ORGANISATION DE COOPÉRATION ET DE DÉVELOPPEMENT ÉCONOMIQUES

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

OECD-IMF WORKSHOP

Real Estate Price Indexes
Paris, 6-7 November 2006

Paper 7

Real estate price indices in Germany: past, present and future

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Paper prepared for the OECD-IMF Workshop on real estate price indexes, Paris, 6-7 November 2006

Revised draft of 30 November 2006

Abstract

In the past, information on residential property price developments in Germany could be inferred only from a small number of indicators of sometimes dubious quality. These indicators often lacked a clear methodological foundation and had a restricted coverage. Moreover, they gave – to some extent – contradictory signals. The Bundesbank residential property price indices derived from BulwienGesa data, which was released in 2003, brought some improvements with respect to intertemporal comparability. The main weaknesses of the Bundesbank indicators are the reliance on expert assessments instead of true transaction data and the limited coverage (only cities). Still, the BulwienGesa/Bundesbank indicators remain the market leaders in Germany. The increasing use of the internet for residential property transactions and finance has provided additional indicators. However, the future will belong to hedonic indices. The German Federal Statistical Office is developing hedonic indices based on data gathered by local expert committees for property valuation. Due to the federal structure of Germany, however, it is very difficult to compile comparable data from all over the country. The Association of German Pfandbrief Banks is developing hedonic property price indices based on data gathered in the course of its member banks' commercial operations, and it invests heavily in improving the quality of the raw data. The main motivation behind this effort is compliance with new capital adequacy requirements. As a by-product, high-quality hedonic property price indices for Germany might emerge, covering not only residential property but also commercial property.

I Introduction

Since the late 1990s, asset price developments have moved increasingly into central bankers' radar screens. While consumer price inflation appeared to be well anchored at historically low and stable levels, excess liquidity seemed to flow into asset markets and drive prices up, thereby increasing the risk of creating bubbles, probably followed by crashes. Pronounced fluctuations in asset prices, however, may undermine macroeconomic stability and erode the soundness of the banking industry. In the "brave new world of central banking", timely information on the path of asset prices is crucial for the effectiveness of monetary policy and for the supervision of the financial system, as Cecchetti (2006) recently emphasised. While the availability of such data is assured with respect to most financial assets, the situation is worse with respect to residential property and much worse with respect to commercial property. The fact that the International Monetary Fund devoted a full chapter of its Compilation Guide on Financial Soundness Indicators to real estate price indices (IMF, 2004) also highlights the need for appropriate commercial and residential property price indicators.

From a theoretical point of view, several authors have advanced the opinion that house prices should be incorporated into the target price index of a central bank (eg Bryan/Cecchetti/O'Sullivan, 2002) or into an index used for compensation (eg Reis, 2005). While these positions are not undisputed – Mankiw/Reis (2003), for example, advocate the use of a stability index that gives substantial weight to wages, which are rather sluggish and bubble resistant – it is generally agreed that a cost-of-living index has to cover owner-occupied housing, either in the rental equivalence or the user cost variant (Diewert, 2003). Within a cost-of-goods index (a "pure" price index) – the euro-area Harmonised Index of Consumer Prices (HICP) follows this approach – the net acquisition of residential structures should be considered (ILO *et al*, 2004, Chapter 23). All this cannot be achieved without reliable property price indices. Even adherents to the rental-equivalence approach would like to know whether this approach gives a reasonable approximation to the user cost of capital.

The present paper describes the gloomy past, the brighter present and the hopefully radiant future of property price statistics in Germany. As in many other countries, there exists at present no official property price index for Germany. Information on property price developments can be acquired, however, from an increasing number of private data suppliers. The quality of the data is sometimes not too bad, but other times rather poor. The main problem is that in Germany there exists no centralised register of residential property transactions, and the existing decentralised registers are not well coordinated. Although transaction prices are collected by the local expert (surveyor) committees for property valuation (*Gutachterausschüsse*), these data pools are not standardised across federal states – sometimes not even within states.

A leading theme of the present paper is the slow relaxation of data constraints. In the past, it was mostly the lack of adequate data, which impeded the

development of fully satisfying house price indicators for Germany. This lack of data even led to German academic research on property markets being conducted using Paris housing market data (Maurer *et al*, 2004). In the meantime, however, the German Federal Statistical Office has started negotiations with the expert committees for property valuation of the federal states (*Landesgutachterausschüsse*), which in some way coordinate the work of the local surveyor committees. This effort might lead in the medium term to a standardised register containing transaction prices and the corresponding property attributes, which might serve as a basis for calculating high-quality property price indices. Also, member banks of the Association of German Pfandbrief Banks have started to pool data on property transactions. And finally, the internet, which is becoming increasingly important as a "virtual" marketplace for property transactions and mortgaging, is offering new opportunities for gathering the relevant data.

The paper is structured as follows. Section II discusses the data requirements of various types of property price indices. Section III reviews present day property price indices in Germany with a look back, and section IV describes property price indices currently under construction. Section V concludes.

II Variants of property price indices and data requirements

The fundamental principle of price statistics is that "like" shall be compared with "like" only. In consumer and producer price statistics this demand is normally met by the "matched models" methods. Only if models cannot be matched exactly are prices to be made comparable *via* quality adjustment (ILO *et al*, 2004, Chapter 7; IMF *et al*, 2004, Chapter 7). Following the prices of comparable products over time is the preferred method of compiling price indices. Comparing the prices of non-comparable goods is the exception and not the normal case.

The specific problem with measuring changes in property prices is the near-infeasibility of the matched-models method. Due to the heterogeneity of residential property and the slow turnover, it is only by chance that transactions relating to comparable objects can be observed in a sequence of periods. Hence, when comparing prices over time, either the comparability requirements have to be relaxed, or the prices for non-comparable items have to be made comparable using more or less sophisticated methods. Comparing the prices of non-comparable objects thus seems to be the rule rather than the exception.

The most simplistic approach to comparing property prices over time is to take average transaction values. This so-called "unit-value method" forfeits – if applied to non-comparable objects – the comparability requirement more or less fully. A unit value index is compiled from average transaction values in the base and in the observation period, meaning that changes in the pattern of transactions impact on the index. The "true" price trend can be recovered by this method only if perfect structural stability is assured. Given the pronounced heterogeneity of the housing stock, however, this demand is extremely unlikely to ever be met. By

compiling unit value indices separately for specific regions and property types – this is the so-called classification method – the effects of changes in the composition of the sample of transactions can be minimised. Properly weighted, the result is an index with mix adjustment (Thwaites/Wood, 2003). In the limit, with the number of non-overlapping categories increasing, the unit value indices will converge to matched-models indices. In practice, however, the stratification of property types and regions has to be rather rough, as otherwise no corresponding objects would be found and cells would be left unfilled (Ahnert/Page, 2005). Sometimes a basic quality adjustment will be performed by taking the price per square meter (which presupposes that the size of the living space is known). Taking the median price instead of the average will remove undue influences of outliers. But even then such indices are probably distorted by changes in the composition of transactions. The major advantage of the unit-value approach is that the data requirements are not very strict. For the most simplistic variant just the transaction values have to be known. More ambitious indices, however, require additional data on location and characteristics.

Repeat sales indices try to mimic the matched-models approach of goods and services price statistics. For the compilation of such indices, only properties sold at least twice within the period under review are considered. The data requirements of this approach are minor, but its limitations should be obvious. First, the price developments of property that is resold within a rather short period might be unrepresentative of overall price developments (this is the sample selection bias of the repeat-sales model – see Meese/Wallace, 1997). Second, the characteristics of a property may change over time, either due to wear and tear or due to renovation and additions and alterations (Englund *et al*, 1999). And third, repeat-sales indices are prone to revisions, as each reselling of a property adds an observation on price change which affects not just the estimate of average price change for the present period but for the full time span between two transactions (Clapham *et al*, 2006). Especially for short-term price comparisons, the repeat-sales method is inadequate, as the share of prices actually observed which enters into the index compilation is close to zero.

Hence, the preferred method of compiling property price indices would be one which makes full use of the available information by taking all transactions into account – as the unit value method does – but at the same time tries to achieve comparability over time – as the repeat sales-method does, but without forsaking representativeness. The hedonic regression method tries exactly to do this by relating the prices of residential property to its characteristics.[1] A major requirement of this approach is a comprehensive and standardised description of the transacted properties, with respect to location, physical characteristics of the building, furnishing and condition.[2]

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[1] On the hedonic approach with respect to residential property see Sheppard (1999). The hybrid repeat-sales hedonic model proposed by Case/Quigley (1991) unites the matched-models method for properties that were at least sold twice in the period under review and the hedonic method for the remaining properties.

[2] In this context, it must be noted, however, that the data requirements of the classification approach are not less demanding.

One can imagine that for a full description of properties thousands of attributes would have to be considered. Even if it were feasible to gather all this information, in a hedonic regression it would rapidly consume the degrees of freedom provided by the number of observations. Properties located in a poor neighbourhood, however, are typically poorly equipped and often in a poor condition, and *vice versa*. Hence, the true problem with the estimation often is that there is not enough variance in the data. Ways out of this dilemma include consolidating information via expert knowledge or statistical techniques such as principal component analyses (or multiple correspondence analysis as performed by Arévalo/Ruiz-Castillo, 2006) or restricting the analysis to a small number of attributes, hoping that these variables will also capture the effects of the omitted characteristics.[3] Parsimonious hedonic models tend to work reasonably well if it is not the estimation of implicit characteristics prices but the estimation of quality adjusted prices which is the goal (Malpezzi *et al*, 1998).

Instead of confining the expert judgment to the rating of properties according to location, furnishing and condition, one might go a step further and directly ask local property experts for an assessment of the typical selling price of a typical flat. This approach is only advisable if no true transaction data are available or if the available transaction data only include prices and not much additional information on the characteristics of the transacted properties.

With true transaction prices not always available, the alternative of list prices or advertised prices may be considered. Advertised prices will be different from selling prices. Normally list prices will exceed transaction prices (eg Horowitz, 1992), and the spread between list prices and transactions prices may vary with the state of the housing market, as there are reasons to believe that asking prices are even more rigid downwards than selling prices. Whereas the spread as such does not render the information in advertised prices useless, its variability reduces the information content of advertised prices. Price indices based on list prices might, however, be useful as complementary indicators, as changes in the spread between ask and transaction prices may indicate turning points of the housing market.

Specific problems arise if new homes prevail in the transaction data set. The construction of new residential property occurs typically at the fringe of the metropolitan areas, meaning that the more inelastically supplied property in the centre of the metropolitan area increases faster in price. Hence, a price index restricted to new residential structures which does not control adequately for location may underestimate true property price inflation (McCarthy/Peach, 2004). More importantly, without controlling adequately for location, the prices of new property which are farther out of town will be compared to earlier-period new property located closer to town. This also will bias indices focussed on new property downwards (Shiller, 2005).

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[3] See Triplett (2006) for an extensive discussion of the effects of omitted variables on hedonic coefficient estimates and on hedonic indices.

As property is immobile, diversity in regional economic developments will impact on regional property price developments. Especially in the case of large countries, price developments can be rather diverse. This diversity calls for a broad coverage of regions and for adequate weighting. In this context the question as to whether residential property price indices should be transaction- or stock-weighted is a largely unresolved issue. A transaction-based approach is often considered to be more representative of the actual market situation and to be more appropriate for a price index considering housing as a durable good, whereas a stock-based approach may be more appropriate for analysing wealth effects (eg Ahnert/Page, 2005; Fenwick, 2005). At first glance, this line of reasoning seems to be perfectly fine. It is, however, often observed that, in the housing markets, the volume of transactions varies with the direction in the change in prices (eg Genesove/Mayer, 2001). Prospering markets tend to be characterised by increasing prices and a high volume of transactions, whereas in depressed markets the volume of transactions tends to be much lower.

These characteristics of property markets have important consequences for the behaviour of prices indices. Consider, for example, a demand shock which hits a specific segment of a housing market and then spreads out to other market segments. A transactions-weighted (unit value or Paasche price) index would indicate a huge increase in prices in the period of the primary shock, whereas in consecutive periods only small price changes would be recorded. This phenomenon is illustrated in Table 1. The highly stylised economy consists of five submarkets with housing stocks and initial prices of the same size, and the same steady-state level of transactions. Supply is fully inelastic. A demand shock is supposed to lead to a doubling of prices and to a 400% increase in the volume of transactions in submarket A. After the increase in prices, the volume of transactions falls back to steady-state levels. In the consecutive periods, the shock spreads out to other market segments. In the final period, all prices have doubled, but transaction volumes are back at steady-state levels. With inelastic supply, stock-weighted Laspeyres, Paasche, and Fisher price indices would indicate an overall increase in prices of one-fifth per period, which seems to be a sensible result, as in each period the price in one of the five sub-segments doubles. The average of unit values calculated separately for each of the five submarkets gives the same result (if prices in the base period are identical).

Transactions-weighted indicators, however, tend to bring forward most of the price change. Only if base-period transactions are strictly proportional to stocks, transaction-weighted Laspeyres indices give the same results as stock-weighted indices. In the base scenario, the unit value indicator and the Paasche indicator estimate a price change of nearly 60% for the first period and only small changes afterwards. The situation is even worse if the base period price distribution is not even. Transaction-related unit-value indices may then even overshoot the true price increase for any property. With respect to the Laspeyres-Paasche spread, the positive correlation between prices and transactions will turn it negative. As a consequence, chaining will drive indices further apart, with transaction-weighted

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chained Laspeyres indices being seriously biased downwards.[4] Summing up, there are strong arguments in favour of stock-weighted property price indicators, whereas transaction-weighted indicators seem to send out dubious signals.

For a timely assessment of housing market conditions, not just annual changes but also price developments within a year should be considered. The European Central Bank would like to add quarterly residential property price indexes to its set of monetary policy indicators, but due to the lack of adequate data from several countries (including these Germany), it has to settle for an annual indicator (Ahnert/Page, 2005). With temporal disaggregation, however, the need for broad coverage, adequate quality adjustment and weighting increases, since shortening the observation period reduces the number of observations and makes changes in the structure of transactions more likely.

III Present day residential property price indices in Germany

At present, current official statistics for the housing market cover the prices of building land and of constructing residential buildings. In addition, the German Consumer Price Index (CPI) contains a rent component, which is also supposed to represent owner-occupied housing *via* the rental-equivalence approach.[5] Official statistics on residential property prices are not provided. However, this does not mean that there are no indicators from non-official sources that claim to fill the gap. On the contrary, the vacuum in official statistics has brought an increasing number of price indicators calculated by a variety of institutions involved in some way or another in the market for residential property.[6] These indicators differ widely in terms of data source, methodological foundation, regional scope and kind of housing stock covered. Among the targeted users are building and loan associations, project developers, investors, real estate agents, experts and appraisers and other persons working professionally with residential properties. Finally, commercial banks use the data with the aim of estimating credit default risk according to the forthcoming Basel II capital adequacy standards.

When evaluating the usefulness of different indicators for inferring overall price trends, it is important to ascertain how representative the data base is for the German residential property market and how useful it is for making intertemporal comparisons. In order to be representative for the whole market, prices should be observed for a large number of objects across the relevant geographic regions, including urban and rural areas and cities of different sizes. As intertemporal

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[4] This finding raises some doubts as to whether transactions-weighted house price indices are really the appropriate approach to owner-occupied housing in the annually-chained Laspeyres-type Harmonised Consumer Price Index. At least, multi-year averages of weights should be considered.

[5] On the various official indicators, see Deutsche Bundesbank (2003b). The rent and rental equivalence component in the German CPI are analysed in Hoffmann/Kurz (2002) and Kurz/Hoffmann (2004).

[6] For a review of residential property price indicators in Germany, see also Rady/Russig (2004) and Hofer (2005).

price comparison is concerned, either typical cases should be considered or differences in characteristics removed by means of hedonic quality adjustment. The ultimate goal is to have a pure price comparison that is not influenced by quality changes (ie changing composition of characteristics of residential property) and structural changes (ie urban or rural areas, small and big cities). A synopsis of available property price indicators is provided in Table 2.

Among the candidate sources of information on residential property prices are public and private institutions with direct access to data, such as the local expert (surveyor) committees for property valuation, real estate agent associations, building and loan associations, mortgage banks, periodicals, online marketplaces and tax authorities. The enumerated entities have in common that they are, as a by-product of their daily business, regularly confronted with a high number of price observations. For example, as a natural outcome of their job, **real estate agents** have an expert insight into residential property market developments. Hence, real estate agents associations have, at least in theory, the necessary data for the construction of price indices for residential property. However, the knowledge of the real estate agents is local and decentralised. It has to be standardised and pooled to become useful for nationwide property price indicators. The same applies to the information gathered by **building and loan associations** and **mortgage banks**. These institutions are typically specialised in providing mortgages for specific (regional) segments of the residential property market.

The same applies also to the information gathered by the **local expert committees for property valuation** (*Gutachterausschüsse*). The main task of these expert committees consists in collecting data concerning prices and characteristics of buildings and dwellings and in estimating the value of houses and land. Price and locational data of recent property transactions are provided by notaries, whereas data on further characteristics must be gathered by the expert committees themselves. This usually takes the form of a questionnaire which is sent to the buyer and/or seller of a property, who is, however, not obliged to fulfil the request. The expert committees are independent, but regulated by the *Bundesländer*. This regulation is rather diverse, and as a result this applies also to the organisation of the expert committees. Some committees were established at the district level, others at the municipality level. Moreover, the data are not harmonised across the different committees. The raw material available in the different local committees is highly heterogeneous and the availability with respect to timeliness is quite diverse, so that there are huge problems regarding standardisation of data even at the level of the *Bundesländer*, not to mention the federal level.

A Traditional property price indicators

It should therefore not come as a surprise that many of the traditional indices are based on raw data provided by the **German Real Estate Association IVD** (*Immobilienverband Deutschland*). IVD was founded in 2004 as a merger of the German Real Estate Agents Association **RDM** (*Ring Deutscher Makler*) and the Association of German Real Estate Agents **VDM** (*Verband Deutscher Makler*). Both associations used to publish annual residential property price reviews (*Immobilienpreisspiegel*) based on information gathered by the associated real estate agents. Especially the RDM *Immobilienpreisspiegel* has a long tradition dating back to the 1970s. The new IVD *Wohnimmobilienpreisspiegel* can be regarded as a continuation of the traditional RDM/VDM price reviews. The main focus of the *Wohnimmobilienpreisspiegel* is on regional information on price levels of typical residential property. Some information about price developments over time is provided only as a supplement. The IVD price review publication covers prices on many different types of objects from nearly 300 cities. The basis for the data set is transaction data from the second quarter of the respective year. Associated agents report transaction prices for a specific city. After collection, the prices are processed and condensed and outliers are deleted. The different real estate objects are summarised into categories or types, location and quality of living being the most important criteria for the categorisation. An example of such categories is detached homes (incl garage and a large lot according to location). Further quality nuances considered are simple quality (with simple furnishing, about 100 square metres), middle quality (middle quality of location with balanced population structure, about 125 square metres living area, central heating, bath, WC) and good quality (one-family home in good location, but not a prestige area with good furnishing and building substance, central heating, about 150 square metres). As a general rule, the prices reported in the *Wohnimmobilienpreisspiegel* follow the idea of the mode. Nationwide aggregates are not computed.

Due to the importance of information on property price developments for monetary policy, the **Deutsche Bundesbank** began to monitor prices in the German residential real estate market at a very early stage (for details, see Leifer, 2004). From the late 1980s on, the Bundesbank used RDM data to compile price indicators for apartments, terraced houses and detached houses of a middle quality, covering 50 West German cities. Using the population figures of a fixed base year as a weighting scheme, the Bundesbank aggregated the city-specific RDM data in order to obtain a price indicator for West Germany. From the beginning, the Bundesbank was aware of the fact that the quality of the raw data used to obtain its property price indicator could not satisfy the high standards of official statistics. With this limitation in mind, it never was the goal of the Bundesbank to analyse its price indicators up to the last decimal place, but to facilitate a cautious inference about the general price trend they conveyed. The Bundesbank price indicators derived from RDM data were never published.

In the following years, a number of problems with the RDM data became apparent. These problems comprised missing values for some cities, for which estimates had to be imputed; structural breaks due to changes in the reporting real estate agent[7] and apparently excessive volatility in boom and recession cycles, presumably due to a systematic bias in the reported prices. In the mid 1990s, the Bundesbank compared property price data of different sources with the aim to provide a more solid and broader data basis for the regular calculation of price indicators. After some considerations, it decided to use data from BulwienGesa AG, a leading German real estate consultancy, as these data seemed to display a higher degree of intertemporal consistency than the RDM data.

The **BulwienGesa AG** data stem from a comprehensive annual survey of regional property markets. Correspondents of the BulwienGesa AG estimate typical rents and purchase prices of specific types of commercial and residential real estate. Information derived from the work of building and loan associations, research institutions, surveyor committees, real estate associations, chambers of trade and industry and independent experts etc flow into these estimates. The intention is to capture the specifics of regional differences in price movements. Rural areas are not considered. In accordance with the typical case method, the indices are calculated separately for various types of property and various regions in order to eliminate the most serious structural effects. Afterwards, the indices are condensed into overall indicators by means of suitable weightings. The typical properties considered by BulwienGesa are terraced houses offering a satisfactory living standard in average to good locations with approximately 100 square metres of living space and owner-occupied dwellings, likewise providing satisfactory living conditions in average to good locations, with approximately 70 square metres of living space. The total price is shown in the case of terraced houses and the price per sqm in the case of owner-occupied dwellings. BulwienGesa calculates retrospectively up to 1990 typical prices for new dwellings and for second-hand accommodation separately; the data prior to 1990 refer to new dwellings. The findings of the annual survey are summarised in the report "*Immobilienindex*".

For the calculation of its own residential property price indicators, the Bundesbank uses objects with good quality of living in middle to good locations, the apartments having about 70 sqm and the terraced houses about 100 sqm of living area. Initially, data from 60 German cities (western Germany: 50 cities, eastern Germany: 10 cities) was used. Now, the sampling universe comprises data from 125 cities (western Germany: 100, eastern Germany: 25). Within each of the real estate categories (apartments, new dwellings and second-hand; terraced houses, new dwellings and second-hand) the city-specific data are aggregated with population figures from the year 2000 to different regional and

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[7] For example, the new agent may take central locations into account, whereas the "old" agent may also include the suburbs when providing the estimate of his region.

nationwide aggregates (Germany, western Germany, eastern Germany).[8] These dwelling-specific indices are disseminated to the interested public. Further aggregates (northern Germany, southern Germany, cities with more than 500,000 inhabitants, cities with more than 250,000 and less than 500,000 inhabitants, cities with less than 250,000 inhabitants) are compiled for Bundesbank purposes only and are not regularly published.

As the aggregation among different types of dwellings is concerned, the Bundesbank also calculates indices which cover apartments as well as terraced houses. In the case of second-hand dwellings, the additional weights were derived from total living space as recorded by the microcensus complementary survey of 1998 and the building activity statistics. In the case of new objects, the weights were derived from the cost of the completed building contained in the official building activity statistics. The indices for newly constructed dwellings and for second-hand dwellings are not aggregated.

As regards data availability, the figures for overall Germany and eastern Germany are available from the beginning of 1995 onwards at yearly frequency. BulwienGesa also reports data for the first half of the 1990s for eastern Germany. However, the explanatory power of the data is not overly high for this period, so that figures from the early 1990s are not considered by the Bundesbank. In the case of western Germany, data on resale start in 1990 and for new dwellings in 1975. The data from BulwienGesa are available in spring of the year following the reporting year. As IVD data for the second quarter of the reporting year are available in late summer or autumn of the same year, the Bundesbank has been using IVD data in order to extrapolate the BulwienGesa data, thus producing a first "flash" estimate, which is, however, not published.

The price indicators for residential property calculated by the Bundesbank on the basis of BulwienGesa data were initially used for internal purposes only. And this restrictive use of the data would have prevailed until the present, if there were no other events that left the Bundesbank with no other way than to make available their own calculations to the general public. In the 1990s, the **Bank for International Settlements BIS** published in its annual report (BIS, 2002, 130) price indicators for residential property for Germany which were in stark contrast to the indicators preferred by the Bundesbank (Figure 1). According to the figures cited in the BIS report, since the mid 1990s residential property prices in Germany fell by 2.5% per annum. The BIS figures were used by other institutions for their analysis of the German economy, including the OECD, European Commission and commercial banks, and could have given reasons to postulate a deflationary process in Germany. Since the indicators of the BIS, which were based on the unweighted arithmetic mean of the prices from RDM for flats of

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[8] The use of fixed population figures from the year 2000 for the whole sample (the West German data for new dwellings begin in the year 1975) may be subject to criticism. However, the population structure does not change dramatically. For example, if an alternative calculation is performed for the old sampling universe of Germany (50 cities) that does not use the population figures from the year 2000, but those from the year 1975 as the weighting scheme, then both price indicators still show very similar price dynamics.

middle quality in only four big cities (West Berlin, Frankfurt am Main, Hamburg and Munich), the Bundesbank did not consider these data as being representative for Germany. Therefore, and despite its many reservations, the Bundesbank decided to make its own price indicators for residential property available to the general public.[9] The price indicators calculated by the Bundesbank may not describe the reality exactly, but may be nearer to the truth than the BIS figures. They can be seen as a "second best" approach to the problem of missing official statistics on residential property prices. Since then, BIS has been using the Bundesbank data for its analyses and reports.

A further institution that traditionally provides regional data on real estate prices is the **Central Office of the Regional Building and Loan Associations** LBS (*Bundesgeschäftsstelle der Landesbausparkassen*). With yearly frequency, it publishes the *LBS-Immobilienpreisspiegel,* whose data is based on the price information gathered as a by-product of its mortgage financing and real estate business. The LBS data contain information about the price development in 600 cities. The LBS reports the mode and the price ranges as gathered from local property market experts in a survey conducted in spring of each year. The price information covers apartments and single-family homes. The focus of the *LBS-Immobilienpreisspiegel* is on regional property price levels. No price changes are reported.

B More recent property price indicators

Neither IVD nor BulwienGesa nor LBS claim full regional coverage of the German residential property market, which causes problems when using their data to draw conclusions about overall price trends. One particular institution that does declare full regional coverage of the German market for residential real estate property is the **Institute for Urban, Regional and Housing Research** (*Institut für Stadt-, Regional- und Wohnungsforschung*) **GEWOS** GmbH. GEWOS gathers individual prices recorded at residential property market transactions by the local expert committees for property valuation. The data is supplemented with further estimates based on information provided by tax authorities on the revenue raised by the property acquisition tax. Finally, gaps in the data are filled with estimates based on own surveys and expert judgements (GEWOS, 2006). Based on this information from various sources, GEWOS aims to achieve full regional coverage (ie including all German cities and administrative districts). Actually, GEWOS is the only institution that covers rural areas. The main results of overall price trends are summarised in its annual real estate market analysis IMA (*Immobilienmarktanalyse*). Price indicators are calculated on the basis of the number of transactions and the turnover from these transactions, resulting in average prices of detached houses and flats. An explicit weighting scheme is not used. These unit value indices have the serious disadvantage of not being

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[9] They were first briefly presented in the May 2003 issue of the Bundesbank's Monthly Report (Deutsche Bundesbank, 2003a). A more detailed presentation was given in the September 2003 issue of the Monthly Report (Deutsche Bundesbank, 2003b).

standardised, meaning that prices of houses and apartments with differing characteristics and location are averaged and then compared over time. Without structural stability, these indicators cannot be expected to deliver reliable estimates of price change on the German property market.

Based on data provided by GEWOS, the **Institute for Urban Development, Housing and Saving Schemes for Housing Purposes IFS** (*Institut für Städtebau, Wohnungswirtschaft und Bausparwesen*) has been publishing, on a regular basis since 1996, an index of owner-occupied property prices called DEIX (*Deutscher Eigentums-Immobilien-Index*). Backdata reach back to 1989. The DEIX is designed to show nationwide developments in the prices of detached houses and flats on the basis of the above-mentioned data sources. The main pro of these indicators is their broad coverage and the reliance on actual transaction data (according to IFS, in 2005 470,000 price observations were fed into the index), the main con the averaging across heterogeneous objects without adequate weighting.

The data gathered by real estate agents associations, the expert committees and the commercial banks have in common that they are to some extent transaction-based. The private company **IDN Immodaten** takes a different approach and gathers information for offer prices of real estate property from advertisements. For its real estate market data base, IDN Immodaten continuously evaluates advertisements from 97 sources, ranging from daily newspapers to online marketplaces. For an ad to be recorded, it has to contain at least information regarding price, location and size of the residential property. Further characteristics such as area, number of rooms and baths, and extras such as balcony, terrace, garden, fitted kitchen, etc are also taken into account, if available. According to IDN Immodaten, the data pool now comprises information from over 75,000 districts and cities. This gives a fairly detailed geographical coverage of the property market. Since April 2002, when the data base was initiated, about 70 million ads have been recorded. At present, 1.7 million ads are recorded per month. Such huge amounts of data, especially those taken from online marketplaces, are handled with the help of automated data bases that filter out extreme values. A further problem is that one single property may be advertised simultaneously at different places, potentially leading to double counting. In order to avoid or at least reduce the occurrence of such double counting, IDN Immodaten employs an automated check sum approach that identifies those advertisements that coincide in their profile of price and characteristics and records them only once. Of course, this approach is only a very rough filtering procedure. If the same object is advertised more than once and the ads of the same object differ at least in the listing of one key characteristic, then they will be (falsely) treated as if they were different objects. Since about 70% of all ads do not even have a street name, only telephone contact with the advertiser could ultimately avoid double counting. However, the costs of such a procedure are prohibitively high.

The independent economic and social science consultancy **Empirica AG** makes use of the IDN real estate market data base for calculating its own price

indicators. The resulting time series start in January 2003 and are continuously updated and made available to interested users for a fee. New ads enter the data base with a time lag of about three weeks. Four times per year a summary of the market for residential property for all administrative districts (*Landkreise*) and cities not part of administrative districts (*kreisfreie Städte*) is given. The summary comprises prices per sqm and prices per object of new semidetached, detached and terraced houses, own-use apartments and undeveloped lots. No use is made of the more detailed information on characteristics of the advertised properties. The various indicators are tabulated for cities or administrative districts and are complemented with the standard deviation and deciles of prices per square meter. The information given on deciles is considered to substitute for an explicit quality adjustment, which is a rather bold assertion. Moreover, the offer prices in advertisements have the disadvantage that they usually differ from actual transaction prices. As such, they are more an indicator of market sentiment. The main advantage of offer prices against transaction prices is the relatively low cost and timely access to the raw data. The IDN data also form the basis for the residential property price indicators which are being developed by the **German Federal Office for Building and Regional Planning** (*Bundesamt für Bauwesen und Raumordnung*, BBR). At present, however, only scarce information on these indicators is provided (see Sigismund, 2005).

A monthly indicator of residential property price developments is provided by the **Hypoport Group**, which – according to its own description – "is a technology-based, all-round financial services provider of a new kind." ([http://www.hypoport. com/index.php](http://www.hypoport.com/index.php)). Its property price indices refer to single apartments, new one-family houses and existing one-family houses. The data are gathered from the EUROPACE platform, which is an internet provider of mortgages. Each month, about 4,000 to 6,000 property transactions are recorded. Hypoport reports monthly average prices (unit values), the average size of the living space and the average year of construction. The calculation of the various indices reported by Hypoport is rather intransparent. The reference period is August 2005, and the reported indices are highly, but not perfectly correlated with the average price per sqm. The graphs provided by Hypoport display a three-month moving average of the indices.

C Comparing the various indicators

The development of the various property price indicators for Germany is depicted in Figures 1 to 7. A good first impression about the diversity of the price movements conveyed in the data from different providers is given in Figure 1. It compares various price indicators, which are available at least from 1990 onwards for western Germany. As the figure shows, the various indicators share some common dynamics. In the first half of the 1990s, a period that is marked by the cyclical upturn that followed the opening of the borders in Central Europe, all indicators rose continually. In the mid-1990s, a downward correction set in. However, the pace and extent of the price hike, as well as of the downward correction, is quite heterogeneous. While the DEIX (unit-value) indicator derived

from GEWOS data only shows a rather slight downward movement and stagnation afterwards, the RDM indicator (based on typical prices) has fallen steadily, resulting in a discrepancy of more than 40 percentage points between the DEIX and the RDM indicator at the end of the period of observation. According to the expert-based information from BulwienGesa, in the 1990s the price for second-hand property rose faster than the price for new dwellings. This might be connected with the fact that living in town centres is again being regarded as more attractive and therefore demand for second-hand property has increased. Furthermore, the new-dwellings index might be downward biased, for the reasons given in section II. As of late, the gap in the price development of second-hand and new dwellings seems to have narrowed.

The indicators for Germany from GEWOS beginning in 1995 show stagnation in western Germany and Germany after the mid-1990s and a further price decrease in eastern Germany (Figure 2). According to the price indicators calculated by the Bundesbank on the basis of raw data from BulwienGesa, the prices of most types of property decreased only slightly in the latter half of the 1990s, with the exception of second-hand apartments, the prices of which decreased more sharply (Figure 3). The monthly Hypoport price indicator turns out to be quite volatile (Figure 4), probably due to averaging across heterogeneous entities. Adequate quality adjustment and/or adequate weighting would probably smoothen the development of the index.

A first impression about the regional heterogeneity of price dynamics for residential property in Germany, which is indicative for the need for adequate weighting, is given by the breakdown in eastern and western Germany in Figure 5. The breakdown shows that, in eastern Germany, the price trend of almost all categories moves downward over the period of observation. In western Germany, the prices are somewhat less volatile, perhaps with the exception of the prices of apartments for resale, which rose sharply in the first half of the 1990s and decreased steadily afterwards. Further insight is gained by calculating price indices for northern and southern states in western Germany. Price indices for new dwellings and resale constructed for western Germany, southern Germany and northern Germany basically show a co-movement in price dynamics over the regions. However, due to a period of divergence in the years from 1995 to 1997, the overall price change in southern regions is lower than that in overall Germany and in northern regions (Figure 6).

Finally, a breakdown according to the size of municipalities in western Germany shows that the prices of new apartments between big cities of northern Germany vs southern Germany diverged in the period of observation (Figure 7).

Summing up, most price indicators show, in principle, a co-movement in their overall trends in the period after 1990. However, over shorter periods, the indicators display quite heterogeneous price dynamics. For example, if one calculates the annual percentage change in 2005 (Table 3), the price indicator for residential property calculated by the Bundesbank stagnated in the case of new dwellings in Germany and decreased by 2 percent in the case of second-hand

objects. For western Germany, the indicators show a 1 percent increase in new apartments. The DEIX for western Germany indicates a pronounced increase of 3 percent for detached houses and apartments, whereas the Hypoport indices show a decrease ranging from -2 percent for second-hand homes to -4 percent for new homes.

IV Upcoming property price indices for Germany

Despite the increasing number of property price indicators (mainly due to innovations in the area of information technology such as online marketplaces), the "status quo" in the area of residential property price indices remains unsatisfactory in the case of Germany. Present day indicators, including the Bundesbank residential property price indices, can only be regarded as a "second best" or even "third best". Improvement is mostly required with respect to the regional coverage (inclusion of rural areas), quality adjustment and temporal disaggregation. As far as quality adjustment is concerned, the future will certainly belong to hedonic methods. They are well-suited to cope with such heterogeneous products as residential properties. The method of typical cases and the application of expert judgment on prices and quality can help, yet they lack transparency and cannot be traced back to actual transactions. With temporal disaggregation, the adequate quality adjustment becomes even more important, as it is more likely that the structure of transactions in the observation period differs from that in the reference period.

At present, there are two endeavours aiming to provide representative price indices of residential property with the help of hedonic methods, one coming from the private sector and one a pilot study being conducted at the German Federal Statistical Office.

The private initiative has been launched by the Association of **German Pfandbrief Banks VDP** (*Verband Deutscher Pfandbriefbanken*).[10] In 2004, this association began to compile a data base with transaction prices and characteristics from commercial and residential real estate property mortgaged by member banks (see Hagen/Hofer, 2006). The primary purpose of this data pool is the estimation of loss given default for mortgage loans (LGD rating), which is a requirement of the Basel II advanced internal ratings-based (IRB) approach (see Trotz/Bärwald, 2006). Real estate property is categorised and rated according to a standardised scheme. Main categories are commercial and residential property; within residential property, one-family houses, two- or three-family houses, apartment buildings and freehold flats; within one-family houses, free-standing houses, semidetached houses and terraced houses. Residential properties are rated according to location, furnishing, condition and saleability on a decigrade scale, reaching from "excellent" to "disastrous". A handbook details how to weight the various characteristics of the properties in the rating process

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[10] In early summer of 2005, VDP succeeded the Association of German Mortgage Banks VDH.

(Verband deutscher Pfandbriefbanken, 2005; see also TEGoVA, 2003). Furthermore, the vintage, the size of the living space and the size of the lot (for one-family houses) are recorded. The aim is to calculate, on the basis of this data, hedonic price indices of real estate. Presently, the main focus is still on the quality of the input data. Whereas for the first year the data quality was rather poor – mainly due to missing and inconsistent data – it improved significantly in the second year, and preliminary hedonic analyses have delivered promising results. For the compilation of a truly representative index, the regional coverage has to be improved; at present, it is still rather unbalanced, as not all banks active in the mortgage business pool their data with VDP. For VDP, it will be crucial to convince member banks that the benefits of having regionalised hedonic property price indices justify the costs of providing the price and characteristics data in a standardised format, timely and consistently rated. A potential weakness of the VDP approach is use of quality ratings instead of actual characteristics (but Hoesli *et al*, 1997, also use ratings instead of actual characteristics), implying that the unbiasedness of the index relies on the intertemporal consistency of the quality ratings.

As regards efforts in the sector of official statistics, the **German Federal Statistical Office** (Destatis) has developed a price index for owner-occupied housing in Germany within a pilot study initiated by the Statistical Office of the European Communities (Eurostat) in 2002. The main goal and motivation of this study is to fill a gap in the coverage in the Harmonised Index of Consumer Prices (HICP) by applying the net acquisition approach to owner-occupied housing. The net acquisition approach requires that only residential property newly acquired by the household sector be considered. Transactions within the housing sector are assumed to cancel each other out. The restriction to newly acquired residential property implies that mostly new dwellings are to be taken into account. For the purpose of the house price index, Destatis classified new dwellings in the following types (Dechent, 2004):

- Self-made houses (the owner buys construction materials and services from construction companies)

- Prefabricated houses (the owner buys prefabricated homes from specialised companies)

- Turnkey-ready houses (the owner buys a conventional, turnkey-ready home from the property developer, who may also act as the real estate agent).

For each one of these categories, adequate sources for price data had to be found. In order to cover the category "self-made houses" it is necessary to record the expenditures of private households acting as buyers of construction materials and services, ie the expenditures for all the relevant materials and for services bought from building companies. The official price statistic for construction (*Baupreisindizes*) is the main source of data on this type of residential property acquisition.[11] Since the construction price indices also contain the prices of

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[11] The construction price indices are calculated on a quarterly basis and measure the price development for selected products and services needed for the construction of houses. The recorded prices are transaction prices.

prefabricated one-family houses (with and without a cellar), the prices for "prefabricated houses" can also be gained from existing construction price statistics.

The situation for turnkey-ready houses is not as straightforward. This case comprises transactions in which the buyer of residential property purchases a turnkey-ready new dwelling directly from the constructing company. Since such transactions are currently not covered by official statistics, other sources had to be looked for. In order to fill the lack of data in the field of turnkey ready building, Destatis acquired data from the expert committees for property valuation. As the expert committees are autonomous entities that act independently they are, however, not obliged to deliver statistical data in a way needed for the regular calculation of official price statistics. Due to these limitations, Destatis had do focus on cooperation with selected expert committees and harmonise the process of data sampling and delivery. For the pilot study, Destatis used data from expert committees of land value from five out of 16 federal states in Germany, covering the years 2000 to 2002. The largest federal state participating in this experimental study supplies nearly 400 quotations per quarter of a year, whereas other states report much less data, sometimes only 20 quotations. As can be inferred from Table 4, the number of characteristics which go into the (experimental) house price index is quite restricted (which is, however, not uncommon for hedonic property price indicators).

On the basis of data described above, Destatis calculated experimental hedonic housing price indices. Due to the small sample of the data from the eastern Germany, the data for the eastern federal states (Saxony, Saxony-Anhalt and Mecklenburg-Western Pomerania) were pooled in order to perform regression analyses. Thus, the separate price indices were calculated for Lower Saxony, Hesse and Rhineland-Palatinate and eastern Germany. With regard to the hedonic method, a variant of the imputation method is used, meaning that missing prices are estimated by means of regression analysis. As both the prices of the reference period as well of the base period are imputed, the procedure is called "double imputation" (Linz/Behrmann, 2004). Destatis prefers the double imputation method because it excludes outliers from the index calculation, which may enhance the robustness of the index. A specific feature of the Destatis index is inclusion of the standard land value (*Bodenrichtwert*) among the explanatory variables. This originally continuous variable is, however, transformed into several dummy variables, with the intention that only the cross-section variation in the standard land value enters the regression. Preliminary results are shown in Figure 8. According to the index, property prices seem to have decreased in the period from 2000 to 2002, which is a plausible result. Less plausible is the rather high volatility of the quarterly figures, especially the dip in the second quarter of 2002. The pronounced volatility seems to suggest that either the quality adjustment is not fully adequate or that the number of observations is still too small for reliable quarterly figures.

V Conclusions

At present, property price indicators for Germany mainly rely on expert judgment or on averaging transaction prices across non-comparable entities. Adequate weighting is not a common practice – with the exception of the BulwienGesa and Bundesbank indicators. The frequency of indicators is mostly annual. Information on price developments within a year is provided only by indicators which lack adequate quality adjustment and weighting, resulting in excessive volatility.

However, there is some hope that the state of affairs will improve in Germany, probably not so much as a result of political initiatives or a sudden change in the mind of market participants. Broadly based price indicators of high quality provide great benefits for many users, but with fragmented markets, the incentives for providing adequate data for the compilation of such indices are weak. The improvement in the quality of price data will probably come from changes in the housing and mortgaging markets in Germany: first, from regulatory decisions concerning the banking industry; second, from the consolidation of the German banking industry; third, from the introduction of new financial instruments; fourth, from the rapid technological progress in the development of online market places; and fifth, from structural changes in the German housing market.

On the first point: The tightened capital adequacy and risk disclosure requirements motivated banks to step up their efforts to develop a transparent and data-based credit valuation system. For mortgages, this requires data on the quality of the financed property. This was the starting point for the VDP initiative which can be interpreted as an effort to create a club good which benefits mainly the contributing member banks. A nationwide high-quality residential property price indicator might evolve as a by-product. On the second point: The ongoing consolidation in the German banking industry coincided with increasing specialisation and outsourcing of various activities. In a number of cases, the mortgage business was separated from other bank business and farmed out to specialised institutes (Lamby, 2005). As a consequence, mortgage banking is becoming (even) more professionalised, which will increase the need for adequate property market data and probably also the willingness to contribute to9 the compilation of adequate indicators. On the third point: The admission of REITs (Real Estate Investment Trusts) will increase the demand for reliable price indicators for the valuation of shares in these trusts. Without such indicators, the marketing of such trusts might become difficult. On the fourth point: The emergence of online property and mortgage marketplaces has increased the need for standardised information and rendered the pooling of (decentralised) information much less expensive. On the fifth point: Fiscal needs induced many municipalities to sell off public housing stock packages to international investors, meaning that turnover will in German residential property markets will probably accelerate, which will broaden the data basis for the calculation of property price indices.

In recent years, the rising interest in property price indicators and the shrinking costs of providing such data have lead to an increasing diversity but not yet to an increasing quality of the indicators. There are, however, indications, that things are changing. The VDP initiative strives for a high-quality indicator and spends significant resources on the intertemporal comparability of the raw data. It is to be hoped that the promising preliminary results will induce further banks to pool mortgage transactions data with VDP. With a broad coverage of the market, reliable quarterly indices based on actual transaction data should become feasible.

On the side of official statistics, Destatis already calculated an experimental hedonic housing price index for new dwellings, whose main motivation is to fill a gap in the coverage of the HICP. The index will be calculated at least at quarterly frequency. The regional coverage of the experimental index was, however, rather limited. For the future, Destatis is also planning to calculate housing price indices for second-hand objects, thus closing the remaining gap in official statistics on the housing market. For this initiative to be successful it will be, however, crucial to convince the *Bundesländer* that a well-coordinated approach to gathering property transactions data would benefit all.

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Table 1. Price indices and unit value indices – weighting and chaining

	Market segment				
	A	**B**	**C**	**D**	**E**
	Stock				
	1000	1000	1000	1000	1000
Period	**Prices**				
1	1	1	1	1	1
2	2	1	1	1	1
3	2	2	1	1	1
4	2	2	2	1	1
5	2	2	2	2	1
6	2	2	2	2	2
7	2	2	2	2	2
Period	**Transactions**				
1	100	100	100	100	100
2	500	100	100	100	100
3	100	500	100	100	100
4	100	100	500	100	100
5	100	100	100	500	100
6	100	100	100	100	500
7	100	100	100	100	100

Indices									
	Unit values		Prices						
	Stocks	Trans.	Stocks	Transactions					
				Laspeyres	Paasche	Fisher	Laspeyres	Paasche	Fisher
Period				Fixed	Fixed	Fixed	Chained	Chained	Chained
1	100	100	100	100	100	100	100	100	100
2	120	156	120	120	156	137	120	156	137
3	140	167	140	140	167	153	129	233	173
4	160	178	160	160	178	169	137	339	216
5	180	189	180	180	189	184	146	481	265
6	200	200	200	200	200	200	154	666	320
7	200	200	200	200	200	200	154	666	320
	Variant A: Period 1 prices								
	1	2	3	4	5				
Period	**Indices**								
1	100	100	100	100	100	100	100	100	100
2	107	89	107	107	126	116	107	126	116
3	120	126	120	120	148	133	116	179	144
4	140	167	140	140	167	153	126	268	184
5	167	211	167	167	184	175	137	414	238
6	200	259	200	200	200	200	149	643	310
7	200	200	200	200	200	200	149	643	310
	Variant B: Period 1 prices								
	5	4	3	2	1				
Period	**Indices**								
1	100	100	100	100	100	100	100	100	100
2	133	222	133	133	171	151	133	171	151
3	160	207	160	160	181	170	142	267	195
4	180	189	180	180	189	184	150	378	238
5	193	167	193	193	196	194	156	486	275
6	200	141	200	200	200	200	159	559	298
7	200	200	200	200	200	200	159	559	298

Table 2. Selected price indicators for residential property

Institution	Characteristics and comment
Bundesamt für Bauwesen und Raumordnung	- *Data source*: IDN Immodaten GmbH. - *Quality and location*: Prices per square meter and prices per object for new and second-hand semidetached houses, detached houses, terraced houses, owner-occupied apartments and undeveloped lots. - *Coverage, availability and periodicity*: quarterly regionalised data. - *Quality adjustment*: ? - *Aggregation*: ? - *Comment*: Offer (offer) prices of advertisements.
BulwienGesa AG (formerly Bulwien & Partner and Bulwien AG)	- *Data source*: Estimates by local correspondents, based on information by German real estate agents' associations, Chambers of Industry and Commerce, surveyor committees of the municipalities, building and loan associations, research institutions, own surveys, newspaper advertisements and information from test purchases. - *Type of dwelling and location*: Owner-occupied apartments (good quality, middle to good location, ca 70 sqm), terraced houses (good quality, middle to good location, ca 100 sqm), undeveloped lots for detached houses (good location, ca 800 sqm). - *Coverage, availability and periodicity*: 125 cities from 1990 onwards, 25 cities being from the eastern German federal states. New dwellings and second-hand are documented separately from 1990 onwards. From 1975 to 1990, data for new dwellings for 50 cities of western Germany available. Yearly data. - *Quality adjustment*: Method of typical cases. - *Aggregation*: The data for towns and cities within the category in question (flats, terraced houses) is aggregated to an index using population figures for 2000. - *Comment*: Extensive, but not full coverage (rural areas missing). Prices are the result of "expert judgement". The idea of the typical prices corresponds to the idea of a median.
Deutsche Bundesbank	- *Data source*: BulwienGesa AG. - *Type of dwelling and location*: Owner-occupied apartments (good quality, middle to good location, ca 70 sqm) and terraced houses (good quality, middle to good location, ca 100 sqm). - *Coverage, availability and periodicity*: Western Germany before 1989, 50 towns/cities; from 1990 onwards 100 towns/cities. eastern Germany from 1995 onwards, 25 towns/cities. Until 1994, West Berlin was classified as belonging to western Germany but from 1995, the whole of Berlin was classified as belonging to eastern Germany. *Western Germany*: Resales from 1990 onwards. New dwellings/first-time occupation from 1975 onwards, although the inclusion of pre-1990 resale prices cannot be ruled out either. The strict separation between new dwellings/first-time occupation and resale was only introduced in 1990. Annual data. - *Quality adjustment*: Method of typical cases. - *Aggregation*: The information on towns and cities within the category in question (flats, terraced houses) is aggregated using population figures for 2000, resulting in a base-period weighted index. The series is rebased every 5 years. Due to changes in regional coverage, the series has been chain-linked in the years 1990 and 1995. The aggregation of the data for new dwellings (flats and terraced houses) is based on the assumed cost of the completed building derived from the construction statistics for

	1999, 2000 and 2001. The aggregation of the data for resale (flats and terraced houses) is based on the share of terraced houses and flats in the total living area according to the additional microcensus survey of 1998 in connection with the construction statistics from 1996 to 2000. An aggregation of the data for new dwellings and resale is not available.
	- *Comment*: Extensive, but nut full coverage (rural areas missing).
Deutscher Städtetag	- *Data source*: Expert committees of 61 (mainly large) cities.
	- *Type of dwelling and location*: undeveloped lots (250-500 sqm), separated in lots for terraced houses and multiple family houses, as well as 1-2 family homes (90-140sqm), multiple family houses and owner-occupied apartments (60-100 sqm), separated into first and resale (year 1950-1974) in the west, 1946-1990 in the east) all in sqm. Data relate to middle quality in middle location.
	- *Coverage, availability and periodicity*: About 147,000 transaction prices. Yearly data since 1992. Data are published in late summer/autumn for the previous year.
	- *Quality adjustment*: Method of typical cases.
	- *Comment*: Also data on turnover available. Aggregation according to regions, but not for all Germany. Missing data for some *Bundesländer*.
Empirica AG	- *Data source*: IDN Immodaten GmbH.
	- *Quality and location*: Prices per square meter and prices per object for semidetached houses (new dwellings and resale), detached houses, terraced houses, owner-occupied apartments and undeveloped lots.
	- *Coverage, availability and periodicity*: Since 2003, four times per year a summary is given of the market for residential property for all administrative districts (*Landkreise*) and cities not part if administrative districts (*kreisfreie Städte*). Average price per square meter, its standard deviation and deciles. Quarterly data.
	- *Quality adjustment*: None.
	- *Aggregation*: None.
	- *Comment*: Offer prices of advertisements.
GEWOS GmbH (Institut für Stadt-, Regional- und Wohnungsforschung) / Institut für Städtebau (ifs)	- *Data source*: Surveyor committees of municipalities (about 500), data from property acquisition tax records and estimates from retail price experts.
	- *Type of dwelling and location*: The data contain new dwellings and second-hand, but this data is not published or documented separately. No differentiation. Cases refer to different quality and location.
	- *Coverage, availability and periodicity*: Full market coverage (according to GEWOS) of transaction prices for owner-occupied apartments and one-family homes. Yearly data since 1989. Each August, data for previous calendar year is available.
	- *Quality adjustment*: None.
	- *Aggregation*: unit values.
	- *Comment*: Restricted explanatory power due to missing information on prices per square meter. No temporal/regional comparability of data due to lack of differentiation by size and location etc. The price dynamics suggested by the data are probably to a large extent a result of structural effects. However, GEWOS is the only source which records transactions outside cities.
Hypoport AG	- *Data source*: Mortgage transactions via the internet platform Europace, which is operated by Hypoport.

	- *Type of dwelling and location*: Indicators ("HPX Indices") are calculated for single apartments (purchase price, built since 1950, living space sized between 70 and 100 sqm, own- or buy-to-rent property, no connected commercial space), new homes (total construction costs, including building lot, living space between 100 and 150 square metres, building lot sized between 200 and 700 sqm, own-use property, no connected commercial space, no additional land plot) and existing homes (purchase price including building lot, built since 1950, living space between 100 and 150 sqm, building lot sized between 200 and 700 sqm, own-use property, no connected commercial space, no additional land plot). - *Coverage, availability and periodicity*: About 4,000 to 6,000 transactions per month, totalling a financing volume of about 1 billion EUR per month. According to estimates of Hypoport, over 10% of the German market for private house financing is recorded. Available data include average purchase prices, average size of living space, average size of per square meter, average year of construction. Monthly periodicity. - *Quality adjustment*: Very rough approximation of the method of typical cases (location is not considered). Prices per square metre plus some additional adjustments. - *Aggregation*: Unweighted averages. - *Comment*: The prices are recorded in the context of loan commitment undertaken by banks and therefore reflect the credit polity of the banks. Movements in the index can be caused by changes in the credit policy of participating banks.
IDN Immodaten GmbH	- *Data source*: Advertisements in daily newspapers and online marketplaces (about 1.7 million per month). - *Type of dwelling and location*: All real estate objects advertised in currently 97 sources (periodicals, internet bourses) are recorded. For an advertisement to be recorded, it has to contain at least information regarding price, location and size. Further characteristics such as effective area, base area, number of rooms and baths, extras such as balcony, terrace, garden, fitted kitchen, etc if available. - *Coverage, availability and periodicity*: The data base comprises information of over 75,000 districts and cities. The data base is updated continuously and access is provided for a fee. - *Quality adjustment*: None. - *Aggregation*: None. - *Comment*: Offer prices from advertisements. A property may be double counted if it is advertised more than once and the automatic check sum approach fails to identify this fact.
IVD Immobilienverband Deutschland (IVD)	*(see RDM and VDM)*
Ring Deutscher Makler (RDM); "RDM-Immobilienpreisspiegel"; recently merged with VDM to form IVD Immobilienverband Deutschland (IVD)	- *Data source*: Real estate agents' association RDM. - *Type of dwelling and location*: apartments (3 rooms, ca 70 sqm), terraced houses (ca 100 sqm, without garage), free standing homes (100-200 sqm incl. garage) and undeveloped lots, modest, satisfactory and good living conditions. In the cases of apartments and homes also very good living conditions. The attribute "living condition" is interpreted as a combination of location and quality of the dwelling. The other attributes are not defined, but "typical" examples are given. - *Coverage, availability and periodicity*: 300 cities (with missing data). No categorisation in new dwellings and second-hand.

	Periodicity: Yearly, since 1973. Release in autumn for Q1 of the same year.
	- *Quality adjustment*: Method of typical cases.
	- *Aggregation*: None.
	- *Comment*: The recorded price is the mode rather than the arithmetic mean. Due to the early availability, the Bundesbank uses the data from RDM in order to extrapolate the BulwienGesa AG data at the end of the series (however, this flash estimate is not published).
Sparkassen- und Giroverband / LBS	- *Data source*: Survey among 600 real estate agents from LBS (*Landesbausparkasse*) and from the savings bank (*Sparkasse*). Each agent is responsible for a specific region, for which he is able to report data.
	- *Type of dwelling and location*: Owner-occupied apartments (middle to good location, ca 100sqm), terraced houses and single homes (middle to good location). New dwellings and resale prices are reported separately. All data refer to average to good living conditions and average/typical location.
	- *Coverage, availability and periodicity*: 330 cities (comprising, among others, 80 "big" cities), with missing data. The LBS records about 25,000 cases per year. The Sparkassen record some further cases not explicitly quantified. Periodicity: Yearly, since 2000.
	- *Quality adjustment*: Method of typical cases.
	- *Aggregation*: Done; weighting scheme unknown.
	- *Comment*: A span and the mode are recorded. No recording of full index over all cities, but over 4 regions (north-east, north-west, south, south-west).
Verband Deutscher Makler (VDM) "VDM-Immobilienpreisspiegel"; recently merged with RDM into IVD Immobilienverband Deutschland (IVD)	- *Data source*: Survey among 2500 members of VDM, most of them reporting prices for a specific marked segment.
	- *Type of dwelling and location*: Owner-occupied apartments (60-90 sqm), one family houses (150-220 sqm), undeveloped lots for single family homes and for apartments. Data available for the categories "modest to average" and "modest to above average", whereas no clear-cut definition is given.
	- *Coverage, availability and periodicity*: 81 German cities, with missing data, including 23 in eastern Germany. The data comprises transactions of new dwellings and resale and no differentiation is available. The aggregation is performed without the use of a weighting scheme. Periodicity: Yearly since 1986. Data are published in October for the calendar year (including forecast for the rest of the year).
	- *Quality adjustment*: Method of typical cases.
	- *Aggregation*: Done; weighting scheme unknown.
	- *Comment*: Information is only available in the form of price spans. Furthermore, there is no aggregation for all cities.

Table 3 Change in residential property prices according to various indicators
(percentage change to previous year)

Residential property	2005
Bundesbank	
New dwellings (Germany)	0
Terraced houses	-1
Apartments	1
Second-hand (Germany)	-2
Terraced houses	0
Apartments	-2
New dwellings (western Germany)	0
Terraced houses	0
Apartments	1
Second-hand (western Germany)	-1
Terraced houses	0
Apartments	-2
GEWOS/ifs	
Detached houses (western Germany)	3
Apartments (western Germany)	3
Residential property overall (western Germany)	2
Hypoport AG	
HPX-apartment	-3
HPX-newhome	-4
HPX-existinghome	-2
IVD	
Detached houses (Germany)	-1

Table 4 Characteristics reported for the house price index

Physical characteristics

- Type of dwelling/property type
  - o Single-family house
  - o Two-family/semidetached house
  - o Terraced house
  - o Free-standing house
  - o Freehold flat in multi-storey buildings
- Vintage
  - o 2000, 2001, 2002; if possible 1999 and 1998
  - o Date of purchase (month, day)
- Type of construction
  - o Conventional ("Self builders"; not prefabricated)
  - o Prefabricated 4
  - o Furnishing and luxury elements (Sauna or swimming-pool included)
  - o Cellar
  - o Storing position for car (s)

Locational characteristics

- Federal state (*Bundesland*)
  - o County
  - o City
  - o Municipality
  - o Part of municipality
- Type of quarter
  - o Downtown district
  - o Outskirts
  - o Rural regions
- Location of building/dwelling in general
  - o Simple/plain
  - o Medium/average
  - o Good/very good

General price variables

- Purchase price (real transaction price)
- Size of the (developed) real estate/land/plot of land (in square metres)
- Size of the living area (in square metres)
- Proportionate price of the plot of land in relation to the total purchase price
  - o If the proportionate price is not available: specification of the 'standard land value' (in German: Bodenrichtwert"; in EUR/sqm). The 'standard land value' is approximately equivalent to the current market price of the location/plot of land.
- Building/dwelling ready for occupancy at the point of time of purchase
- Building/dwelling in stage/phase of building or planning

Source: Linz/Behrmann (2004), pp 5-6.

Property price developments in western Germany according to various indicators

Figure 1

1990 = 100[#], log scale
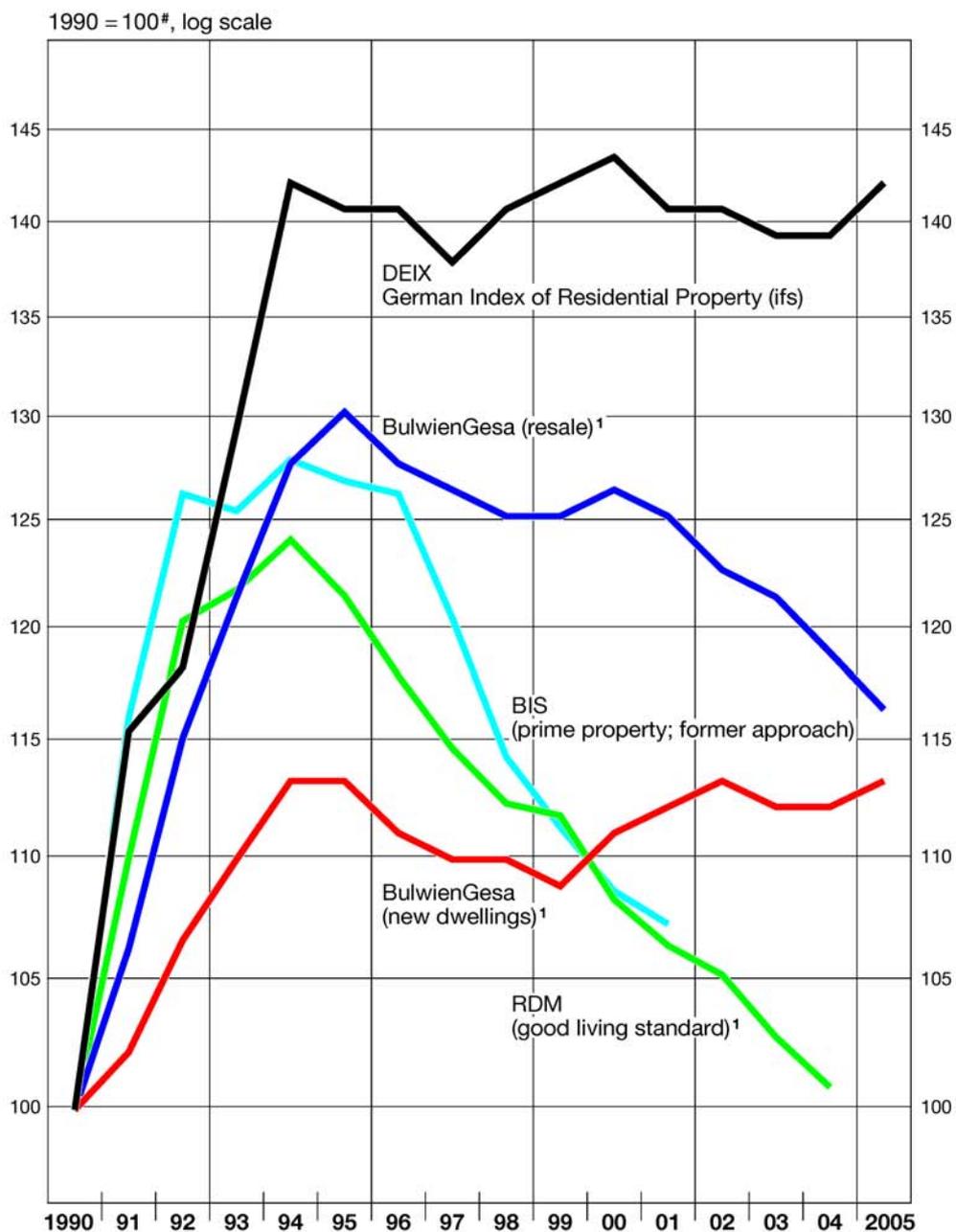
Note: The BIS indicator covers the price developments of four major cities (West Berlin, Frankfurt am Main, Hamburg and Munich); data from BulwienGesa covers 125 cities, from RDM about 250 cities. With the exemption of DEIX, data only refer to urban areas. - 1 Sources: BIS, BulwienGesa AG, GEWOS GmbH, RDM, own calculations.

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Figure 2

Price developments for apartments according to GEWOS

1995 = 100, log. scale
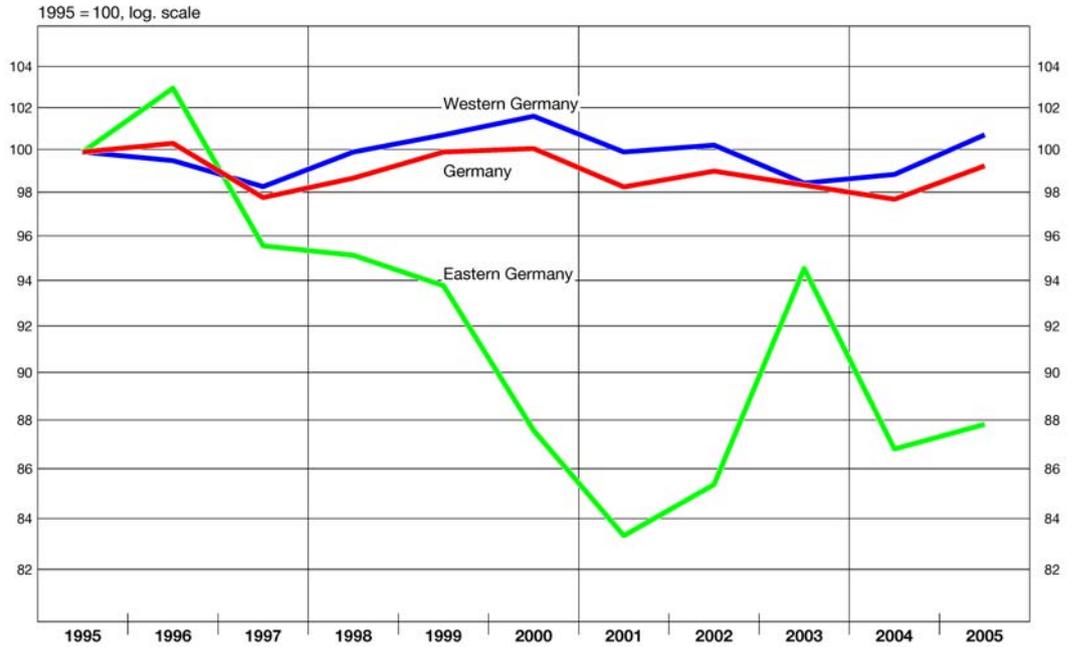
Source: GEWOS (2006).

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Figure 3

Price indices for residential property in Germany calculated by the Bundesbank

1995 = 100, log. scale
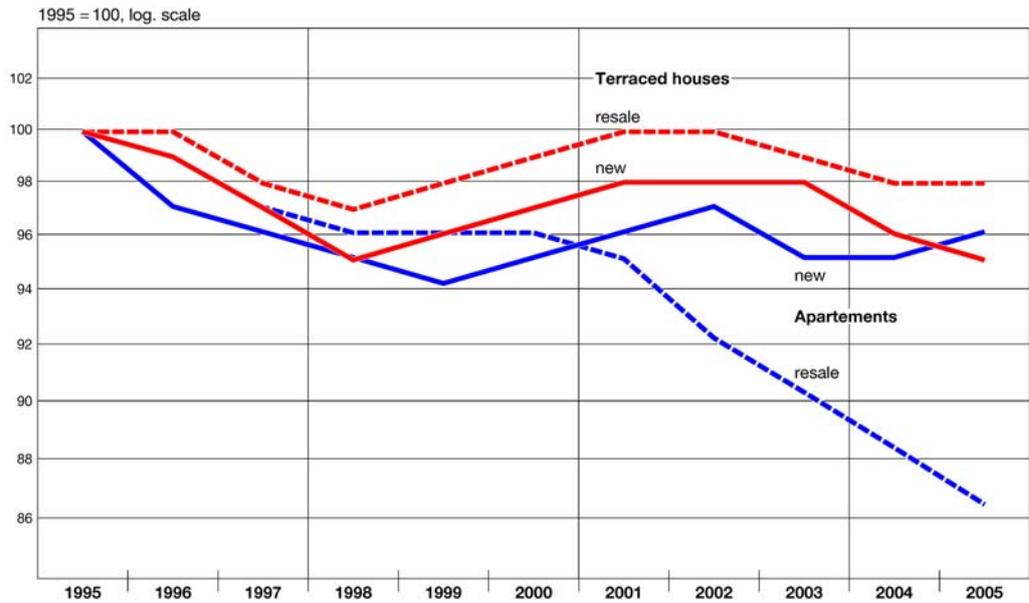
Source: Bundesbank calculations based on data provided by BulwienGesa AG.

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Hypoport price indicators for apartments, detached and semi-detached houses

Figure 4

Base period unknown, log. scale

Source: http://www.hypoport.com/index.php.

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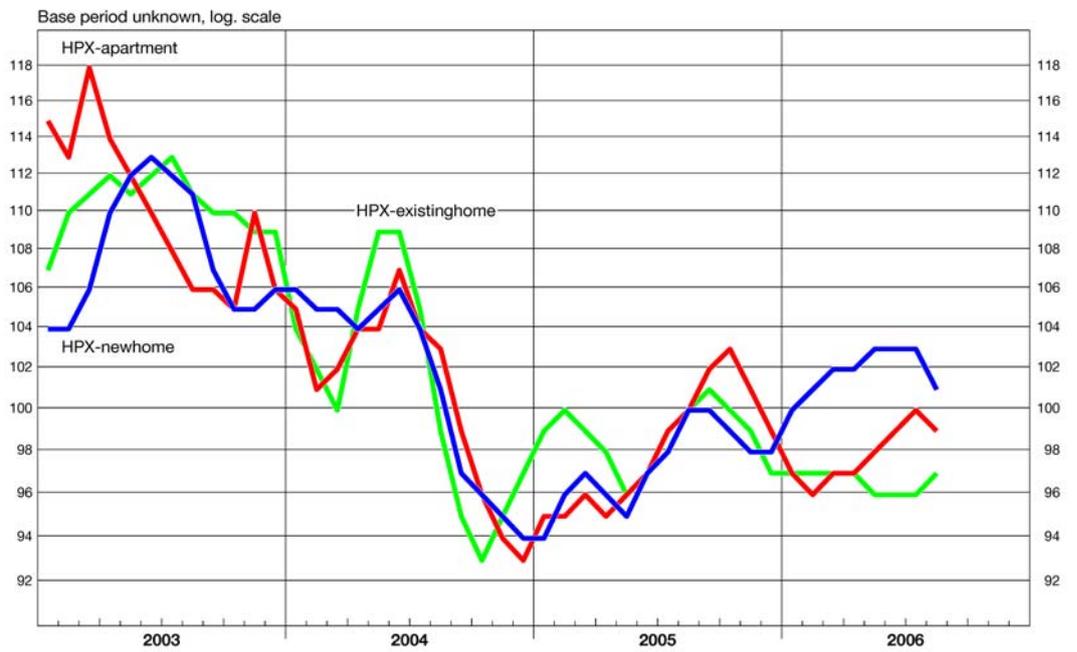
Regional breakdown of property price developments in Germany

Figure 5

Germany
1995 = 100, log. scale

Terraced houses — resale / new dwellings

Apartments — resale / new dwellings

Eastern Germany

Terraced houses — new dwellings / resale

Apartments — resale / new dwellings

Western Germany
1990 = 100, log. scale

Terraced houses — resale / new dwellings

Apartments — resale / new dwellings
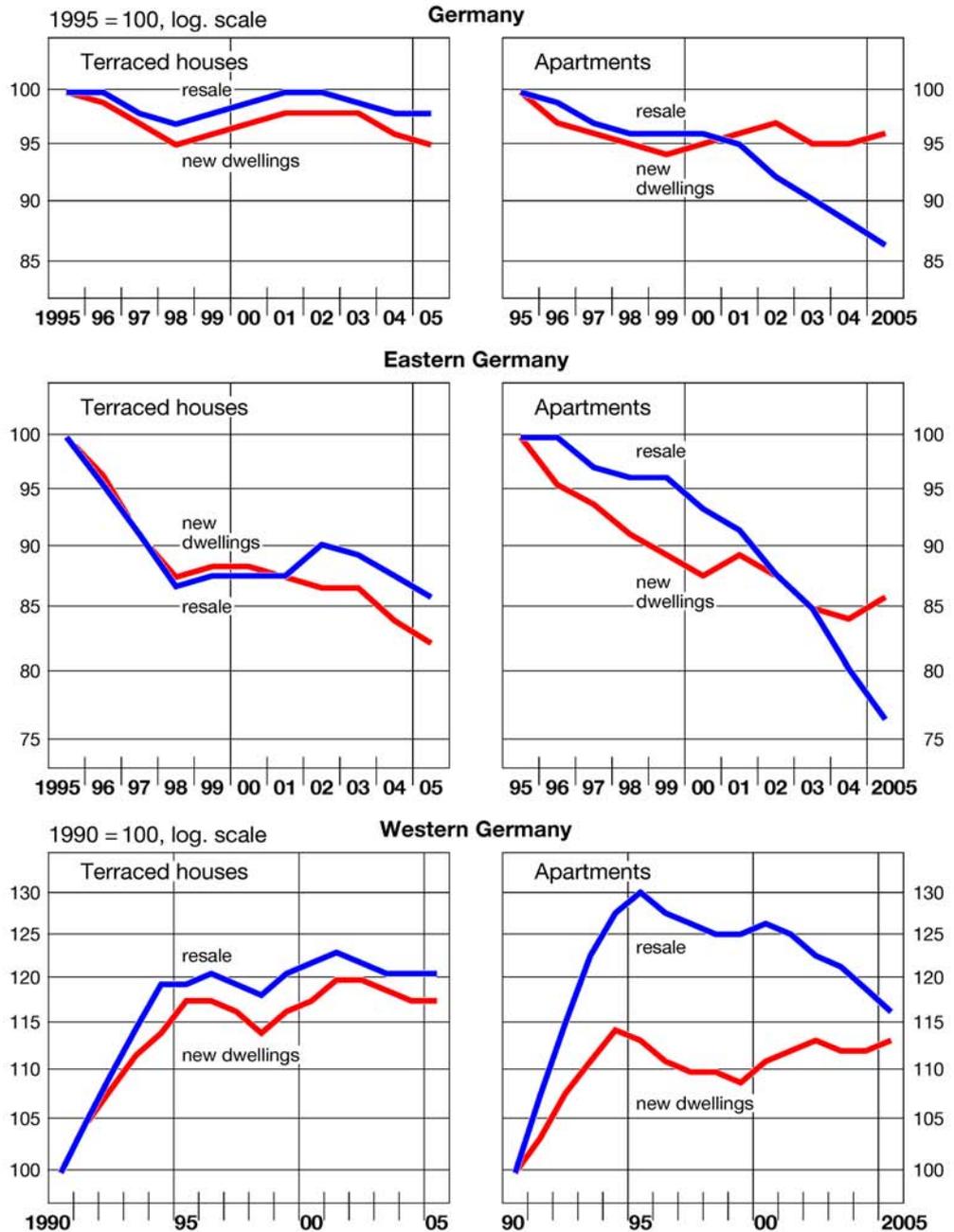
Note: Up to 1995, West Germany includes West Berlin. From 1995 onwards, West Berlin is included in eastern Germany. - Source: Bundesbank calculations on the basis of data from BulwienGesa AG.

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Figure 6

Prices for residential property in West Germany, northern vs. southern regions

1990 = 100, log. scale

New dwellings

Terraced houses / Apartments

Resale

Terraced houses / Apartments
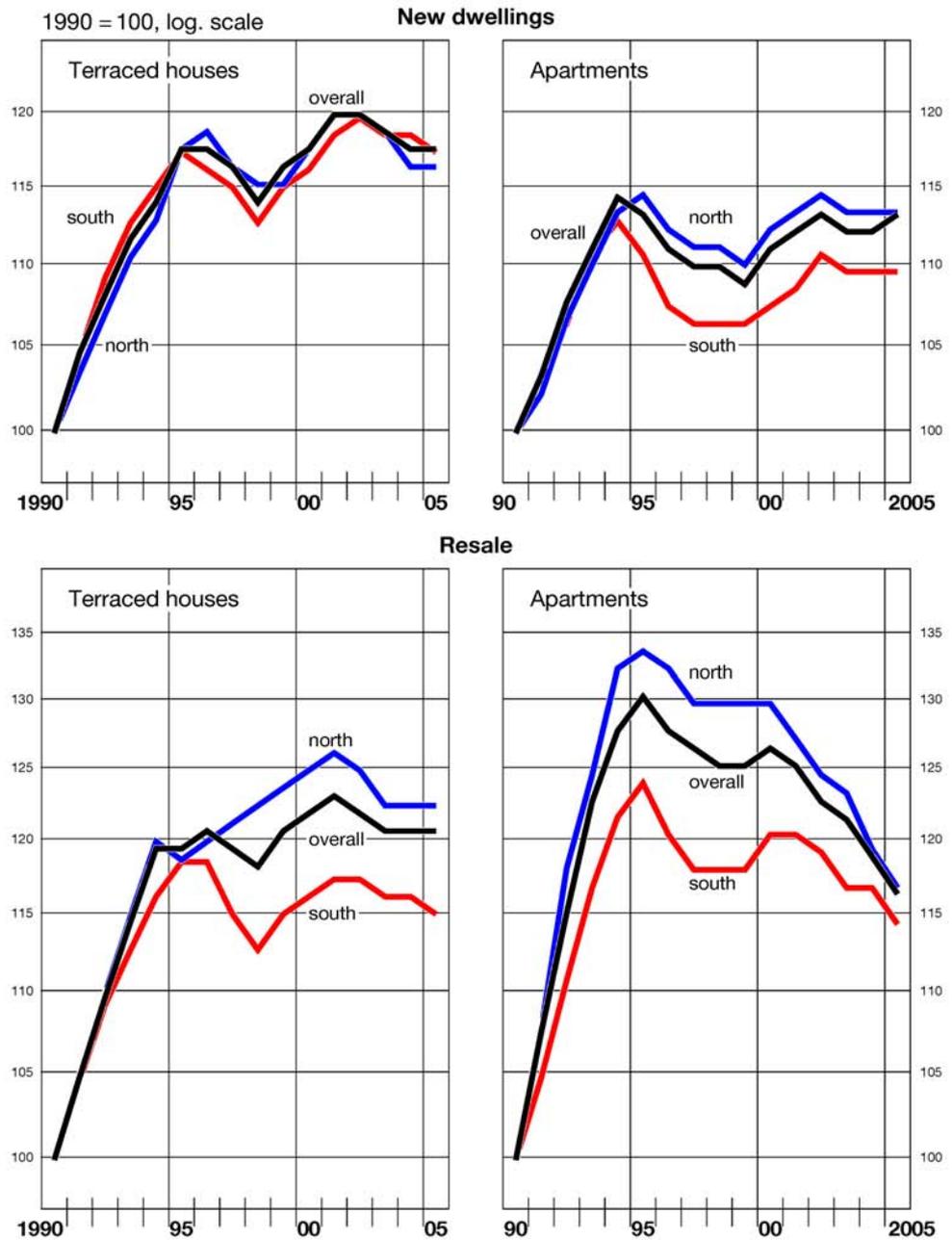
Note: Southern Germany includes Bavaria, Baden-Wuerttemberg, Hesse, Rhineland-Palatinate, Saarland. Northern Germany comprises the remaining states (excluding East Germany). Up to 1995, West Berlin is included in northern Germany. *Source:* Bundesbank calculations on the basis of data from BulwienGesa AG.

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Figure 7

Prices for residential property in West Germany, large vs. small cities *

Southern Germany [1]
— large cities
···· small cities

Northern Germany [2]
— large cities
···· small cities

1990 = 100, log. scale

New dwellings

Terraced houses

Apartments

Resale

Terraced houses

Apartments
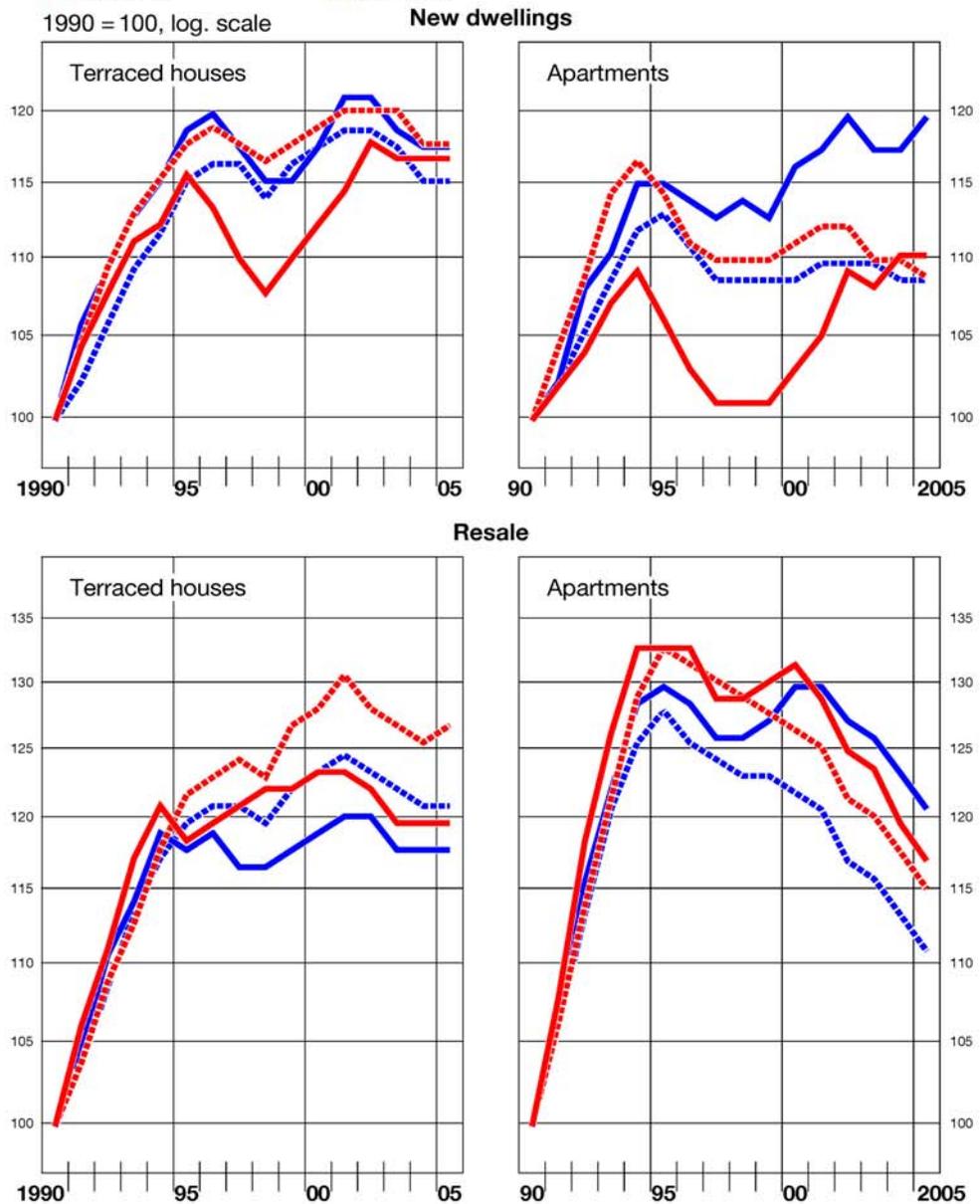
Notes: * Large cities = cities with 500,000 inhabitants or more. - Small cities = selected cities with over 40,000 and up to 500,000 inhabitants. - **1** Bavaria, Baden-Wuerttemberg, Hesse, Rhineland-Palatinate, Saarland. - **2** Remaining federal states (without East Germany); development up to 1995 including West Berlin, afterwards excluding Berlin. Source: Bundesbank calculations on the basis of data from BulwienGesa AG.

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Hedonic price indices for turnkey-ready houses (Destatis)

Figure 8

2000 Q1 = 100, log. scale
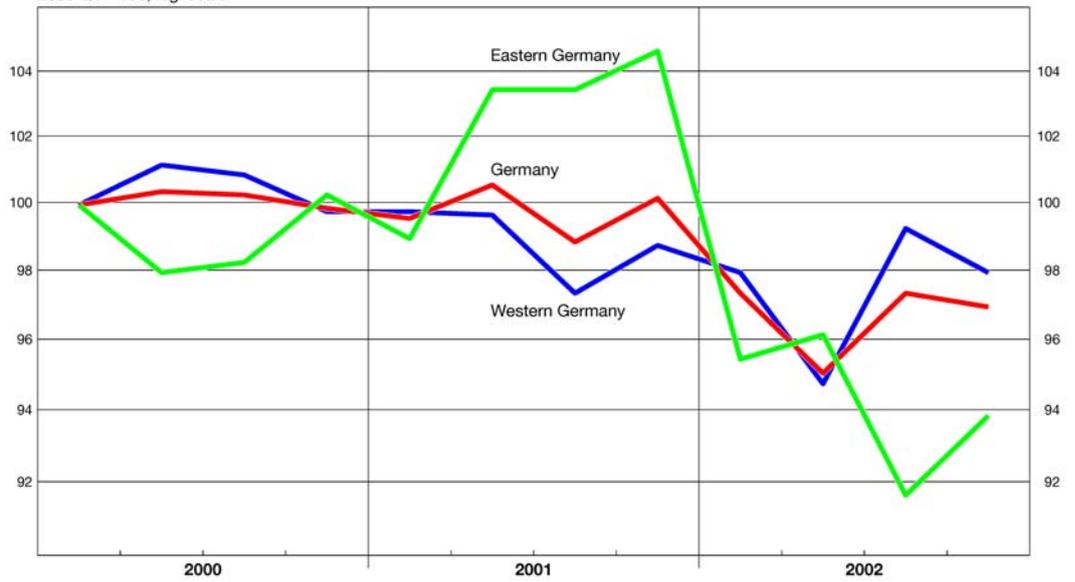
Note: Regional aggregates are only based on federal states with available data. Western Germany includes Lower Saxony, Hesse, Rhineland-Palatinate; Eastern Germany includes Saxony, Saxony-Anhalt and Mecklenburg-Western Pomerania. Aggregation is based on turnover in the construction sector. - Source: Dechent (2004).

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