national economic statistics. There are, however, alternative and potentially more appropriate weighting schemes, which are discussed in this section. Table 2 shows the framework of the four possibilities discussed in Sections 5.1 and 5.2 and gives the potential candidates for which data exist.

Table 2

Available sources of euro area country weights

Weights	Transactions	Stocks
Nominal	– *Proxy* - **National accounts gross fixed capital formation, housing** (source: NSIs; available countries: all; harmonised data)	– **National accounts balance sheets** - **dwellings** (AN.111) (source: NSIs; available countries: BE, NL, FI; harmonised data) – *Proxy* - **National accounts, actual** + **imputed rents** (source: NSIs; available countries: all except LU; harmonised data)
Volume	– **Number of transactions** (source: NSIs; available countries: all except ES, AT; non-harmonised data)	– **Number of dwellings (total stock)** (source: NSIs; available countries: all; non-harmonised data) – *Proxy* - **Population** (source: NSIs; available countries: all; harmonised data)

Note: NSIs = national statistical institutes.

Source: ECB.

As a transaction weight, gross fixed capital formation in housing would be a choice for an index for new dwellings; however, as discussed in Section 4, the share of new dwellings in total transactions is relatively small and varies between countries and so is not necessarily a good weight for the overall index. Moreover, gross fixed capital formation excludes the value of land, which is a non-produced asset. An alternative proxy is to use the number of transactions, with the caveats mentioned before. For all transaction weights, distortion of the weights by one-off influences must be avoided and multi-period averages are preferable to weights for one single period.

The harmonised weighting scheme most relevant for a stock-weighted index, the national accounts balance sheets (according to European System of Accounts (ESA95) definitions), is only available for three euro area countries. The national accounts balance sheets give the current replacement costs of the stock of dwellings, excluding land and including a breakdown by institutional sector. Although the exclusion of land is a disadvantage, as differences in relative land prices between countries would not

be reflected in the weights, the national accounts balance sheets are a promising source for country weights but can only be used once they are compiled by more euro area countries.

As regards stocks, a possible proxy is the actual rents paid and imputed rents of owner-occupiers, which is available for all euro area countries except Luxembourg. The use of such data would require the assumption that the ratio of (actual + imputed) rents to residential property price levels is the same in all countries, which may not be the case due to different tax/subsidy regimes and societal preferences regarding home ownership. As regards "volume" or non-monetary weights, the data on number of transactions are available for euro area countries (except Spain and Austria) from the European Mortgage Federation (EMF) and the data on number of houses in the total stock area are available for all countries from the decennial Census of Population and Housing. The EMF transaction data are non-harmonised and so are not strictly comparable: some countries include, for instance, commercial properties, others exclude new dwellings or own constructions. Data on the number of houses in the stock of dwellings from the censuses come from national statistical institutes, are of good quality and are generally comparable. Unfortunately data from the 2001 census had not yet been published for all countries at the time of writing and so the 1991 round provided the latest available information. Finally, population data may be considered a proxy to a volume-based measure of the stock of dwellings. In practice it is often used to weight detailed regional data, presumably mainly due to the lack of more appropriate regional weighting indicators.

An important point is that, of all the potential data sets mentioned in this section, only gross fixed capital formation in housing, possibly used together with data on national accounts balance sheets, could provide a coherent breakdown between new and existing dwellings at the euro area level. All other data discussed would only provide weights for an overall index.

5.4 What is the effect of different weighting schemes on the euro area aggregate?

Having given an overview of the available data, this section looks at the effect of some of the potential weighting schemes on the euro area aggregate.

Table 3

Possible country weighting schemes for the euro area aggregate

Euro area = 100

	No of transactions[1] (1995-97)	Housing stock (census data 1991)	Actual + imputed rents (2001)	Gross fixed capital formation in housing (1999-2001)	GDP (2001)	Population (2001)
BE	3.5	3.1	3.8	3.0	3.7	3.4
DE	18.2	26.6	34.7	38.8	30.3	26.9
GR	2.5	3.6	2.2	1.7	1.9	3.6
ES	13.4	13.4	6.9	9.5	9.5	13.1
FR	24.4	20.4	22.9	16.6	21.6	19.9
IE	2.2	0.8	1.5	2.4	1.7	1.3
IT	18.1	19.5	17.0	14.3	17.8	18.9
LU	0.1	0.1	0.0	0.2	0.3	0.1
NL	8.9	4.8	5.0	6.8	6.3	5.2
AT	2.6	2.6	2.5	3.1	3.1	2.7
PT	3.3	3.3	1.0	1.8	1.8	3.4
FI	2.8	1.7	2.5	1.9	2.0	1.7

[1] Data from the European Mortgage Federation. Figures for Spain, Austria and Portugal estimated using data on housing stock.

Sources: ECB; EMF; Eurostat; national sources.

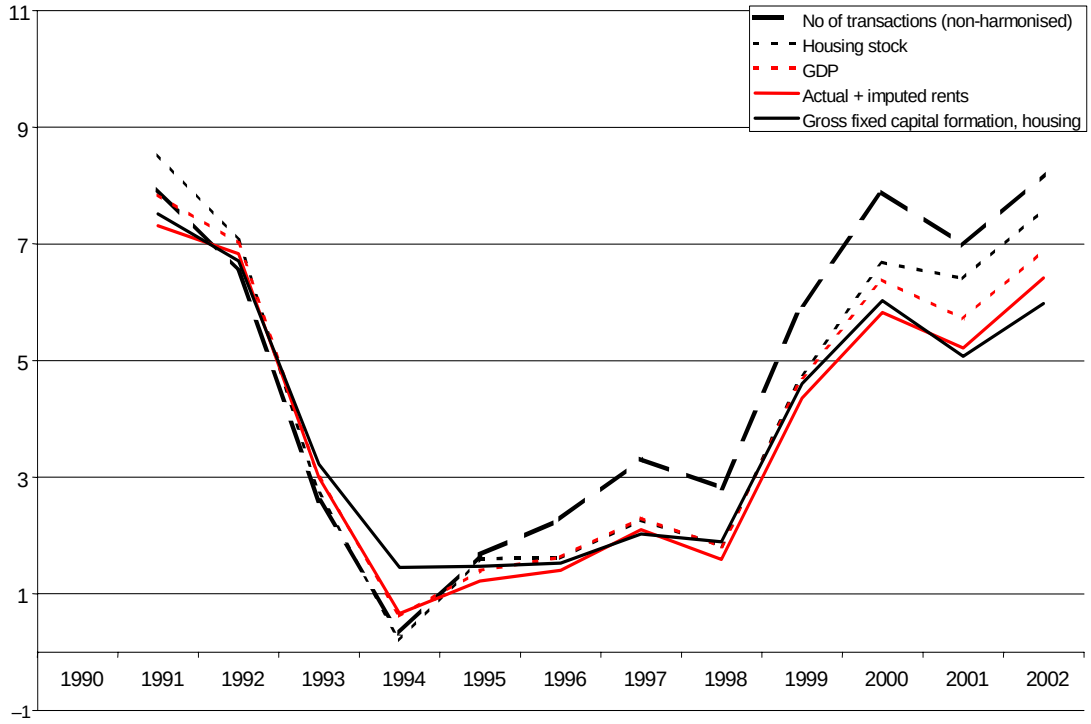
Table 3 shows the country shares in the euro area. For the more volatile data (transactions and gross fixed capital formation in housing), a three-year average was taken for the most recent available data; otherwise 2001 data are used with the exception of the housing stock, for which 2001 data are not yet available. The data show both marked differences and similarities in different parts of the table. Regarding their weight in the euro area aggregate, the most significant difference is between different weights for Germany, ranging from 18 to 39% in the euro area aggregate.

Graph 5 shows the results of applying these different weighting schemes to the same set of national data in order to calculate euro area totals. National contributions to the euro area figures for 1992 and 2002 are shown in Annex 3. The results are generally very similar, especially using GDP, actual and imputed rents and the housing stock weights. The aggregate weighted by the number of transactions is relatively similar until 1994 and then deviates and remains consistently higher than the other aggregates. This is mainly explained by the behaviour of the German data, which is similar to the euro area average until 1995 and then drops significantly below (the difference between the annual growth rates was 7 percentage points in 2002). As Germany has a particularly low share in the transaction weights, the transaction-weighted euro area aggregate is higher than all other aggregates. Also important is the effect of different weighting sets for Spain, because after l998 the annual increases are significantly higher than the euro area average.

Graph 5

Euro area residential property price indices using different weighting schemes

Annual changes, in per cent



Source: ECB.

The tables in Annex 3 demonstrate that there are, in some cases, considerable differences in the national contributions under different weighting schemes, but that the cancelling effect means the overall aggregate is often unaffected (eg in 1992). However, where the effects of divergent national growth rates and differences in the weights work in the same direction, as in 2002, the effects are more significant, leading to a difference of up to 2.2 percentage points.

It seems that the choice between the available weighting schemes is more important for the magnitude of the rate of change than the trend. However, as the differences in the magnitude of the rate of change can be significant, the question remains: which weighting scheme should be used in the euro area aggregate? Given the low quality of the data on the number of transactions, and given that this is a basic volume measure rather than the desired nominal measure, we conclude not to use these weights. Gross fixed capital formation in housing provides good-quality harmonised data; however, the fact that it applies only to new dwellings and excludes land prices means it is rather too far from the required measure. Moreover, it tends to be volatile. The remaining three measures produce the closest results, as shown in Graph 5. Both the housing stock and actual + imputed rents differ from the desired measure and, given that GDP falls between the two, we may pragmatically conclude that the existing GDP-weighted index is an acceptable solution given the available data.

6. Conclusions

The euro area residential property price index compiled by the ECB is a useful indicator for economic analysis. However, as an aggregate of non-harmonised national indicators it can only be regarded as an estimate of the general trend in price developments. There are substantial differences between the current national sources used and these differences can be assumed to have a greater impact on the resulting aggregate than those found in other non-harmonised euro area statistics. Moreover, the national data are often only broad proxies for the national price developments. In the absence of better quality harmonised indicators, it is difficult to precisely assess the reliability of the current index. Evidence from comparing available national sources suggests that the criteria used for selecting national components into the aggregate, namely breadth of geographical and market coverage, sophistication of quality adjustment, and reliability of source data, are correct. However, in many cases the choice is limited to series which fall considerably short of the targeted definition and quality requirements. For this reason the index may best be used to analyse trend developments, but both *smaller* short-term (annual) *changes* in the index and the *level* of the annual *growth rates* have to be treated with a considerable degree of caution. Work is also needed to increase the periodicity of the euro area index to quarterly, which requires higher-frequency data for Germany and Italy.

For the aggregation of the data into a euro area indicator, there is more than one variant which may provide a valid result. In practice, the choice of available weighting schemes is limited and in no case provides an ideal solution. For an inflation index nominal weights should be used, but whether they refer to the flow of transactions or the stock of dwellings depends on the final purpose of the index. Increased country coverage of national accounts balance sheets may provide an appropriate answer in the medium term. Simulations with available data suggest that a properly measured weighting scheme would produce quite different results depending on this decision, especially with regard to the relative share of new and existing dwellings in the overall index. Given the unsatisfactory characteristics of the alternatives, it is suggested to continue using GDP weights until a more appropriate harmonised data set becomes available.

Annex 1:
Overview of national series used in the ECB euro area residential property price indicator (overall index)

Country (GDP weight)	Frequency	Timeliness	Data source	Dwelling type	Geographical coverage	Cash/ mortgages	Quality adjustment	Regional weighting
BE (3.8%)	Quarterly	5-6 months	Mortgage bank	Existing small/ medium-sized dwellings	Whole country	Mortgages only	...	...
DE (30.3%)	Annual	3 months	Research institute/central bank	Separate series for new/existing terraced houses and flats	60 cities	Both	Flats: price per square metre; Terraced houses: only of about 100 square metres, medium to good areas	Population
GR (1.9%)	Quarterly	5 months	Research institute/central bank	All dwellings	Urban areas	Both	Price per square metre	Size of dwelling stock
ES (9.5%)	Quarterly	3 months	Government	All dwellings except subsidised dwellings	Whole country	Mortgages only	Price per square metre, subindices by postcode	Population
FR (21.5%)	Quarterly	5 months	Notary/NSI	Existing dwellings	Whole country	Both	Hedonic regression (surface area, number of rooms, bathrooms, age, garage, parking, size of plot and others)	Transaction values
IE (1.7%)	Quarterly	3 months	Government	New and existing dwellings (separate series)	Whole country	Mortgages only	None (unit values)	...
IT (17.9%)	Semiannual	1 month	Newspaper/ central bank	New and existing dwellings (separate series)	96 provincial capitals	Both	Price per square metre; according to proximity to city centre	Size of dwelling stock
LU (0.3%)	Annual	19 months	Central bank/ NSI	Dwellings built after 1944	Whole country	Both	None (unit values)	None

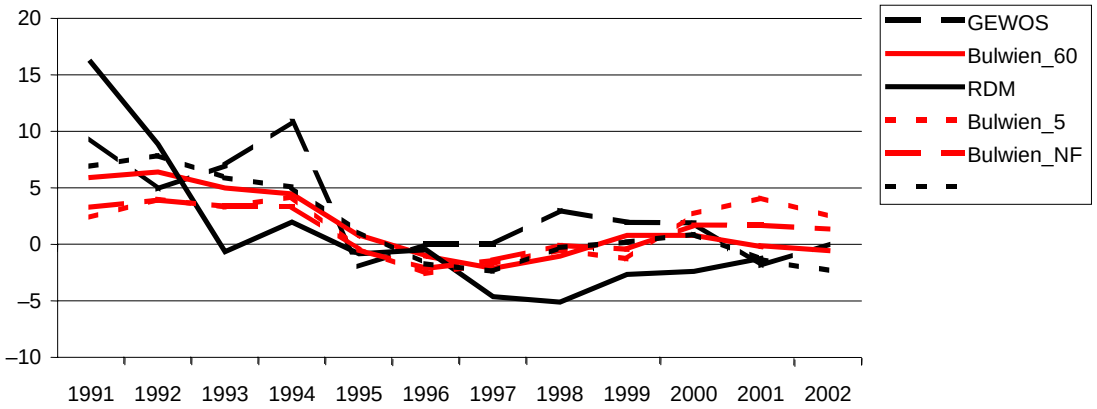
Annex 1 (cont):
Overview of national series used in the ECB euro area residential property price indicator (overall index)

Country (GDP weight)	Frequency	Timeliness	Data source	Dwelling type	Geographical coverage	Cash/ mortgages	Quality adjustment	Regional weighting
NL (6.2%)	Monthly	1 month	Land registry/ central bank	Existing dwellings	Whole country	Both	None (unit values)	None
AT (3.1%)	Semiannual	1 month	Estate agents/ university	All dwellings	Whole country (since 2000), Vienna only (since 1987)	Both	Price per square metre	...
PT (1.8%)	Monthly	1 month	Real estate newspaper/ central bank	All dwellings	30 large/medium-sized towns	Both	Price per square metre	...
FI (2.0%)	Quarterly	1 month	Administrative data	Existing dwellings	Whole country	Both	Hedonic regression (floor size, age, number of rooms, location) and classification approach combined	Dwelling stock (number of houses per cell)

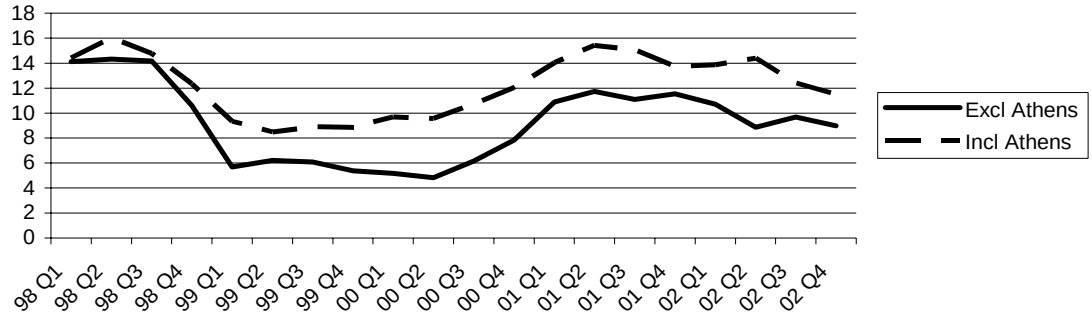
Annex 2:
Alternative national series

Annual changes, in per cent
(for series description see below)

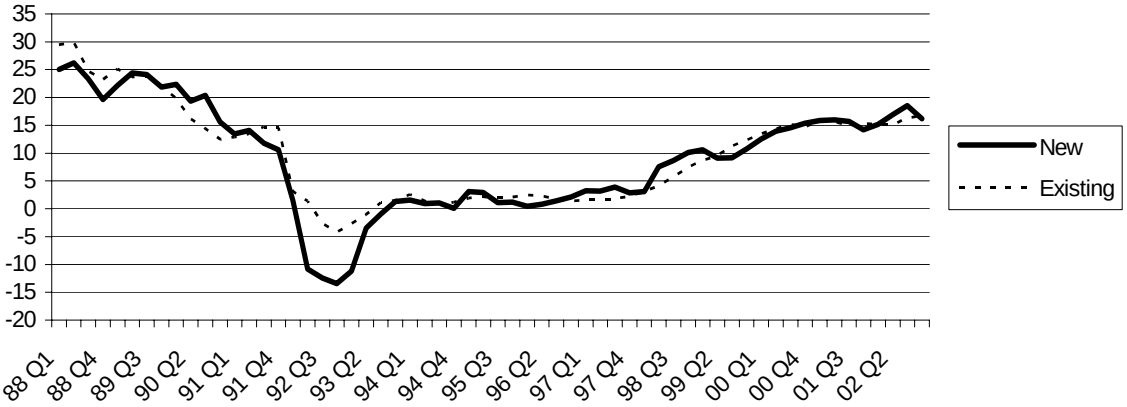
Germany



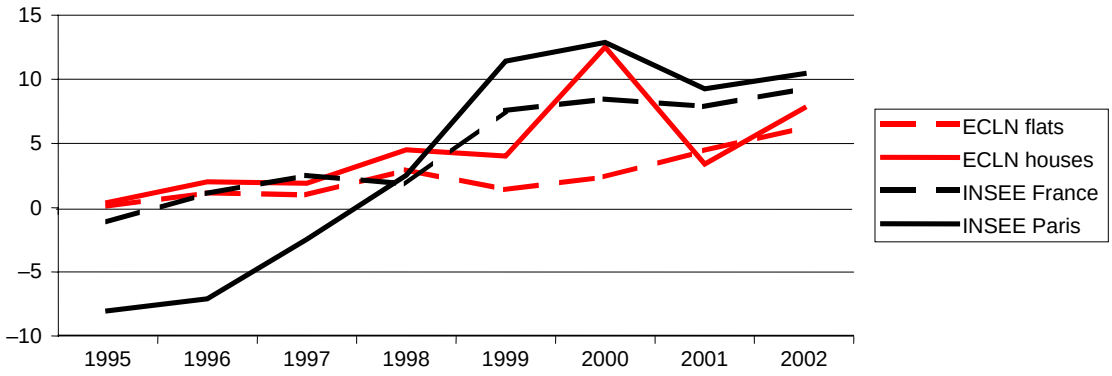
Greece



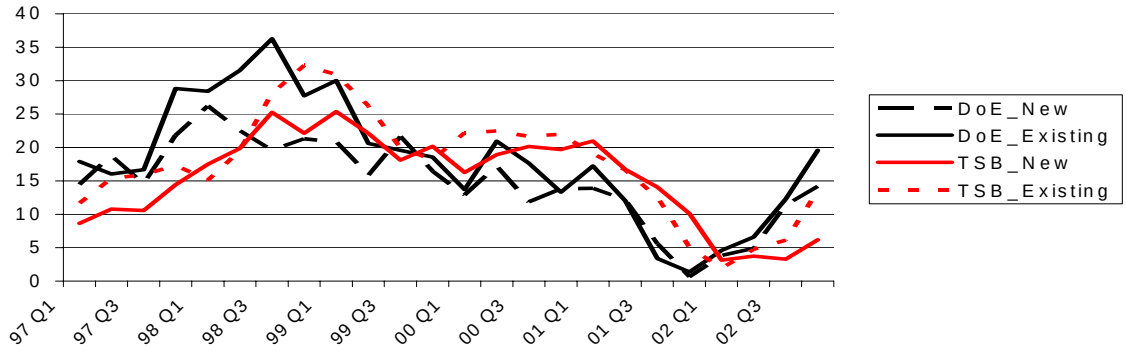
Spain



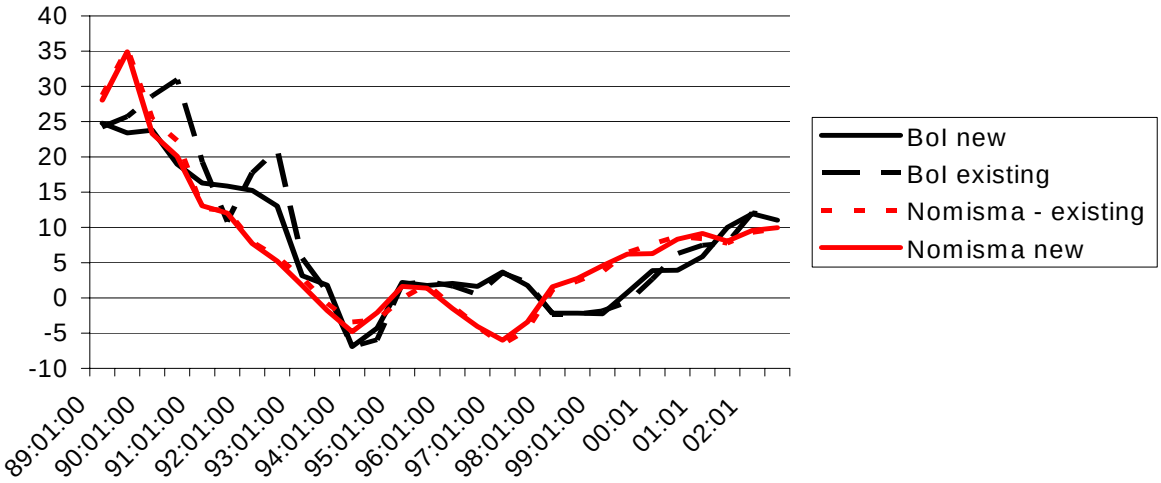
France



Ireland



Italy



Description of the national series used above

Germany (from 1995, whole of Germany, to 1994, West Germany)

- Bulwien 60 - new and existing dwellings - average of 60 cities - series used in the ECB euro area aggregate, described in Annex 1. Source: Bulwien AG.
- Bulwien 5 - new and existing dwellings - average of largest five cities (Berlin, Hamburg, Munich, Cologne, Frankfurt). Source: Bulwien AG.
- Bulwien NF - new flats - average of 60 cities. Source: Bulwien AG.
- Bulwien EH - existing flats - average of 60 cities. Source: Bulwien AG.
- RDM - average of five largest cities, previously used in BIS *Annual Report*. Source: Ring Deutscher Makler (real estate federation).
- GEWOS - average prices for houses and flats, whole country. Source: GEWOS (Hamburger Institut für Stadt-, Regional- und Wohnforschung GmbH).

Greece

- Excl Athens - new and existing dwellings in 15 cities excluding Athens. Source: Bank of Greece.
- Incl Athens - aggregation of Excl Athens series, with a series from a private research institute for Athens. Source: Bank of Greece.

Spain

- New - dwellings less than one year old. Source: Ministerio de Fomento.
- Existing - dwellings older than one year. Source: Ministerio de Fomento.

France

- ECLN Flats - new flats excluding own construction. Source: Ministry of Equipment.
- ECLN Houses - new houses excluding own construction. Source: Ministry of Equipment.
- INSEE France - existing dwellings sold in whole of France. Source: INSEE/notaires.
- INSEE Paris - existing dwellings sold in Paris. Source: INSEE/notaires.

Ireland

- DoE New - new dwellings (all mortgage transactions). Source: Department of the Environment.
- DoE Existing - existing dwellings (all mortgage transactions). Source: Department of the Environment.
- TSB New - new dwellings (mortgage transactions financed by TSB Permanent. Source: TSB Permanent (mortgage bank).
- TSB Existing - existing dwellings (mortgage transactions financed by TSB Permanent. Source: TSB Permanent (mortgage bank).

Italy

- BoI New - new dwellings, 96 cities. Source: Bank of Italy based on data from Il Consulente Immobiliare.
- BoI Existing - existing dwellings, 96 cities. Source: Bank of Italy based on data from Il Consulente Immobiliare.
- Nomisma New - new dwellings, 13 largest cities. Source: Nomisma (private research institute).
- Nomisma Existing - existing dwellings, 13 largest cities. Source: Nomisma (private research institute).

Annex 3:
Contribution of national data to the euro area aggregate under different weighting schemes

Table 1

Contributions to the annual percentage change for the year 1992

	National data (annual change, in per cent)	Weighting scheme used					
		No of transactions (EMF)	Housing stock (census data)	Actual + imputed rents	Gross fixed capital formation in housing	GDP (market exchange rates)	Population
DE	6.2	1.1	1.7	2.2	2.4	1.9	1.7
ES	–1.3	–0.2	–0.2	–0.1	–0.1	–0.1	–0.2
FR	2.5	0.6	0.5	0.6	0.4	0.5	0.5
IT	19.4	3.6	3.9	3.4	2.8	3.5	3.8
NL	8.4	0.8	0.4	0.4	0.6	0.5	0.5
Others	.	0.6	0.7	0.4	0.6	0.6	0.7
Euro area	.	6.5	7.1	6.8	6.7	7.0	7.0

Source: ECB calculations.

Table 2

Contributions to the annual percentage change for the year 2002

	National data (annual change, in per cent)	Weighting scheme used					
		No of transactions (EMF)	Housing stock (census data)	Actual + imputed rents	Gross fixed capital formation in housing	GDP (market exchange rates)	Population
DE	–0.2	0.0	–0.1	–0.1	–0.1	–0.1	–0.1
ES	16.6	2.2	2.2	1.1	1.6	1.6	2.2
FR	9.3	2.3	1.9	2.1	1.5	2.0	1.8
IT	11.9	2.2	2.3	2.0	1.7	2.1	2.2
NL	6.2	0.6	0.3	0.3	0.4	0.4	0.3
Others	.	1.0	0.9	0.9	0.8	0.8	1.0
Euro area	.	8.2	7.6	6.4	6.0	6.9	7.5

Source: ECB calculations.

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