



Eighth IFC Conference on *“Statistical implications of the new financial landscape”*

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## How should we measure residential property prices to inform policy makers?<sup>1</sup>

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<sup>1</sup> This paper was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS, the IFC or the central banks and other institutions represented at the meeting.

# How should we measure residential property prices to inform policy makers?

## Session 4 B – Assessing macroeconomic vulnerabilities

Jens Mehrhoff

### Abstract

There is no simple answer to a complicated question; the high dimensionality of a complex and diffuse phenomenon such as “the residential property market” calls for a broad set of indicators which embodies the joint distribution of price, financial and real economic indicators.

As regards affordability and valuation indicators, another question remains: What drives the ratios? Is it the numerator (e.g. price) or the denominator (e.g. income)? Last but not least, lending standards differ considerably across countries. At the example of the price-to-income and annuity-to-income ratios it is shown that different drivers are at play in the euro-area member states.

Keywords: Financial stability; Indicators; Credit; Affordability; Valuation; Long series

JEL classification: C22; C43; E31; E58; G12; R31

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## Motivation and introduction

The various motivations for the analysis of house prices call for alternative measures to be applied. In macroeconomic analysis: identification of price signals, evaluation of monetary policy channels, and volume measurement in National Accounts; in macroprudential supervision: assessment of asset price bubbles, build-up of risks in banks' credit exposures, and financial soundness of private households. However, these indicators can give different results, which could undermine their credibility for many users. Yet, there should be no unique indicator. In order to determine whether threats to the economy or financial stability emanate from the housing market, the analyses should be based on a broad set of indicators.

The diverse uses and associated methods of residential property price indices, the statistical framework for the compilation of such indices, as well as a dashboard comprising the three dimensions price, financial and real sector variables will be discussed.<sup>1</sup> These include:

- Price and valuation indicators: E.g. price-to-rent, price-to-income and annuity-to-income ratios.
- Loans to and debt of households: E.g. banks' loans and interest payments.
- Construction and activity indicators: E.g. completed housing units and transactions.

Empirical results for the German residential property market will exemplify the usefulness of a multi-indicator approach in times of strong upward movements of price indicators.

About every third euro spent in Germany for private consumption purposes is spent on housing, including imputed rentals for homeowners. Owner-occupied properties constitute the most significant asset of German households; the rate of home ownership in Germany equates to just 44 %. Hence, more than half of the German households are renters. Among the homeowners, two out of five have a mortgage. The value of the property stock is an important part of the wealth of the German economy: gross fixed assets in housing stand at 265 % of GDP.

## Composite indicators

Composite indicators, on the other hand, aim to combine numerous, diverse indicators in a single number. They claim to reduce complex relationships to a supposedly simple measure. For aggregating base variables to a composite indicators one has to select suitable data first and, then, to derive the respective weights. It is not straightforward at all how the selection and weighting of the base variables should be performed: Factor analysis maximises the explained variance of all base variables, the thus derived weights do not, however, represent relative importance. Regression analysis minimises squared error to a given target indicator, whose existence makes the whole exercise somewhat obsolete.

<sup>1</sup> [http://www.bundesbank.de/Redaktion/EN/Standardartikel/Statistics/system\\_of\\_indicators.html](http://www.bundesbank.de/Redaktion/EN/Standardartikel/Statistics/system_of_indicators.html)

Hence, generally accepted and obvious selection procedures as well as weighting schemes cannot possibly exist. One composite indicator could use different base variables than another one; a third one could use the same base variables but apply a different weighting scheme. What is more, a composite indicator suggests substitutability between different base variables such that one would be indifferent between certain combinations. When the composite indicator is not constructed adequately or is not used so, the conclusions derived on that basis might be misleading and costly. Particularly with many base variables, their interpretation will be in conflict.

The high dimensionality of a complex and diffuse phenomenon such as “the residential property market” cannot adequately be reproduced by a composite indicator. Quite the contrary, the joint distribution of price, financial and real economic indicators seems to be at the centre of the current discussion. There is no simple answer to a complicated question; it might, thus, be better to look at a dashboard of indicators rather than to dissolve existing conflicts between base variables. Last but not least, statistics has a consulting function for policy makers – this makes it even more important to produce unbiased, easily interpretable and manageable measures.

## Conceptual and methodological framework

Despite the quest for swiftly disseminated indicators, it is of utmost importance to set up a valid and reliable statistical framework first. The various data users make substantially different demands on the index concepts. These, in turn, need to be tailored for the distinctive purposes. The observation of values and prices generally yields different results. The change in market values between two consecutive periods does not necessarily reflect the pure, i.e. quality-adjusted, change in prices. It is rather a mixtum compositum of quality changes due to depreciation and renovation as well as the quality-adjusted change in prices; if quantities remain the same. Let, for example, the population be equal in the two periods under consideration. Due to depreciation the quality of all buildings will be lower on average. *Ceteris paribus*, it follows that in such a situation values decrease although quality-adjusted prices have remained constant.

In a market economy, prices give signals about relative scarcities through equilibria between supply and demand. In this way, both enterprises and consumers gain important insights into their production and consumption decisions, respectively, so that scarce resources are allocated to where they are most efficiently used. Real estate prices are a significant economic indicator and rising house prices are often associated with economic growth. They stimulate construction activity and promote house sales. Not least, price increases support private consumption via the wealth effect.

For monetary policy making, house price indices are an integral part of inflation measurement. In the near future, owner-occupied housing should become part of the European Harmonised Indices of Consumer Prices – as with other durable consumer goods, the net acquisitions approach will be applied. For the identification of pure price signals, a price index at constant quality is a condition *sine qua non*. Since for short-term business cycle analysis, the most recent

developments are at the centre of attention, aggregation should be performed using transactions only (albeit not necessarily in terms of chain-linked indices).

In addition, figures on residential property are needed in National Accounts: Converting nominal to real figures (deflating): The calculation of the volume requires a pure price index for this asset class (of course, nominal values have a right in their own as an indicator). Neglecting the issue of land-structure spilt, the measurement of the value of the entire housing stock calls for stock-weighted indices, which would also be appropriate for the assessment of households' wealth effects. Furthermore, deflators are needed to estimate the real output of the services of the real estate industry as well as gross (fixed) capital formation in new dwellings – in both cases, a transaction-based price index would be needed, which must cover new dwellings only in the latter case.

Apart from the potential build-up of asset price bubbles, the risks of banks' credit exposures associated to the financial soundness of private households are most relevant. Here, the change in values of financed objects needs to be tracked over time. This has two dimensions: Hazards emerging from newly granted loans, and value changes of properties in the credit stock.

The build-up of asset price bubbles frequently comes with misallocations, a strong surge in housing investment, say. In case of an adjustment, this bears the risk of higher probabilities of default in the non-financial corporations sector. Focussing on the homebuying of private households, the initial ratio of the loan to the value of the property is of special interest for macroprudential authorities. Price dynamics have to be seen here in conjunction with further indicators on the financing; particularly risky is the typical coincidence of housing booms and a credit expansion with lower lending standards.

Much like in short-term business cycle analyses, transactions can be used as a proxy for financings in order to provide valuable clues on the build-up of risks in banks' new business. On the other hand, through aggregation important information on the regional heterogeneity is lost. Empirical evidence in other countries with overheated housing markets has shown that regional developments can develop systemic relevance. This means that, at first, isolated undesired developments eventually gain breadth; a deeper investigation of spatial transmission channels necessitates a geographical breakdown.

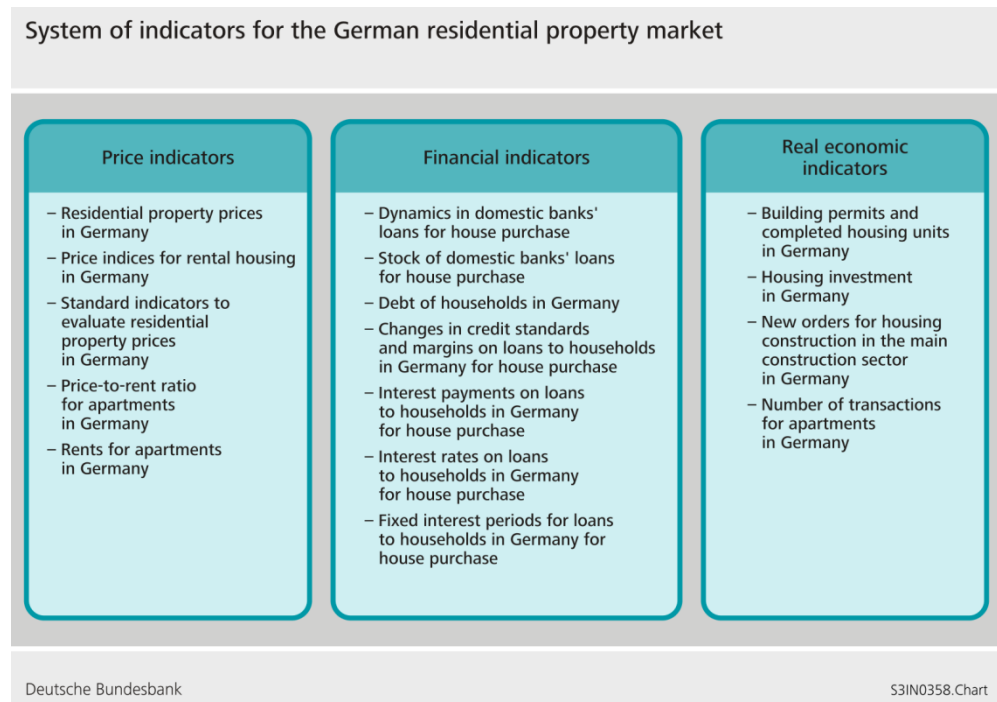
Another important indicator is the change in values – price changes including quality changes – of financed objects over time. This is because, from the banks' perspective, the residual value of a home is of interest only should the debtor default, since then the bank would have to sell the home on the market (possibly in a forced sale). Since the quantity, i.e. floor space or number of bedrooms, is constant in general, the change in the property's value between the time of purchase and a potential foreclosure is:  $\text{Value change} = \text{Price change} + \text{Quality change}$ .

The quality of the house, however, is not fixed but it is assumed to be subject to a constant annual depreciation rate. The sole exogenous variable in the model then would be the quality-adjusted price. Still, it is not the absolute residual value of the house that matters but its ratio to the residual mortgage in the event of credit default. In the first years of the life of the loan, though, the amortisation rate of the annuity is rather low, so that the loan-to-value ratio worsens initially.

From a macroprudential view, only prices of financed objects would be relevant. A bank's credit portfolio would, furthermore, have a changing composition; newly financed objects enter, others exit due to repayments of the loans. For financial stability purposes, additionally, institution-specific figures are indispensable for the identification of risk potentials. The tails of the distribution need close examination as do credit vintages which reflect then-effective lending standards.

## The Bundesbank's dashboard

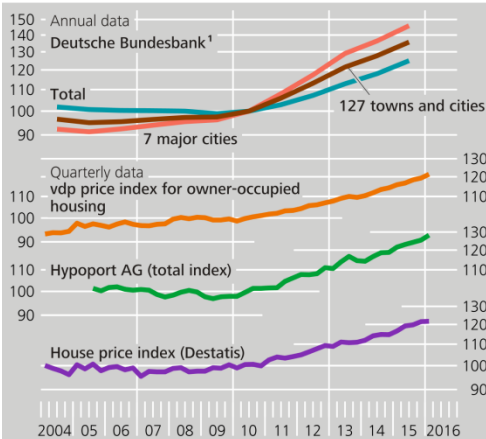
The year 2010 saw a trend reversal in the German housing market, which was reflected in a sharp rise in prices. This situation needs to be addressed in light of the ongoing low-interest-rate environment. In order to determine whether threats to the economy or financial stability emanate from the housing market, the Bundesbank based its analyses on a broad set of indicators. This clearly shows that no statistical one-size-fits-all approach exists but that each subject matter has to be considered separately.



The observed price movements do not, on their own, make it possible to derive any potential overvaluation or undervaluation. A benchmark would be required, but it cannot be specified unambiguously from a conceptual point of view, nor can it be observed directly. Price data going far back into the past contain statistical breaks. Averages of the standard indicators do not take account of medium and long-term trends. If prices as well as rents rise substantially, the price-to-rent ratio may remain largely unchanged. Conversely, the price-to-income ratio would shoot upwards. If the interest rate conditions for new mortgage loans are taken into account, a substantial improvement of affordability can be observed since the outbreak of the financial crisis.

### Residential property prices in Germany

2010 = 100, log scale

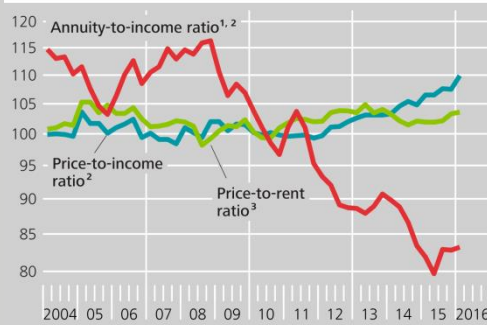


1 Transaction-weighted. Bundesbank calculations based on price data provided by bulwiengesa AG. Deutsche Bundesbank

13 Jul 2016, 10:35:15, S3PR01100.Chart

### Standard indicators to evaluate residential property prices in Germany

2010 = 100, log scale



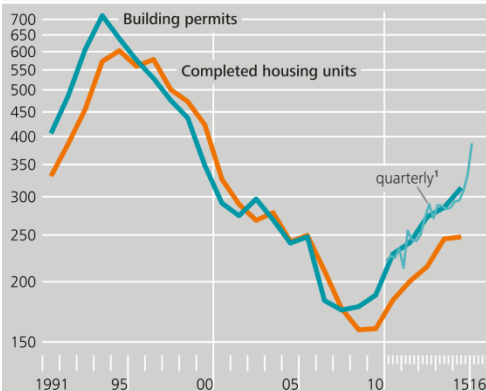
Source: Bundesbank calculations based on data provided by the Association of German Pfandbrief Banks (vdp). 1 Annuity of a mortgage loan with a fixed interest rate (between five and ten years) and a hypothetical term of 30 years in relation to household income. 2 Disposable income per household in Germany, nominal. An increase represents a rise in the purchase price in relation to disposable income. 3 Prices and rents of apartments. Deutsche Bundesbank

27 Mai 2016, 10:57:09, S3PR01182.Chart

Since 2010, only the price indicators for Germany demonstrated strong upward movements. The Bundesbank could not, on the basis of model-based analyses of the valuation situation in the housing market, detect any notable deviations from fundamentally justified housing prices throughout Germany. Hence, at present, no substantial macroeconomic risks are arising from the price structure on the housing market. In the 127 cities studied, current estimates put upward price deviations at between 10% and 20%, measured in terms of the longer-term demographic and economic variables; with freehold apartments in major cities showing the strongest overvaluations.

### Building permits and completed housing units in Germany\*

Thousand apartments, log scale

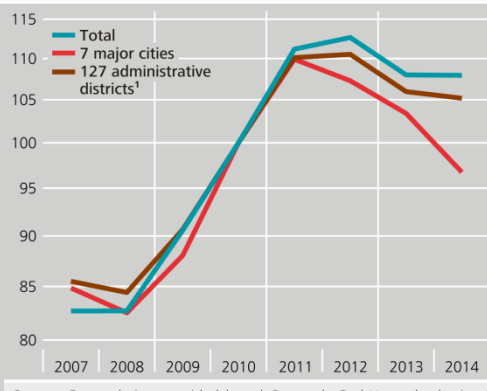


Source of unadjusted figures: Federal Statistical Office. \* In residential and non-residential buildings. Including construction work on existing buildings. 1 Seasonally and calendar adjusted. Deutsche Bundesbank

23 Jun 2016, 11:03:49, S3PR01112.Chart

### Number of transactions for apartments in Germany

2010 = 100, log scale

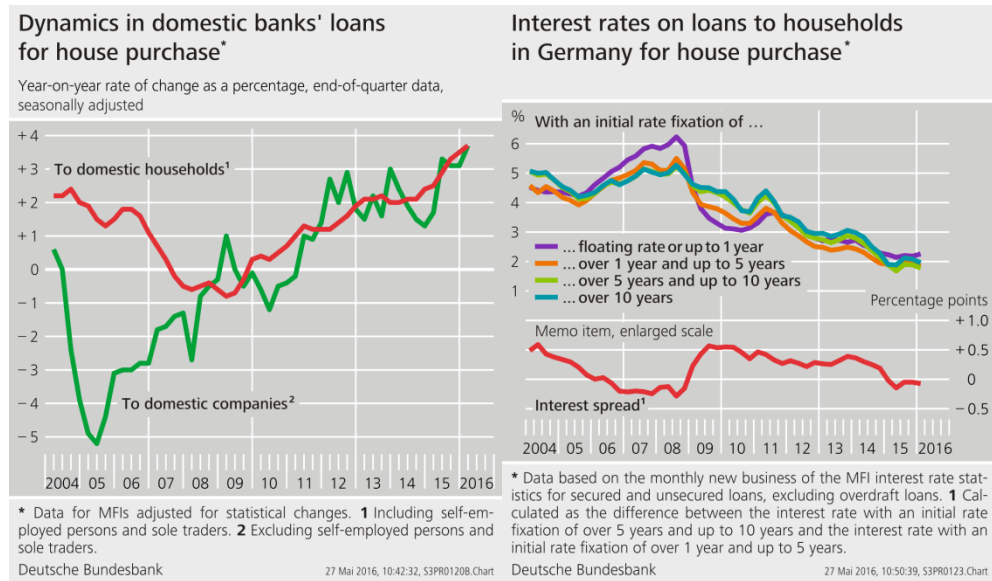


Source: Extrapolation provided by vdpResearch GmbH on the basis of data from surveyor committees. 1 Regional coverage not entirely comparable with residential property prices for 127 towns and cities from bulwiengesa AG. Deutsche Bundesbank

27 Mai 2016, 10:25:29, S3PR01114.Chart

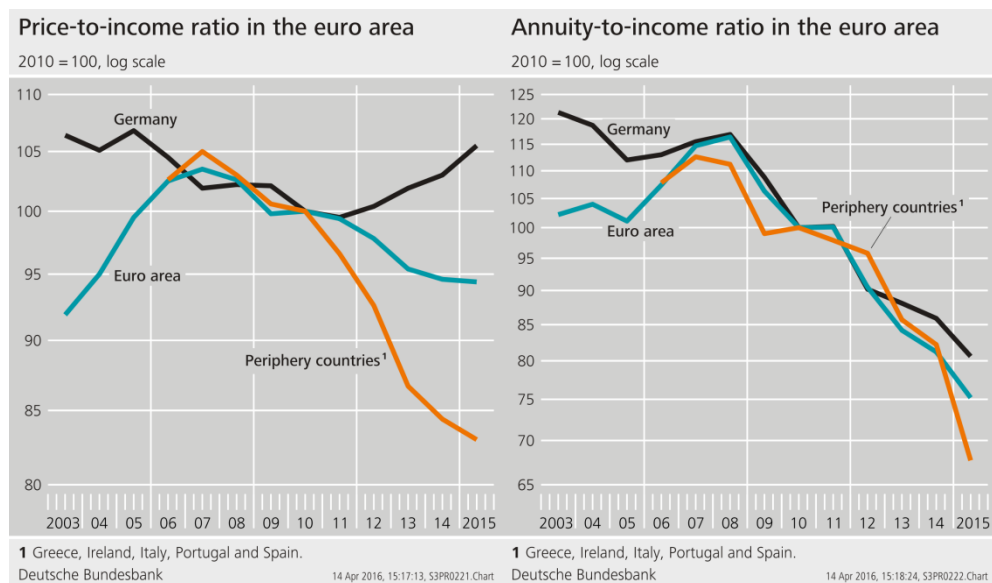
The other indicators mentioned above did not reach critical levels. However, studies of averages throughout Germany have limited value, as moderate rates of increase in housing loans for the whole of Germany could obscure a heterogeneous regional distribution of lending growth. The Bundesbank's analyses show very few signs of procyclical behaviour by banks or of a destabilising nexus between mortgage lending and property prices. However, it is striking that, in the towns and cities under consideration with sharply rising housing prices, a large share of mortgages have a German sustainable loan-to-value ratio (*Beleihungsauslauf*) of

over 100%. This points to structural vulnerabilities in the German banking system to urban real estate market risks.



## Affordability indicators

The annuity-to-income ratio extends the price-to-income ratio in the sense that it takes into account the interest rate conditions. The question, however, remains what drives the ratio – is it the numerator (e.g. price) or the denominator (e.g. income)? Over and above, what price should be used? Certainly, it should be quality adjusted. But should it relate to apartments in urban markets only, say? The same line of reasoning applies to income. A per household approach appears to be reasonable. But how narrow or wide should it be defined? Last but not least, lending standards differ considerably across countries in terms of loan-to-value ratio, initial rate fixation, life of the loan and so forth.





## Summary

The system of indicators has to provide a quick and comprehensive overview of the situation on the housing market. Therefore, the set consists of a selection of particularly meaningful variables. Residential property prices in Germany have risen significantly since 2010. Yet, the price movements are also an expression of continued favourable demand conditions as well as the delayed expansion of supply. Despite the low interest rates, housing loans rose only moderately and lending standards did not ease either.



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# How should we measure residential property prices to inform policy makers?

Dr Jens Mehrhoff\*, Head of Section Business Cycle, Price and Property Market Statistics

# 1. Motivation and introduction

No statistical one-size-fits-all approach but broad set of indicators

## System of indicators for the German residential property market

### Price indicators

- Residential property prices in Germany
- Price indices for rental housing in Germany
- Standard indicators to evaluate residential property prices in Germany
- Price-to-rent ratio for apartments in Germany
- Rents for apartments in Germany

### Financial indicators

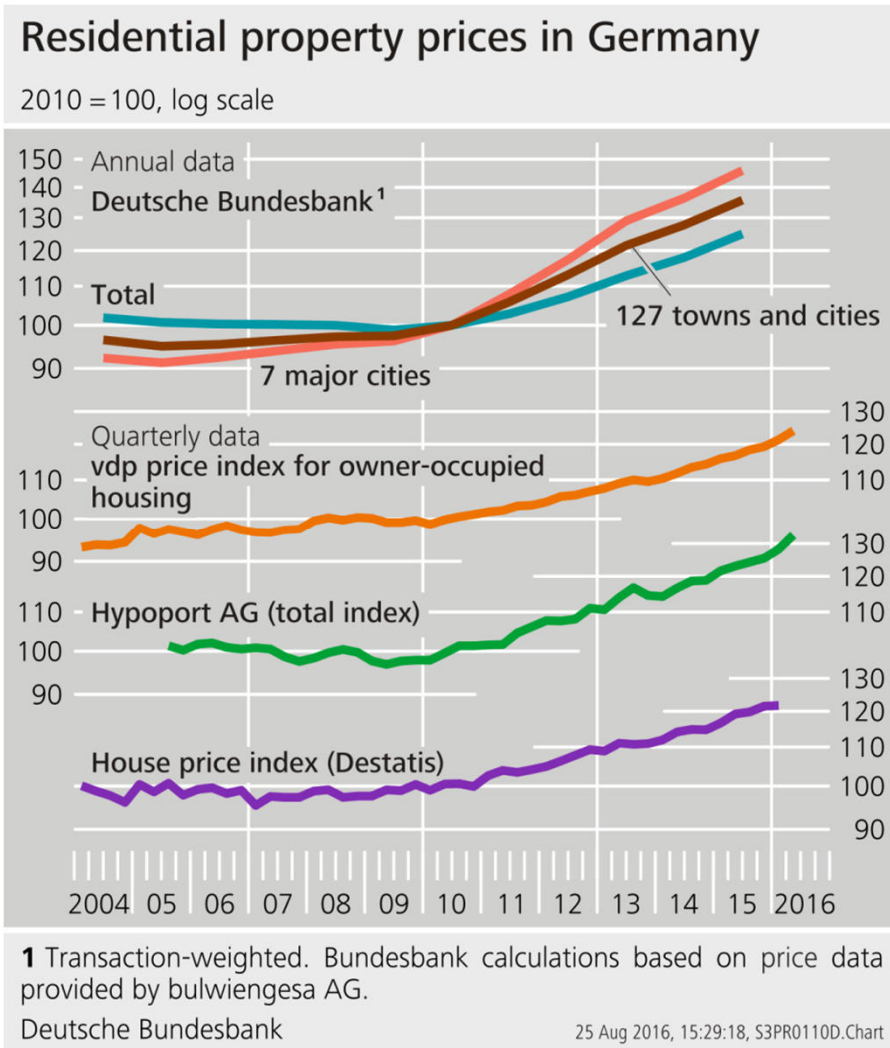
- Dynamics in domestic banks' loans for house purchase
- Stock of domestic banks' loans for house purchase
- Debt of households in Germany
- Changes in credit standards and margins on loans to households in Germany for house purchase
- Interest payments on loans to households in Germany for house purchase
- Interest rates on loans to households in Germany for house purchase
- Fixed interest periods for loans to households in Germany for house purchase

### Real economic indicators

- Building permits and completed housing units in Germany
- Housing investment in Germany
- New orders for housing construction in the main construction sector in Germany
- Number of transactions for apartments in Germany

## 2. The Bundesbank's dashboard

Continuing strong demand outweighed expansion of the housing stock.



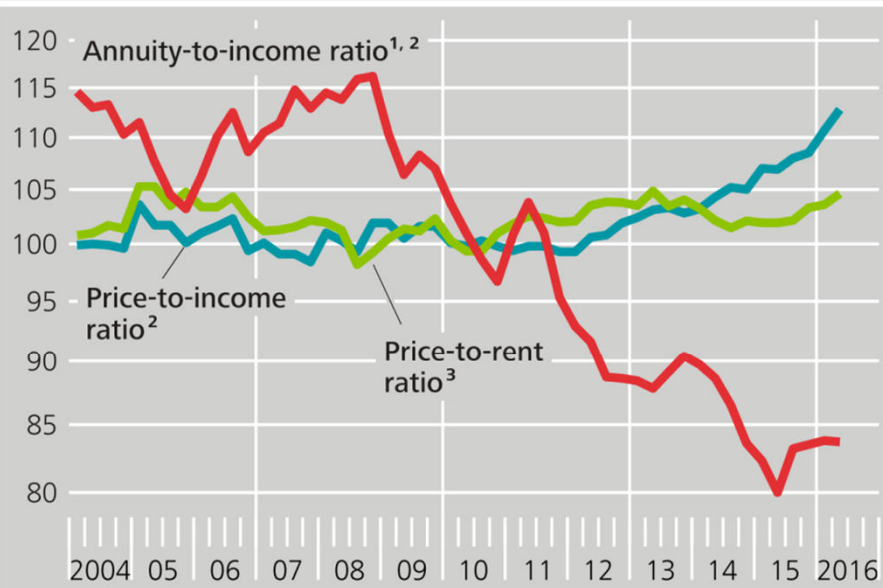
- Last year saw a **further sharp increase in residential property prices** with housing price inflation being **regionally more broadly based** than in earlier years.
- The observed price movements do not, on their own, make it possible to derive any **potential overvaluation or undervaluation**. A **benchmark** would be required, but it **cannot be specified unambiguously** from a conceptual point of view, **nor can it be observed directly**.
- All things considered, the **increase in the price of residential property** during the reporting year is likely to be **greater than** is suggested by the **dynamics of the demographic and economic fundamentals**.

## 2. The Bundesbank's dashboard

Housing is still being valued exceptionally highly in urban regions.

### Standard indicators to evaluate residential property prices in Germany

2010 = 100, log scale



Source: Bundesbank calculations based on data provided by the Association of German Pfandbrief Banks (vdp). **1** Annuity of a mortgage loan with a fixed interest rate (between five and ten years) and a hypothetical term of 30 years in relation to household income. **2** Disposable income per household in Germany, nominal. An increase represents a rise in the purchase price in relation to disposable income. **3** Prices and rents of apartments.

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25 Aug 2016, 15:07:01, S3PR0182.Chart

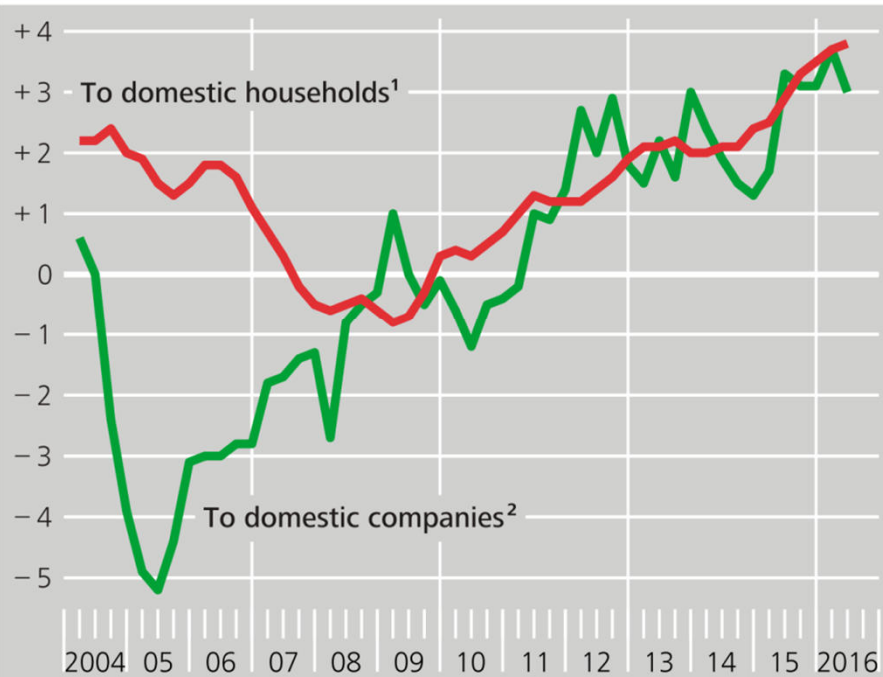
- If prices as well as rents rise substantially, the **price-to-rent ratio** may remain **largely unchanged**. Conversely, the **price-to-income ratio** would **shoot upwards**.
- While the **macroeconomic price-to-income ratio** has shown a **marked increase** over the past three years, there is likely to have been a **further improvement in the affordability** of residential property owing to the **low financing costs** of acquiring it.
- According to the latest estimations, the relevant **upward price deviations** in towns and cities still amount to **between 10% and 20%**. In this context, **freehold apartments in the major cities** continue to show the **steepest overvaluations**.

## 2. The Bundesbank's dashboard

Continued low-interest-rate environment entails risks.

### Dynamics in domestic banks' loans for house purchase\*

Year-on-year rate of change as a percentage, end-of-quarter data, seasonally adjusted



\* Data for MFIs adjusted for statistical changes. **1** Including self-employed persons and sole traders. **2** Excluding self-employed persons and sole traders.

Deutsche Bundesbank

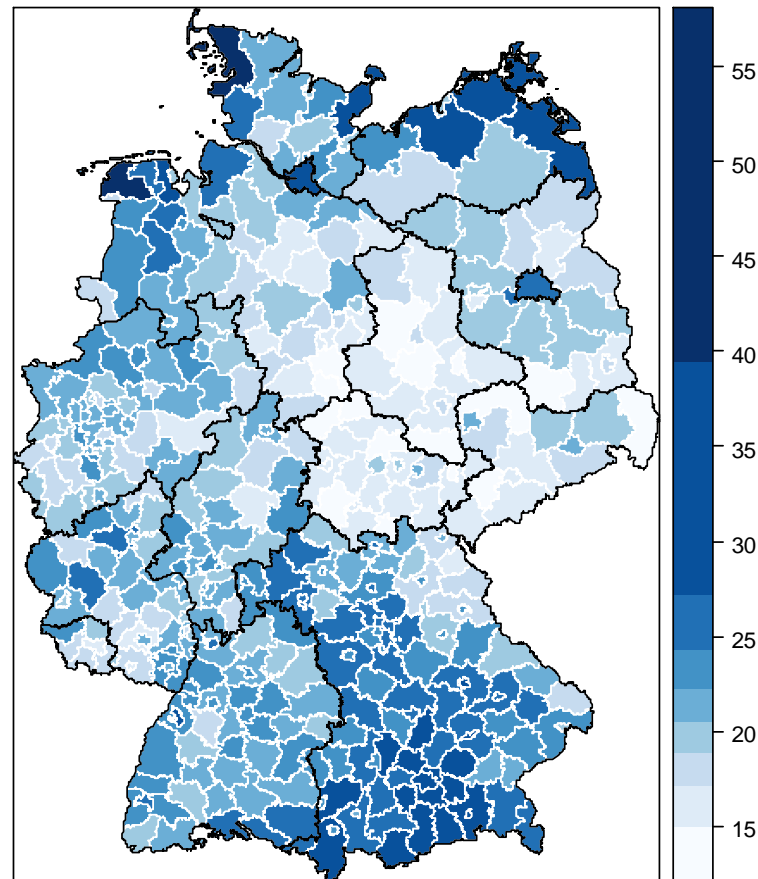
25 Aug 2016, 15:19:27, S3PR0120B.Chart

- If prices continue to rise, creditors could be tempted to **expand lending excessively and loosen credit standards**. This can result in **systemic risks**.
- Although **new lending accelerated significantly** during 2015, growth in mortgage lending to households can still be described as **moderate in a longer-term comparison**.
- Moreover, **household debt levels in Germany continue to decline**, at least in aggregate terms.
- What is more, the Eurosystem's regular Bank Lending Survey shows that German **banks have not loosened their lending standards for mortgage loans** since 2014.



## 2. The Bundesbank's dashboard

### Price-to-rent ratio for apartments in 2015



- **Studies of averages throughout Germany have limited value**, as moderate rates of increase in house prices for the whole of Germany could **obscure a heterogeneous regional distribution**.
- Although the **differences in price rises** between the regions **diminished** again in 2015, **waning price dynamics** did not reduce **existing gaps** between Southern and Northern Germany as well as Western and Eastern Germany.
- With regard to the future stability of the residential property market as a whole, it is therefore of **key importance to investigate the spatial transmission channels of price impulses in greater depth**.



## 2. The Bundesbank's dashboard

<http://www.bundesbank.de/> → English → Statistics → Enterprises and households → System of indicators for the German residential property market



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Banks and other financial institutions

**Enterprises and households**

Output

Orders received

Turnover

Labour costs

Prices

**System of indicators for the German residential property market**

Corporate financial statements

Employees and labour market

### System of indicators for the German residential property market

System of indicators for the German residential property market



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Overview of system of indicators

The objective of the system of indicators is to give a quick and comprehensive overview of the situation on the property market. The system comprises a manageable number of informative indicators that enable a transparent, unbiased and verifiable analysis. The system of indicators is based on a structured presentation from three perspectives: prices, the financial sector and the real economy.

#### Price indicators

- 📄 Residential property prices in Germany  
31.05.2016 | 222 KB, PNG
- 📄 Price indices for rental housing in Germany  
31.05.2016 | 173 KB, PNG
- 📄 Standard indicators to evaluate residential property prices in Germany  
31.05.2016 | 254 KB, PNG

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Your data basket contains: 0 time series

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Time series

Here you will find all the macroeconomic time series of "System of indicators for the German residential property market".

More

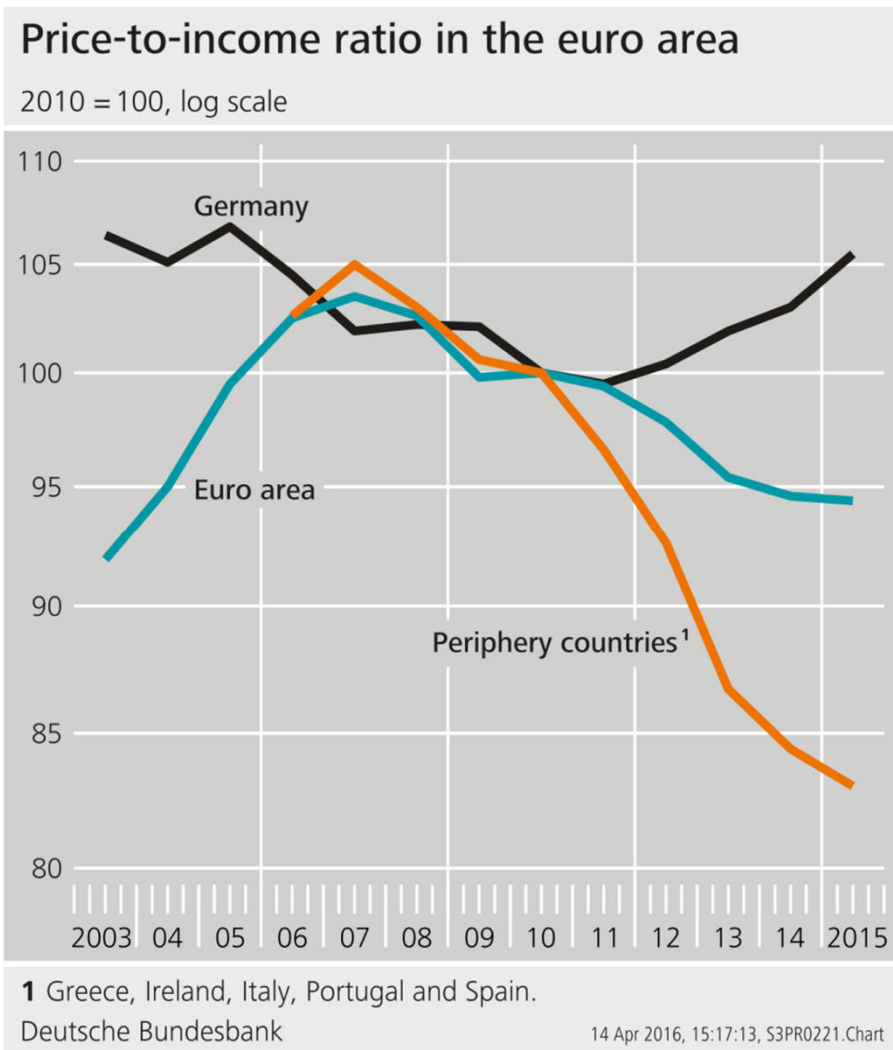
### 3. Affordability indicators

Lending standards differ considerably across countries (SVR 2013/14).

Country	Housing loans to GDP (%)	Average loan to value (%)	Share of floating rates (%)	Average life of the loan (years)	Possibility to withdraw equity
Belgium	47	83	10	20	No
Germany	45	70	15	25	No
France	42	75	15	15	No
Ireland	84	70	67	20	Limited
Italy	23	50	47	15	No
Netherlands	106	90	18	30	Yes
Austria	28	60	61	25	No
Sweden	78	80	52	25	Yes
Spain	62	70	91	20	Limited
U. K.	84	85	.	25	Yes
U. S.	76	80	47	30	Yes

### 3. Affordability indicators

#### Price-to-income ratio in the euro area



#### Percentage change from 2010 to 2015

Country	Prices	Income	P-to-I
Germany	+18	+11	+ 6
Euro area	- 1	+ 5	- 5
Periphery*	-18	- 2	-17

An increase represents a rise in the purchase price in relation to disposable income.

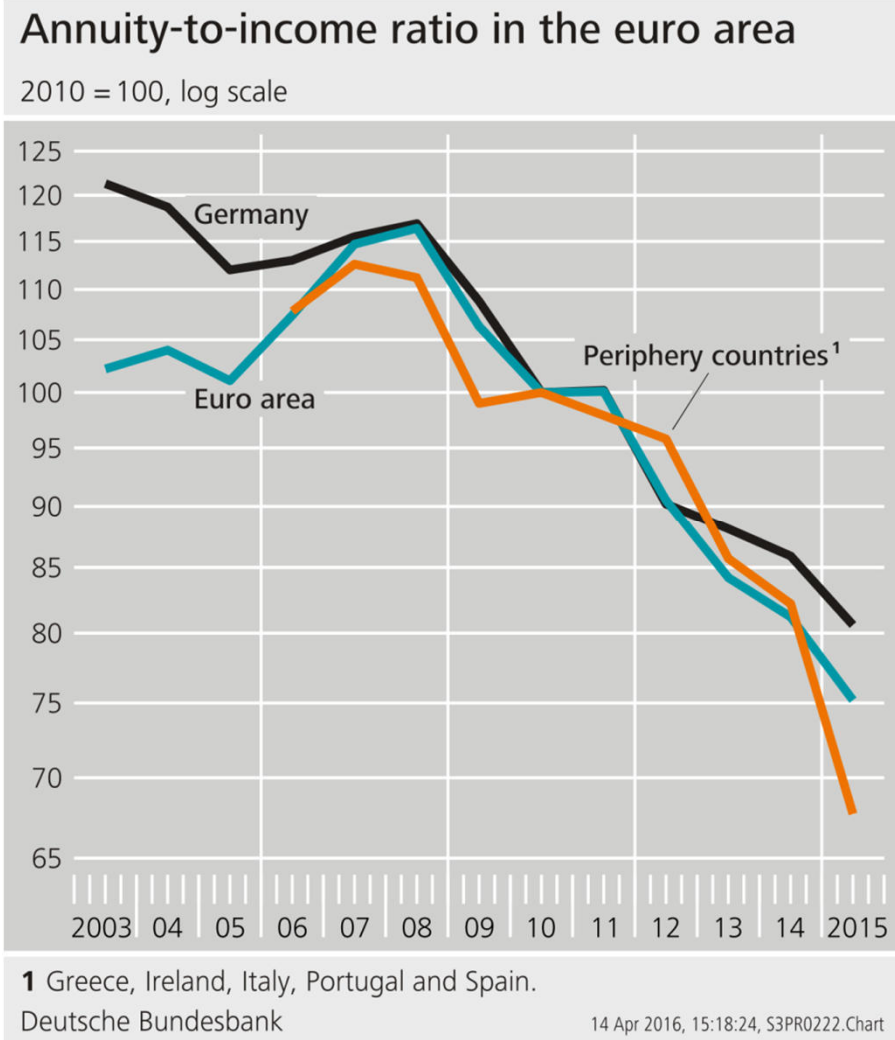
#### Share of disposable income (gross)

Country	Percentage of euro area
Germany	28
Periphery*	35

\* Greece, Ireland, Italy, Portugal and Spain.

### 3. Affordability indicators

#### Annuity-to-income ratio in the euro area



#### Percentage change from 2010 to 2015

Country	P-to-I	Interest	A-to-I
Germany	+ 6	-23	-19
Euro area	- 5	-20	-24
Periphery*	-17	-19	-33

An increase represents a rise in the purchase price in relation to disposable income.

#### Share of credit volume (5 to 10 years)

Country	Percentage of euro area
Germany	56
Periphery*	1

\* Greece, Ireland, Italy, Portugal and Spain.