

# The measurement of euro area property prices pitfalls and progress

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Mortgage lending forms a significant part of EU banks' activity. The value of these loans is underpinned by the value of the real estate used as collateral. The real estate market is known to experience deep economic cycles. Real estate price developments are important for macro prudential analysis. The statistical measurement of real estate price developments is a challenging subject that recently has gained more prominence in Europe. This paper reports on the ESCBs development work in this field for both Commercial and Residential property price measurement.

The measurement of real estate property price developments poses distinct challenges for statisticians. Real estate property is by nature very heterogeneous and is traded infrequently. In normal times this already poses challenges in the observation of transaction prices for comparable (like for like) real estate. This is especially true for commercial real estate. Compiling real estate prices during times of stress, e.g. when the volume of transactions decreases sharply from the normal level, is even more challenging.

On residential property, the paper reports about statistics on changes in house prices which have been collected by European central banks since the year 2000. Underlying data sources have exhibited heterogeneous statistical properties, in particular in terms of types of prices referred to, geographical coverage and representation of dwelling types. Nevertheless, residential property price indicators, derived from this source information, have provided useful insights, into cyclical behaviour as well as into the variation of housing market dynamics across EU countries. A harmonised data set of house price indices has been created by the statistical institutes in the European Union. While this achievement poses a great improvement for recent analyses and assessments of house price developments, the central banks' residential property price data can still be considered useful, e.g. for addressing developments time periods in the 1990s and early 2000s and for benchmarking purposes.

As regards commercial property the ESCB has recently established an experimental indicator of commercial property prices. The paper presents this work in detail and highlights both the advantages and the deficiencies of the approach taken. Finally the paper also presents the research agenda for continued development of the data.

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<sup>3</sup> The views expressed in this paper are those of the authors and do not necessarily reflect the views of the European Central Bank. The authors would like to thank Gabriel Quirós and Tjeerd Jellema for their helpful comments and suggestions.

JEL classifications: C43 – Index Numbers and Aggregation, R30 – Real Estate Markets, Spatial Production Analysis, and Firm Location – General, R31 – Housing Supply and Markets

# 1. Introduction

## 1.1 Background

The recent financial and economic crisis has highlighted that developments in real estate markets (commonly separated into a commercial and a residential segment) can have a major impact on macroeconomic developments and financial stability. Therefore, it is of utmost importance, in particular for policy makers, to report adequately and timely information about the key factors underlying these real estate movements.

In November 2010 a clear impetus for developing statistics on indicators of commercial property prices came from the IMF and the Financial Stability Board, which included real estate price statistics as a principal global indicator (PGI) as recommendation 19 in their report to the G20 entitled "The Financial Crisis and Information Gaps"<sup>4</sup>.

Residential property price indices aim to measure changes over time in transaction prices of houses and flats, including the underlying land, independent of which sector of the economy the buyer or seller come from and who occupies the dwelling after the purchase. Residential property price indicators have been collected by the European Central Bank (ECB) since the year 2000; official statistics, if available, were very incomplete at that time. The ECB's data collection was set up in collaboration with the EU central banks. Price indicators were mainly obtained from the Bank for International Settlements (BIS) which started in the late 1980s to create a data base on house price indicators from data provided by its member central banks. The European System of Central Banks' (ESCB) Working Group on General Economic Statistics (WG GES) has been developing and contributing to the enlargement and improvement of the ECB data collection. This paper heavily draws and largely presents done by the WG GES. While in most cases existing data sources have been applied, some National Central Banks (NCBs) have become actively involved in the data collection. Several central banks contributed to the compilation of the indicators. Statistical activities have ranged from providing data, e.g. for weighting, to the complete development of residential property price indicators. However, the fact that most NCBs are not directly involved in the collection or compilation of residential property price information has been limiting further improvements of the ESCB dataset, in particular in terms of harmonisation. The degree of heterogeneity in terms of data sources, collection methods and compilation procedures has remained substantial. Overall, the statistical quality of the ESCB data has remained below the standards of other economic statistics and price indicators for the euro area. Nevertheless, most indicators allowed identifying major upswings and downturns of housing market prices, while there were several cases in which it turned out to be difficult to capture short-term movements.

<sup>4</sup> See IMF Staff and FSB Secretariat, "The financial crisis and information gaps", available on the IMF's website at <http://www.imf.org/external/np/g20/pdf/102909.pdf>.

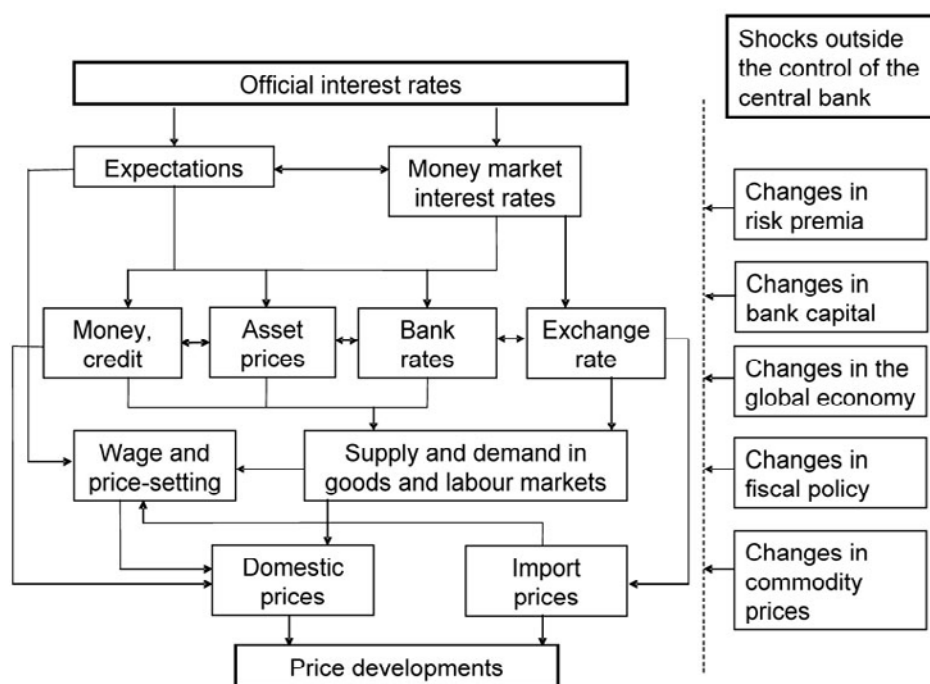
In the mid-2000s, the European Statistical System<sup>5</sup> started creating a set of comparable house price indices for EU Member States, compiled according to harmonised statistical concepts and methods. The official publication of these house price indices started in February 2013. While the ESS achievements on house price indices mark a milestone towards a harmonised statistical compilation and reporting, the non-harmonised statistics collected by central banks, in particular those by the BIS, and other institutes may be considered to be still useful, in particular in terms of back data and long time series, but also for enriching the picture in terms of recent developments.

## 1.2 The use of commercial and residential property price analysis in the European Central Bank

Measures of changes in real estate prices can provide valuable input to both monetary policy and financial stability analyses. This reflects the role that these prices can play in the monetary transmission mechanism and the assessment of the asset quality of bank balance sheets.

The role of commercial property prices in the monetary transmission mechanism is similar to that of other asset prices. On the one hand, commercial property prices may move in response to changes in financing conditions and expectations triggered by monetary policy actions (see Figure 1). On the other hand, commercial property prices can propagate monetary policy actions to economic growth and HICP inflation. While residential property prices may also have a more direct influence on consumer price inflation, the influence of commercial property prices might normally be more indirect through effects on investment decisions. For instance, higher commercial property prices could be reflected in the valuation of fixed assets which might lead to improved financing conditions and better enable firms to raise funds for investment projects.

<sup>5</sup> The European Statistical System consists of Eurostat, the statistical office of the European Union, and all national statistical institutes of EU Member States.



Source: ECB.

Residential property price indicators play a role for monitoring and forecasting macro-economic developments, in particular those related to private households' economic decision making. The buying or selling of a dwelling is typically the largest transaction a private household enters into. Changes in residential property prices are therefore likely to influence substantially budget plans and saving decisions of the potential buyers and sellers. Such price changes also impact on the wealth of dwellings owners of given that it is the largest asset in their portfolio. Houses and flats are purchased as an investment, which creates rental income in the case the dwelling is being let. This is, for the time being, the main channel through which house price inflation may impact on the rates of change of Harmonised Indices of Consumer Prices (HICPs) – the European Central Bank's measure to define price stability in the euro area. The impact materialises via rents and not directly via house prices, since the Harmonised Index of Consumer Prices covers rental payments by households whose weight in the Harmonised Index of Consumer Prices for the euro area in 2014 is 6.2%), but excludes – for the time being – expenditures by owner-occupiers for purchasing or using their own house or flat. Housing investments may also create significant capital gains. Housing price developments can also have an effect on residential construction investment. Finally, housing prices can provide important insights for financial stability analysis, since sharp changes in house prices can have a detrimental impact on financial sector health and soundness, by affecting credit quality and the value of collateral.

From a financial stability perspective, it is also important to observe that institutional investors, such as insurance companies, pension funds, hedge funds, private equity firms and sometimes banks, have large investments in commercial and residential property markets. Banks and other financial intermediaries also tend

to have real estate exposures via collateralised loans extended for investment in real estate. A fall in property prices and rents weakens the property companies' financial soundness and thus their ability to service debt, as well as lowering the value of collateral for mortgages. Lending for real estate activities is the biggest category of total MFI loans to non-financial corporations in the euro area, accounting for 35% of the total, a share that has been increasing over the past ten years. In addition, loans for construction account for an additional 9% of total loans to non-financial corporations. However, the importance of lending for real estate and construction activities combined differs greatly across countries.

## 2. Types of data sources

The nature of real estate markets is such that data collection can be undertaken at different stages of the process of acquiring real estate, can be collected from different actors and, as a result, are available with different timeliness and accuracy. For instance, for a house purchase one might collect data at the time of first marketing (an offer price), when an offer is made for purchase (a bid price), or when the sale takes place (a transaction price) and might be collected from the house owner, a real estate broker, a lawyer or a registration authority, etc. These differences can obviously affect the quality and comparability of the data used. Different types of data sources are explained below.

### 2.1 Types of commercial property data

Commercial property is usually defined as income-generating property, such as office buildings and retail establishments (restaurants, shopping centres, hotels, etc.); industrial buildings (e.g. warehouses, factories, etc.); and residential property that is being leased or developed for commercial purposes. It is helpful to view income generation predominantly in terms of rental income obtained from the letting of commercial property, which is part of the real estate activity. Indicators of commercial property prices are high on the list of central banks' data needs. Commercial property markets play an important role in the real economy and are also important for financial stability, primarily due to banks' large loan exposures to commercial property.

The ESCB conducted a stocktaking exercise aimed at determining what indicators exist in the EU to measure commercial property prices. It found that data sources and methodological approaches varied significantly between countries and over time. The stocktaking showed that data are collected at different stages in the purchase process, or at values or appraisal regimes that are not comparable, or that they are extracted from other, related, information rather than from prices. In broad terms, four types of data sources were identified, including transactions data, property valuations (either official or from the private sector), other expert judgement, and financial markets data.

- a) **Transactions based data:** The ideal source for accurate measurement of commercial property prices is to collect data on transactions as and when they occur given that actual purchases reflect best current market situations and conditions. The data collection needs to have a big enough sample to be representative both of the market as a whole and to allow robust estimates for

any breakdowns that are required. Furthermore, both a good coverage of property types (reflecting the market) is equally important as a sufficient coverage of geographical areas. While transaction prices remain the preferred option for price stability analysis, this may, in reality, be difficult to achieve for commercial property, which tends to be highly heterogeneous and infrequently traded, in particular in small countries and in the case of the latter during times of financial or economic market stress, when property markets often register reductions in liquidity.

In reality, the commercial property market is often highly illiquid (especially in times of market stress) which restricts the possibility of compiling a purely transactions based statistic significantly.

- b) *Valuation-based data sources:*** The majority of the price data identified for commercial property are valuation-based indices, and the data sources are predominantly private organisations such as estate agencies, portfolio benchmarkers and other financial market or real estate companies. These indices are often designed for performance measurement purposes rather than for measuring price changes over time. Such valuation-based indices, while allowing a price estimate to be collected when it would not otherwise be available, can thus often have the following drawbacks:
- valuation errors: the sample used for the calculation of the index may be non-representative of the commercial property transactions (i.e. sample bias);
  - smoothing issues: the index value may be based on subjective valuations and thus incorporate a bias, because there is a tendency for valuers to use comparable historical or past transaction prices when forming an opinion of the value of a property. Hence, a particular value might therefore be too “tied” to its previous valuation in a rapidly moving market;
  - the underlying sample can have non-continuous coverage;
  - only relatively short histories of index data are available for many countries.
- c) *Other expert judgement:*** An alternative approach that can be used is to ask property market professionals (for example valuers, architects and property portfolio managers) to make a professional judgement on the price for a specified but fictitious property. This method is used in some of the better known commercial indices – for instance those produced by Jones Lang Lassalle – but suffers from the valuation-based concerns mentioned above. Furthermore, unless a full range of quality and types of property are judged in this way, they tend to concentrate only on the highest quality property in the most prestigious areas. The approach does, however, have the advantage that it can be compiled in a very timely fashion.
- d) *Financial market data:*** In several countries, there are unit trusts or other financial vehicles (e.g. real estate investment trusts) that solely contain commercial properties as the underlying asset. Movements in these might then be used to infer commercial property prices. However, the underlying assets are unlikely to be representative of the market as a whole. Similarly, movements in the value of the financial asset will not only be due to the change in underlying commercial property prices, but also due to other factors, such as the gearing of the fund in question or money market rate movements. The data are, however, available in real time.

## 2.2 Types of residential property data

Price data underlying the residential property price indicators stem from various sources. Residential property prices collected for registration or taxation purposes usually provide a comprehensive data source. However, data collected for taxation purposes may be prone to underreporting of the prices actually agreed between the buyer and the seller. Administrative data sources are, e.g. used for the compilation of residential property price indicators in countries in Denmark, Lithuania, the Netherlands, Finland, Slovenia, Sweden and the UK. In Germany, the statistical institute collects prices from the local expert committees for property valuation.

Data recorded by notaries also provide a comprehensive source for index compilation, used, e.g., by statistical institutes in Spain and France. Real estate agencies' price data may not be fully representative of all housing transactions depending on the market segments covered by the agencies' business activities. A broader market coverage may be reached by simultaneously referring to transaction and offer prices as well as assessments by market experts. Such price data are typically used by real estate consultancies, as one of several sources of price information. Examples of the use of real estate agencies' price data for the compilation of residential property price indicators are Belgium, Germany ("Bulwiengesa"), Greece, France, Italy ("Nomisma"), Portugal and Slovakia.

Data collections of offer or asking prices usually suffer from not taking into account that actual transaction prices may significantly deviate from offer prices. Asking prices are used in the indicator compiled by the Central Bank of Malta.

House price data collected in the process of financing purchases by mortgage loans may also represent only some segments of the market. Cash-paid transaction may present a significant part of all transactions. In Ireland and the UK residential property price data are provided by mortgage lenders. The indicator compiled by the UK's Office for Communities and Local Government is based on a mortgage survey conducted by the Council of Mortgage Lenders.

Price data derived from appraisals may have the advantage of covering a broad sample of houses and flats. If conducted for administrative purposes, for example in Denmark and the Netherlands, appraisal values might even be available for the entire population of residential properties. However, appraisal values might be biased vis-à-vis actual transaction prices, which is more likely if the appraised value is used when a mortgage loan is refinanced than in cases it is used for taxation purposes. Appraisers might react with a delay to recent market developments. Changes in appraised values might only be reported after actual price have increased by a certain amount.

## 3. Data requirements

Given these important uses of changes in real estate prices, price indicators of good statistical quality are required. The primary objective, whether measuring commercial or residential property, is to measure changes in transaction prices, given that actual purchases reflect best current market situations and conditions. A good representation of property types is equally important as a sufficient coverage of geographical areas. In order to identify market dynamics driven by price changes



over time, property price statistics have to control for quality changes in the properties sampled over time.

Due to the divergent developments of real estate property prices across euro area countries, results for individual euro area countries are essential. In addition, it is desirable to obtain at national and at the euro area level a distinction in the price development between urban and non-urban areas. Separate price indices for different property types would also provide useful information for macro-economic and macro-prudential analyses.

The ECB restated its minimum requirements for residential property price data in December 2004<sup>6</sup> – a euro area (and underlying Member States) quarterly index, covering houses and flats (new and existing), with at least coverage of the large cities and with a 60-90 days timeliness. Similarly, for Commercial Property the requirement is a quarterly index with 60-90 days timeliness. The country coverage requirement is for the EU (reflecting that commercial property bank lending is more likely to cross borders than for residential property).

One aspect, that is as yet unsolved, is that there may be some overlap in the boundaries between residential and commercial indices. This is because in order for a property to be commercial it must, by definition, give rise to an income stream. As a result residential property which is not owner-occupied but is instead rented out fulfils the criteria for commercial property.

Real estate is by nature very heterogeneous, is traded infrequently and the property market can be, particularly in times of market stress, illiquid. The application of the fundamental principle of price statistics, i.e. to calculate price changes of items whose price-determining characteristics are constant over time, requires specific efforts for the measurement of changes in real estate prices, in particular in terms of sampling. Sample-selection biases and insufficient control for shifts in the composition of real estate properties whose prices are used for index compilation may significantly hamper the interpretability of real estate price indicators. Since these issues may not be entirely overcome under all relevant circumstances, their impact to the design and use of real estate price indicators has to be considered in the context of user requirements. For example, the reporting frequency has to be chosen in the light of sufficiently large sample sizes, also in terms of stratification by regions and types of properties. Many practical applications have shown that the compilation of monthly indices is only feasible in real estate markets with high turnover, e.g. in the area of greater London. A quarterly reporting frequency has been reached for many house price indices, while commercial property markets may in some cases only currently allow the calculation of annual indicators.

### 3.1 Commercial property data requirements

Transaction-based data sources provide a priori the best theoretical approach, at least for price stability analysis, but cannot be the sole data source, as market liquidity tends to be too low in times of stress. Valuation data, perhaps

<sup>6</sup> See "Review of the requirements in the field of general economic statistics", ECB 2014, <https://www.ecb.europa.eu/pub/pdf/other/reviewrequirementsgeneconomstat200412en.pdf>.

supplemented by additional indicators, are therefore likely to be key inputs. Given the difficulties encountered in collecting representative information on commercial property transactions directly and hence deriving meaningful price data, it is necessary to examine alternative or complementary sources of information as described in the previous section.

Bearing this in mind, the ESCB has developed experimental<sup>7</sup> mixed source or hybrid indicators, based on nationally available data and that supplied by a major commercial data provider. The data are available at a quarterly frequency around 70 days after the quarter in question and their method of calculation is described in Section 4 of this paper.

### 3.2 Residential property data requirements

In the area of residential property prices, the main interest of the European Central Bank and the national central banks of the European Union in changes is related to developments of transaction prices. Besides that, statistics on the value of the housing stock can also contribute an important piece of information, e.g. for analysing wealth effects. In this context it should be mentioned that different uses of residential property price indices may require different concepts.<sup>8</sup> Whereas an indicator which is designed for tracking price changes over time has to be adjusted for changes in quality over time, appreciation or depreciation of the housing stock as a whole due to quality changes should show up in indicators of housing wealth.<sup>9</sup> Other conceptual differences are related to the type of price and weight information to be used for compiling indices.

## 4. Data used by the European Central Bank

Prices of commercial and residential properties are in most cases derived from secondary data sources. Often, this implies that the structure, the representativity and the timeliness may vary considerably across different sources.

### 4.1 Commercial Property price sources and definitions

A hybrid source approach has been taken to construct headline experimental euro area and EU aggregate indicators of commercial property prices. Transaction-based indicators are the preferred data source, at least for price stability purposes, but the availability of these data is rather sparse. Several EU countries have data that are to some extent based on transactions. These are Denmark (produced by the national

<sup>7</sup> Experimental ECB statistics were defined and discussed in detail in the paper entitled "Experimental data as part of the ECB's statistical production and dissemination policy" by Aurel Schubert (available at <http://q2012.gr/articlefiles/sessions/26.2-Experimental-statisticsECB-Aurel-Schubert.pdf>).

<sup>8</sup> See Fenwick, 2006, "Statistics on real estate prices: the need for a strategic approach", p. 6.

<sup>9</sup> Keeping the sample representative for the housing stock may require adjusting the composition of the sample for shifts in the dwelling characteristics.

statistical institute), Germany (sourced from BulwienGesa AG) and Italy (produced by the Banca d'Italia<sup>10</sup>).

An overview of the source data used is shown in Table 1. The choice made uses the following convention: where transaction-based data are not available from national official statistical sources, data are obtained from a commercial data provider. The ESCB's preference is to use valuation-based data that have been enhanced by available transaction information to construct national indicators. In the absence of transaction data, only valuation-based data are used. Quarterly data are preferred to interpolated annual data.

The Investment Property Databank (IPD) is a commercial information business providing market data and performance analysis for the owners, investors, managers and occupants of real estate. In 2011 the IPD entered into an agreement with the ECB to enhance its dataset in order to supply quarterly commercial property price indices for all directly held commercial real estate assets (all property) and for the four main market sectors – retail, office, industrial and residential (i.e. those residential properties that are let to tenants by professional landlords).

The IPD dataset contains asset-level data from a wide variety of professional investors in real estate. It excludes any data from properties that are indirectly held through investment vehicles, bonds, cash, derivative and real estate funds/investment trust share holdings. This source of data is a key input in the production of the ESCB dataset.

The IPD uses two different methodologies to estimate commercial property prices at a national level: a valuation-based method and, where the required data are available, a transaction-linked method. The valuation-based method uses data on professional valuations of existing buildings. Ideally, the market valuation of a property corresponds to the price that would be agreed between a willing buyer and a willing seller within a reasonable negotiating period, net of purchasers' costs (e.g. legal fees and tax payments). Nonetheless, in practice, the valuations may diverge from the prices that would be settled if a transaction were to take place on account of the cyclical conditions of demand in the market. The calculation of valuation indices starts from very detailed asset-level prices, which are then aggregated up to sector (retail property, industrial, etc.) and national aggregates.

<sup>10</sup> It is expected that data for Greece and Poland will be added to this list in the course of 2014.

Source data used in the compilation of euro area and EU indicators of commercial property prices

Table 1

Country	Source	Original series frequency	Extrapolation method
Belgium	IPD (valuation based)	Annual	Linear extrapolation
Germany	BulwienGesa AG	Annual	Linear extrapolation
Estonia	.	.	.
Ireland	IPD (transaction linked)	Quarterly	None
Greece <sup>a)</sup>			
Spain	IPD (valuation based)	Annual	Linear extrapolation
France	IPD (transaction linked)	Biannual	Linear extrapolation
Italy	Banca d'Italia	Quarterly	None
Cyprus	.	.	.
Latvia	.	.	.
Luxembourg	.	.	.
Malta	.	.	.
Netherlands	IPD (transaction linked)	Quarterly	None
Austria	IPD (valuation based)	Annual	Linear extrapolation
Portugal	IPD (valuation based)		
Slovenia	.	.	.
Slovakia	.	.	.
Finland	.	.	.
Bulgaria	.	.	.
Czech Republic	IPD (valuation based)	Annual	Linear extrapolation
Denmark	Danmarks Statistik	Quarterly	None
Croatia	.	.	.
Lithuania	.	.	.
Hungary	IPD (valuation based)	Annual	Linear extrapolation
Poland <sup>a)</sup>	IPD (valuation based)	Annual	Linear extrapolation
Romania	.	.	.
Sweden	IPD (transaction linked)	Annual	Linear extrapolation
United Kingdom	IPD (transaction linked)	Monthly	None

<sup>a)</sup> Data from the national central bank are expected to become available by end 2014.

The transaction-linked dataset uses the valuation data, but supplements and enhances it with available data on transactions in the market in the quarter in question. These are determined by estimating the sale prices of the properties sold as a function of their prior valuations by means of linear regression. The regression coefficients associated with valuations are then used to predict the "hypothetical" sale price of the "unsold" properties in the quarter.

Several caveats to the IPD datasets should be highlighted.

- In times of financial stress, market liquidity tends to be very low and, consequently, a reduced number of transactions may affect significantly the statistical quality and the reliability of the transaction-linked indicator estimations. The basic estimation model includes checks to see if there are a

sufficient number of transactions to produce the associated coefficients with country dummy variables.

- Portfolio investment/disinvestment can cause problems in interpreting the data, as volume changes could have an effect on the prices recorded. To prevent structural breaks emanating from volume changes in the portfolio, the sample is held constant for five consecutive quarters to allow the compilation of year-to-year percentage change series.
- A true quarterly index is preferable in order to facilitate a frequent analysis of commercial property market developments. The IPD provides quarterly data on indicators of commercial property prices that are calculated from the highest possible frequency data available. However, since quarterly valuations are not available for all countries, lower frequency data are interpolated to construct quarterly series<sup>11</sup>.
- Professional investors are likely to predominantly cover the prime segment of the market – usually defined as modern buildings in sought-after locations. In addition, the source data used at present do not include building or construction projects which are still under development. This can be a drawback, in particular when the data are used for financial stability analysis, as they cannot be used to gauge the credit risk confronting banks that have lending exposures to commercial property developments.

Taking into account these caveats, a multi-source analytical approach using a hybrid headline indicator, supplemented by both valuation and hybrid valuation/transaction-based series, is arguably necessary for users to assess and monitor the development of commercial property prices.

The IPD datasets currently used to construct the headline dataset at the ECB contain national quarterly price series for Belgium, Ireland, Spain, France, the Netherlands, Austria, Poland, Portugal, Sweden and the United Kingdom, although some of these series are interpolated. This means that the quality of the annual data compiled is higher than that shown at a quarterly frequency.

As mentioned above, for the ESCB dataset on indicators of commercial property prices, the preferred data are those supplied by national official statistical sources or endorsed by the relevant national central bank. When these are not available, IPD data are used by the ECB to compile euro area and EU aggregates. In the case of indicators of commercial property prices, the commercial property prices of a country should ideally be weighted by the total size of the commercial property market in that country or the value of the annual turnover. As such data are not generally available, a suitable proxy has to be found. At present, the euro area and EU indices are compiled using nominal GDP weights.

The calculation of the weighted euro area and EU series is as follows.

- A moving five-year average of GDP weights is applied to the annual percentage change of the chosen data source for each available country. Euro area and EU aggregates are produced only when coverage of 70% is achieved as measured by the GDP weights.

<sup>11</sup> Data for Belgium, the Czech Republic, Spain, Hungary, Austria, Portugal and Sweden are treated in this way.

- This implies that, for EU and euro area aggregates, countries that are not covered are assumed to show the same dynamics as the GDP-weighted average of countries for which indicators of commercial property prices have been compiled.

## 4.2 Residential property price indicators

Indicators on changes in house prices have been compiled for several years, mostly outside the area of official statistics. Before statistical work has been intensified, changes in dwelling prices were sometimes derived from average prices, i.e. the arithmetic or geometric mean or the median of recorded price data. The meaningfulness of such average prices for measuring house price inflation depends on the way it is controlled for differences in the composition of the sample with respect to the characteristics of the houses or flats. Constant-quality price indices can be compiled by applying hedonic regressions which use information about the physical attributes of houses and flats and their location. In Eurostat's data set, several house price indices make use of hedonic regressions. Generally, hedonic regression analysis of house prices usually requires a well-defined set of data about housing characteristics.

By comparing purchase prices for the same dwelling over different points in time, a "repeat sales"-index controls for differences in the physical attributes and the location. However, the overall condition of a house or flat might have deteriorated between two sales; the location might have become more attractive, e.g. due to a better connection to public transport, and then the "repeat sales"-method does not necessarily measure pure price changes. Additionally, since only prices for dwellings are taken into account which are sold more than once, this might not be representative for the whole housing market. If house price values are appraised on a frequent basis, the latter problem could be overcome by covering also appraisal valuations. In cooperation with the Delft University of Technology the national statistical institute of the Netherlands recently developed a residential property price index which combines data of the Land Registry Office "Kadaster" and government appraisals. Price changes are derived from the change in the average ratio of sales prices and appraisal values in a base period and a comparison period (the "SPAR" approach).

When aggregating indicators across regions, house types or quality categories, an appropriate weighting scheme has to be chosen. Various approaches to weighting have been applied in practice. Using weights based on housing stock data usually implies a high degree of stability. If reliable information about the housing stock is not available, it is common practice to use population weights as a proxy.

The potential volatility of transaction weights may have a significant impact on the index measures, in particular if the weights are frequently updated and chain-linked indices are compiled. A positive correlation between price increases and transactions might even result in index values which deviate substantially from expected outcomes, if the weights differ substantially in the course of a house price cycle.

A way to limit the volatility stemming from concurrent transaction-value weights for new dwellings is to apply a more stable weighting structure, which reflects, e.g., the average number of purchases over several years. However, this

might imply that in periods in which only a few houses are purchased in a certain segment of the market, the price changes might still get a high weight in the overall index resulting from former periods' high transaction values or volumes.

For residential properties, the ECB started in 2001 compiling a euro area aggregate. National price indicators are combined as an arithmetic average of the rates of change of the available national price indicators, weighted by shares in the euro area gross domestic product at current prices. Gross domestic product shares have been used for weighting, mainly due to availability and comparability of these data across EU countries. Data on transactions or housing stock which would provide more specific information about the structure of the housing market are not available for several countries. In order to get quantitative insights in the impact of alternative weighting schemes, the European Central Bank conducted test calculations, for which existing data gaps were filled by referring to proxies.<sup>12</sup> The results suggested that the general price trend was not significantly affected by the choice of the weights.

The ECB compiles also a long time series for the euro area. Back data for the bigger euro area countries were taken from sources of lower statistical quality compared to the headline indicator, while the cyclical dynamics reflected by these back data is considered to be sufficient for building a long series at the euro area level.

As a result of an EU-wide initiative by the statistical office of the European Union, Eurostat, and the national statistical institutes an almost complete set of official price indices for EU Member States was made available in early 2013. These price indices are provided at a quarterly frequency, based on transaction prices. A common index formula is applied, weights represent the market structure in terms of sales. Eurostat publishes a press release of the EU data set around three months after the end of the reference quarter.

The data set of house price indices as compiled by the statistical institutes in the EU have set new standards in terms of comparability. However, these time series are rather short. Index values have been made available as of the first quarter of 2005, for several countries time series start in the years 2007 or later. Therefore, these data do not yet allow analysing several cycles of the housing markets.

Most ESCB residential property price indicators cover time spans starting in the early 2000s or mid1990s. Recently, the Bank for International Settlements published a set of long time series which covers periods from the early 1970s. Long time series covering several decades often require linking of data sources that may differ in terms of definition and coverage. Therefore, international comparisons of non-harmonised national sources have to take into account that the quality of the data is usually lower for periods before the 1990s.

<sup>12</sup> See Ahnert and Page (2005), "Euro area residential property prices: the aggregation of non-harmonised national data", p. 299 and European Central Bank (2005), February 2005 issue of the Monthly Bulletin, p. 57.

## 5. Current data

Commercial and residential property prices tend to follow similar but not identical trends. Overall, from the data it can be seen that the commercial property appear to be somewhat more volatile when compared to the Residential data. This perhaps reflects that residential property provides shelter – a necessity – while commercial property does not and hence is likely to be transacted more rapidly in response to economic conditions. An illustration of this is shown in Chart 1 which plots, for the euro area, both series.

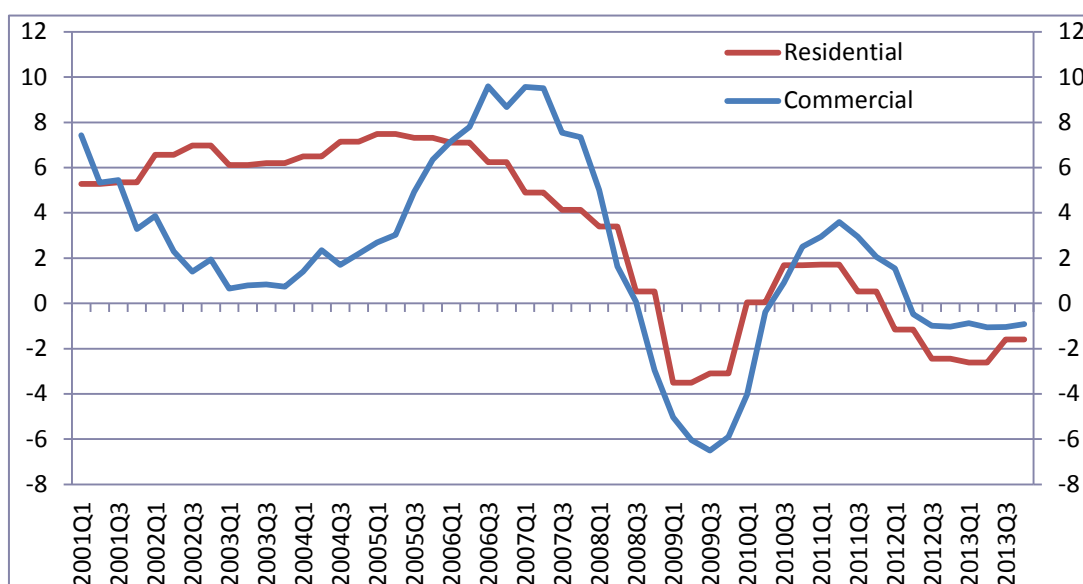
In the more recent past both series show the sharp effects of the financial and economic crisis and a levelling off of changes.

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### Euro area residential and commercial property prices

Annual percentage changes

Chart 1



Source: ECB, WG GES.

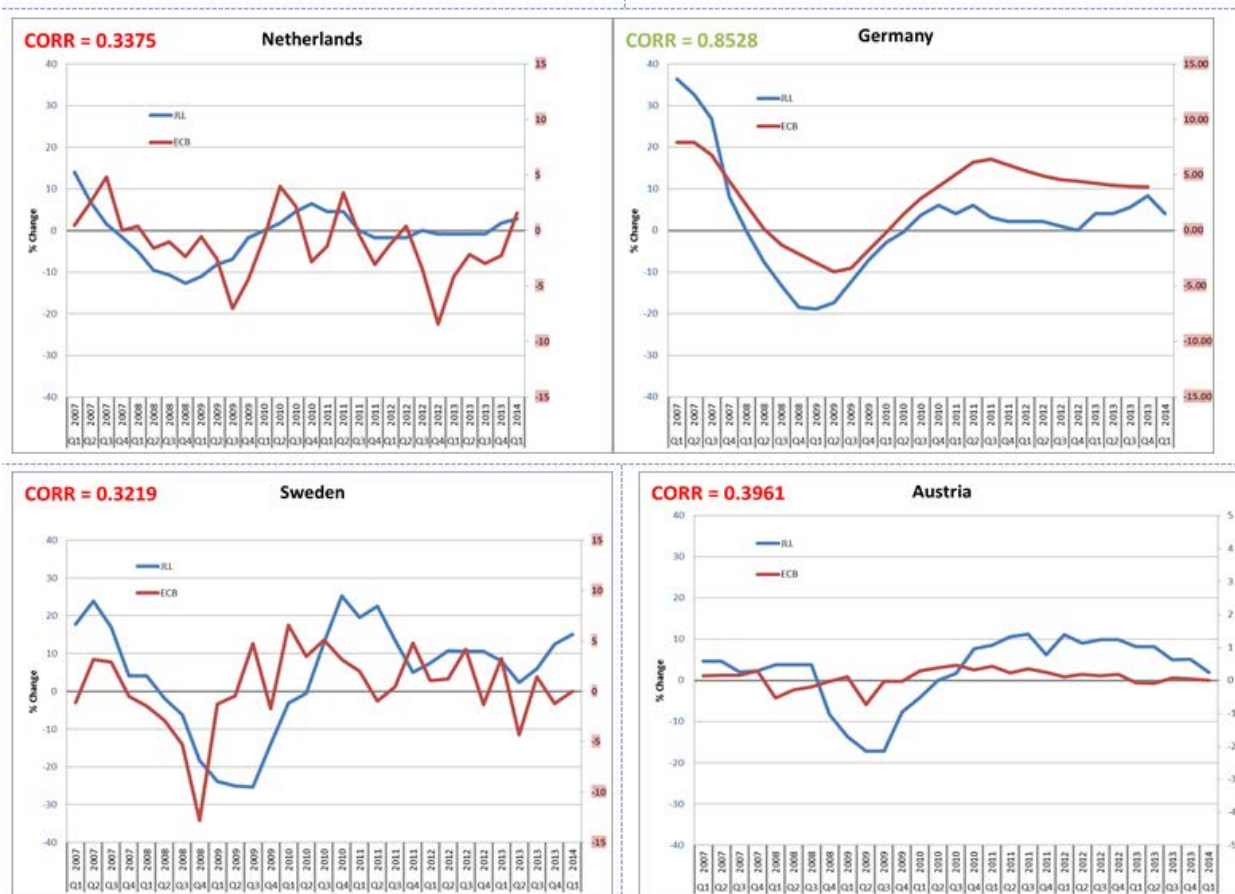
The current data as compiled by the ECB for commercial property can differ in some countries from that supplied by other compilers. The reasons may be a result of very different compilation methods or assumptions. An example is the data published by Jones Lang Lasalle which uses expert judgement about the price of a fictitious property to create indices. To illustrate the differences Chart 2 shows the different results for a selection of countries.



## Differing sources of commercial property prices

Annual percentage changes; JLL right hand scale, ECB, left hand scale

Chart 2



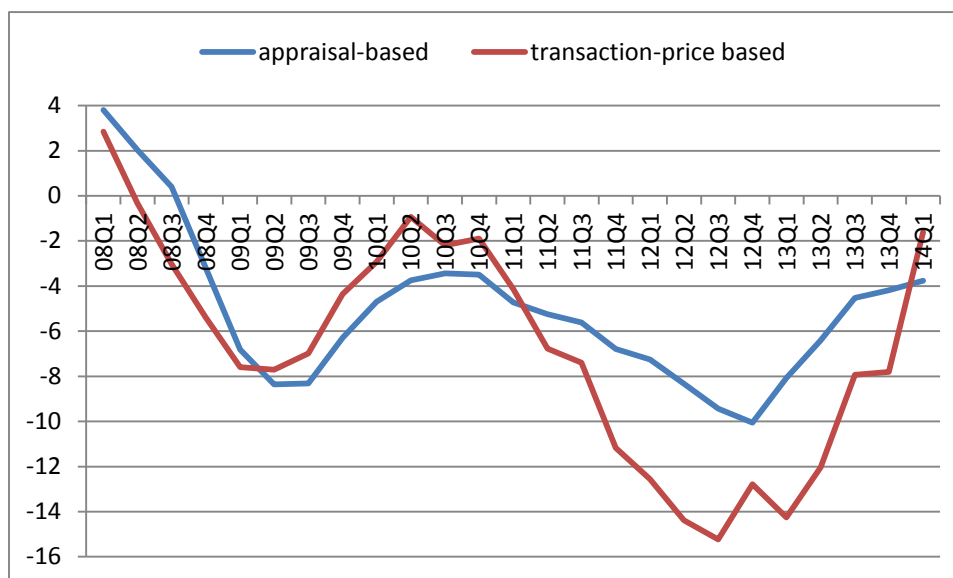
As can be seen in some cases the two methodologies are giving similar results while in others there is no obvious connection between the series. These aspects highlight that the issue of data comparability is extremely pertinent in this field.

For residential property price indicators, the example for Spain of appraisal-based indices and transaction price indices (Chart 3) illustrates that the main difference may not be the dating of turning points, but the intensity of upswings and downswings reflected by the price statistics.

## Residential property price indicators for Spain – appraisals and transaction prices

Annual percentage changes

Chart 3



Source: ECB, WG GES.

It may be argued that indicators based on varying data sources and according to different methods enrich the picture for macro-prudential and macro-economic analyses. However, this requires that detailed metadata are provided. The availability of such data is currently often not entirely sufficient. Differences which are mainly caused by statistical methods may remain undetected by users, bearing the risk of drawing inappropriate conclusions. This calls for identifying headline indicators, in particular for cross-country comparisons and compilations of euro area and EU aggregates. Both aspects are of high importance for international institutes engaged in policy, like the ECB.

## 6. Conclusions and outlook

The ESCB's collection of price statistics on residential and commercial properties has been used for filling data gaps while official indices are worked upon by the ESS. Official house price indices for the euro area have become available in 2013. By contrast, statistical work on commercial property price indicators has started only recently. Under the auspices of Eurostat, a Handbook on Commercial Property Price Indicators is being drafted in which the conceptual and methodological framework is set. The ESCB's work on the compilation of indicators is currently the only project in the area of official statistics from which practical experience can be gained.

The ESCB intends to continue developing the commercial property price data, by addressing the limitations mentioned before, until official and more harmonised data become available. In this respect, the ESCB has set the following quality

enhancement objectives, both at a national level and for the IPD dataset, for the forthcoming years:

- An ongoing exploration of alternative data sources for the countries which are not currently covered by the available source data. The same procedure will be undertaken for information which can increase the coverage of transactions. With this in mind, the exploitation of national sources identified in the stocktaking exercise is a possible avenue for future development.
- A regular review of the data against other data sources and/or economic indicators, in order to examine the robustness of the indicators.
- While data are available for transaction and valuation-based breakdowns by type of property (offices, retail, industrial, etc.), indicators analogous to the hybrid headline indicator have not yet been calculated. Investigations will be undertaken into how they might be calculated.
- The establishment of related indicators, such as rents and vacancy rates, in order to aid in the analysis of the data.
- An exploration of whether it is possible to integrate information on property under development into the index or if a separate indicator needs to be provided.
- An investigation to establish whether weighting solutions can be found to correct the anomalies, both within a country and when aggregating to the European levels. As described above, the individual valuation/transaction data are simply summed to a country aggregate using the total information for each of the properties reported by data respondents. This could mean that, for instance, the index is dominated by office properties, while the structure of the market is different.
- Interpolation methods will be reviewed. At present, data for a particular country supplied less often than quarterly are interpolated linearly. It may be that explanatory variables can be found that would allow this process to be enhanced.
- Geographical information will be exploited. To further enhance the transaction-linked data, a successful research project was conducted by the ECB on a subset of IPD data pertaining to the Netherlands which examined the geographical location of individual properties and used spatial<sup>13</sup> autocorrelation to improve estimates. Subject to data availability, the methodology may be applicable to other Member States.
- Quality adjustment will be developed, although the methods used are data intensive and this is a technically challenging area for longer-term research.
- Further data which can increase the coverage of transactions will be incorporated as they become available. These data will replace estimates based on the IPD database or will otherwise be incorporated into the dataset if not covered by the IPD.

<sup>13</sup> Spatial dependency is the covariation of properties within geographic space: characteristics at proximal locations appear to be correlated, either positively or negatively.

The ESCB's collection of indicators on changes in prices of residential properties has provided useful insights, while requirements in terms of comparability have only recently been fulfilled with the release of Eurostat's data set. In terms of back data the ESCB's data set remains useful.

The European Central Bank and national central banks will continue to jointly develop datasets on commercial and residential property price statistics. In the area of commercial property price statistics, the ESCB's experimental work will most likely remain the most comprehensive effort within official statistics towards reaching a data set for the euro area. Both for commercial and residential property price indicators several minor and major improvements have been achieved over the recent years. However, the fact that most national central banks are not directly involved in the collection or compilation of residential property price information limits the further improvements that can be achieved.