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How should we measure residential property prices to inform policy makers?¹

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¹ This presentation was prepared for the meeting. The views expressed are those of the author and do not necessarily reflect the views of the BIS or the central banks and other institutions represented at the meeting.

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

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

Structure of the presentation

1. Motivation and introduction
2. Conceptual and methodological framework
3. The Bundesbank's dashboard
4. Spatial dependencies

“Real estate prices (residential and commercial)” (Recommendation 19 of the G20 Data Gaps Initiative)

1. Motivation and introduction

- Four stylised facts about the **German residential property market**:
 - 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 267 % of GDP.**

1. Motivation and introduction

- The **various motivations for the analysis of house prices** call for **alternative measures** to be applied.
 - **Macroeconomic**: identification of price signals, evaluation of monetary policy channels, volume measurement in National Accounts.
 - **Macroprudential**: assessment of asset price bubbles, build-up of risks in banks' credit exposures, 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**.

1. Motivation and introduction

- 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.
 1. **Price and valuation indicators**: E.g. price-to-rent, price-to-income and annuity-to-income ratios.
 2. **Loans to and debt of households**: E.g. banks' loans and interest payments.
 3. **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.

2. Conceptual and methodological framework

2.0 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**.

2. Conceptual and methodological framework

2.0 Composite indicators

- 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.**

2. Conceptual and methodological framework

2.0 Composite indicators

- 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**.

2. Conceptual and methodological framework

2.1 Setting the stage

- 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**.

2. Conceptual and methodological framework

2.1 Setting the stage

- The **market value provides a nominal measure** for residential property. If quantities (floor space or lot size in square metres, say) are available, dividing the value in euro by that quantity yields a so-called **unit value in euro per square metre**. Thus, the value can be split up as follows:

$$(1) \quad \text{Value} = \text{Unit Value} \times \text{Quantity}.$$

- However, the unit value in Equation (1) **depends on the quality of the building and not just on floor space, or the location of the lot and not only its size.**

2. Conceptual and methodological framework

2.1 Setting the stage

- Since price indices aim for a quality-adjusted indicator **prices here denote a constant quality *numéraire*.**
- With a hedonic quality adjustment, say, it is possible to decompose the value into a **constant-quality price** and a volume measure that inherits quality changes (e.g. through modernisation):

$$(2) \quad \text{Value} = \text{Price} \times \text{Volume}.$$

- Therefore, an index for property prices in its pure form will reflect **movements in prices that are stripped of quality changes**. The latter are included in the volume as shown in Equation (2).

2. Conceptual and methodological framework

2.1 Setting the stage

- Eventually, the ultimate statistical goal is splitting up the value into a **quality-adjusted price**, the quality component itself and a quantity measure independent of quality:

$$(3) \quad \text{Value} = \text{Price} \times \underbrace{\text{Quality} \times \text{Quantity}}_{\text{Volume}}$$
$$\underbrace{\text{Price} \times \text{Quality}}_{\text{Unit Value}} \times \text{Quantity}$$

- Following Equation (3), the value is obtained via **multiplying the constant-quality price of a unit by a dimensionless mark-up (or mark-down) for the desired level of quality and the nominal quantity** of the structure or the land. This **mark-up can reflect characteristics such as the age of the building or its year of construction.**

2. Conceptual and methodological framework

2.2.1 Macroeconomic identification of price signals

- 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** (more on the measurement of “The Wealth of Nations” shortly).

2. Conceptual and methodological framework

2.2.1 Macroeconomic identification of price signals

- 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).

2. Conceptual and methodological framework

2.2.2 Uses in National Accounts

– In addition, figures on residential property are needed in **National Accounts**:

- **Converting nominal to real figures (deflating)**: The calculation of the volume as shown in Equation (2) 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.

2. Conceptual and methodological framework

2.3 Financial stability

- 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**:
 1. **Hazards emerging from newly granted loans**, and

 2. **value changes of properties in the credit stock.**

2. Conceptual and methodological framework

2.3.1 Evaluation of build-up of housing bubbles at the current end

- 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**.

2. Conceptual and methodological framework

2.3.1 Evaluation of build-up of housing bubbles at the current end

- 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.**

2. Conceptual and methodological framework

2.3.2 Valuation of financed objects in the course of time

- 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:**

$$(4) \quad \text{Value change} = \text{Price change} + \text{Quality change.}$$

2. Conceptual and methodological framework

2.3.2 Valuation of financed objects in the course of time

- 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**.

2. Conceptual and methodological framework

2.3.2 Valuation of financed objects in the course of time

- 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**.

3. 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.

3. The Bundesbank's dashboard

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

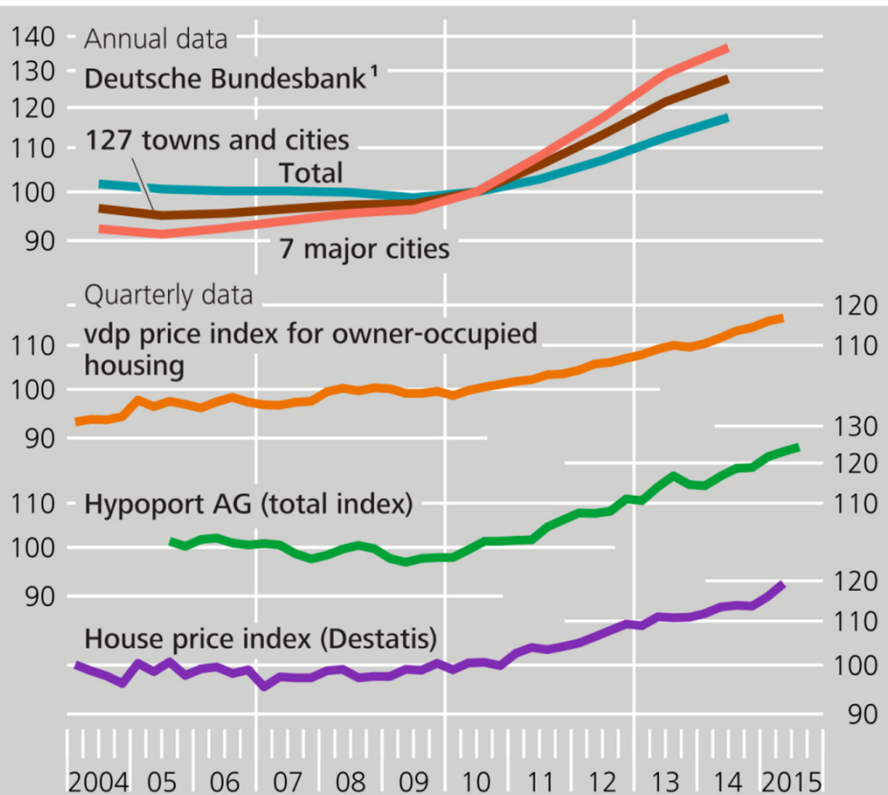
- Building permits and completed housing units in Germany
- Housing investment in Germany
- New orders for housing construction in the main construction sector in Germany
- Number of transactions for apartments in Germany

3. The Bundesbank's dashboard

Prices have been rising since 2010, albeit with no acceleration recently.

Residential property prices in Germany

2010 = 100, log scale



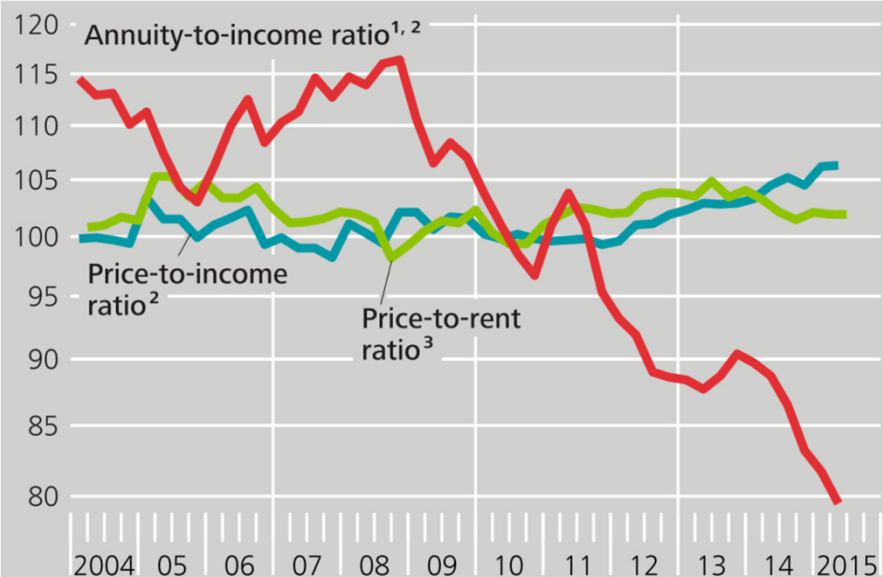
1 Transaction-weighted. Bundesbank calculations based on price data provided by bulwiengesa AG.

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2 Nov 2015, 09:23:57, S3PR0110D.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.

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2 Nov 2015, 09:45:52, S3PR0182.Chart

3. The Bundesbank's dashboard

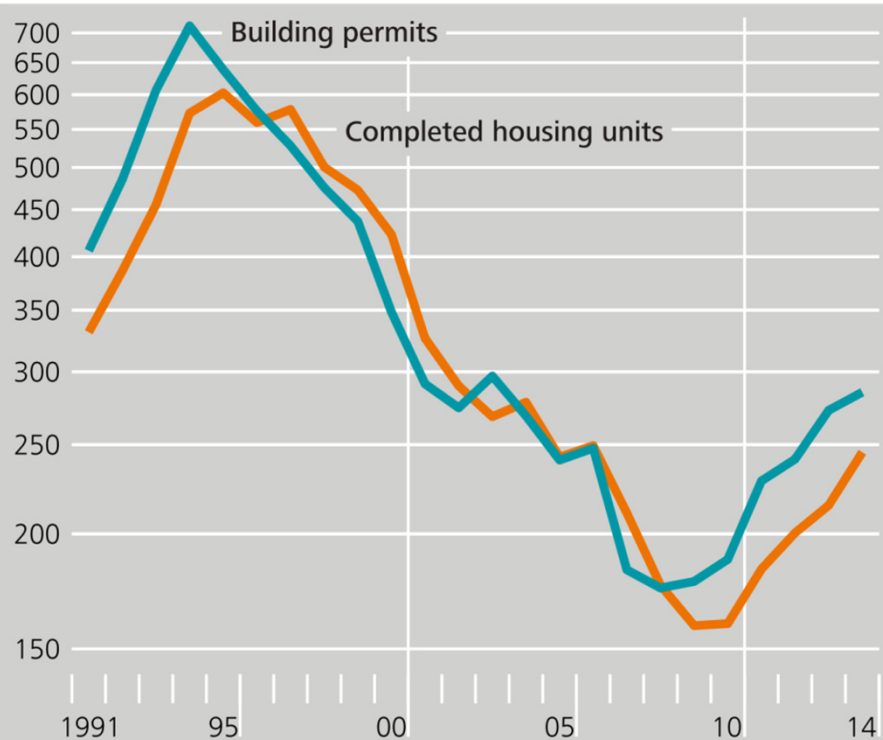
- The observed price movements do not, on their own, make it possible to derive any **potential overvaluation or undervaluation**. A **benchmark** would be required, but it **cannot be specified unambiguously** from a conceptual point of view, **nor can it be observed directly**.
- Price data going far 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.

3. The Bundesbank's dashboard

Price movements reflect the lagged expansion of the housing supply.

Building permits and completed housing units in Germany*

Thousand apartments, log scale



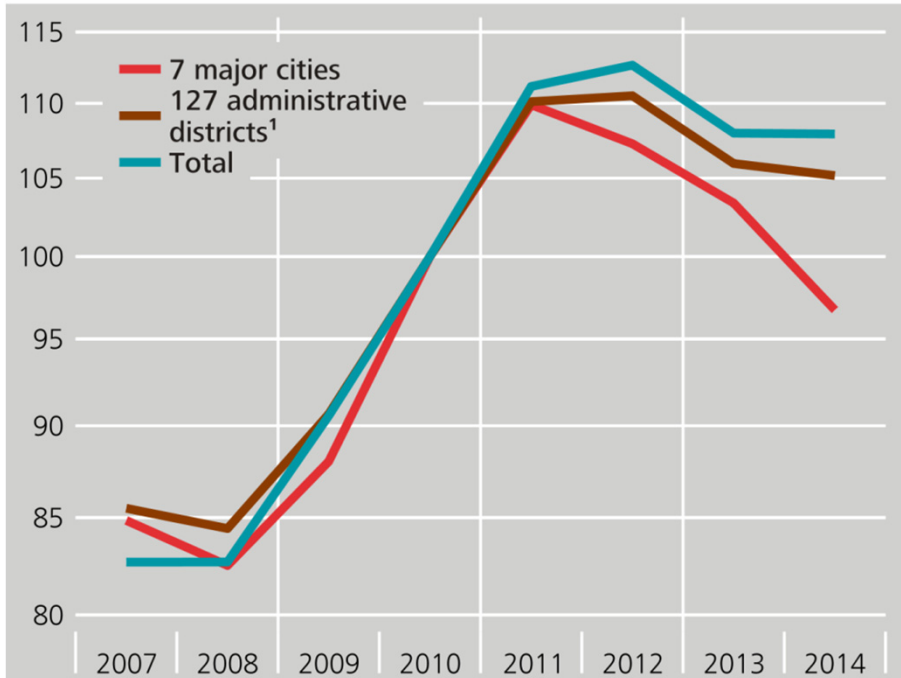
* In residential and non-residential buildings. Including construction work on existing buildings.

Deutsche Bundesbank

2 Nov 2015, 09:26:22, S3PR0112.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.

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2 Nov 2015, 09:27:40, S3PR0114.Chart

3. The Bundesbank's dashboard

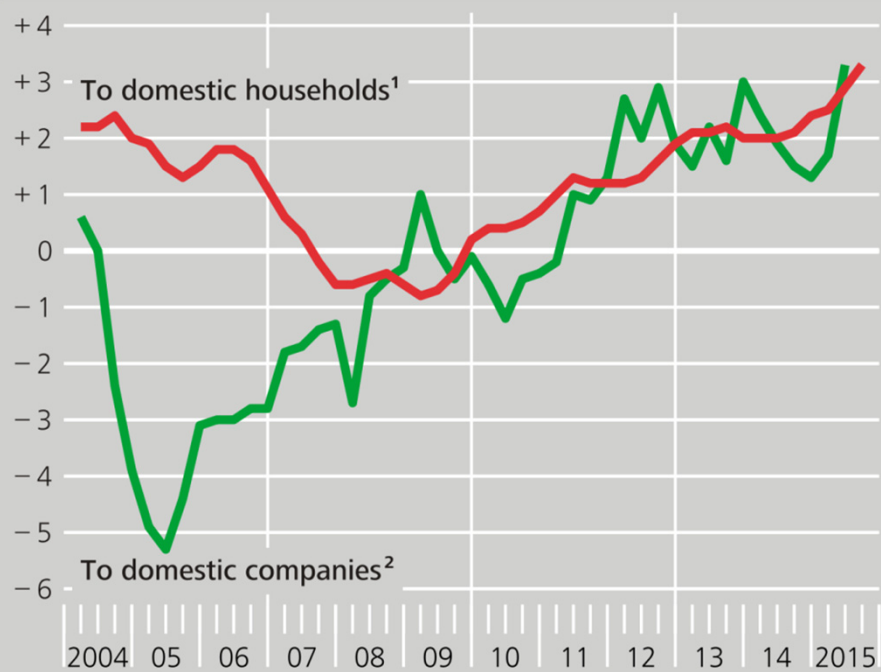
- Since 2010, **only the price indicators for Germany** demonstrated **strong upward movements**.
- The Bundesbank could **not**, on the basis of model-based analyses of the valuation situation in the housing market, detect **any notable deviations from fundamentally justified housing prices** throughout 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**.

3. The Bundesbank's dashboard

Despite the low interest rates, growth in mortgage loans is still sluggish.

Dynamics in domestic banks' loans for house purchase*

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

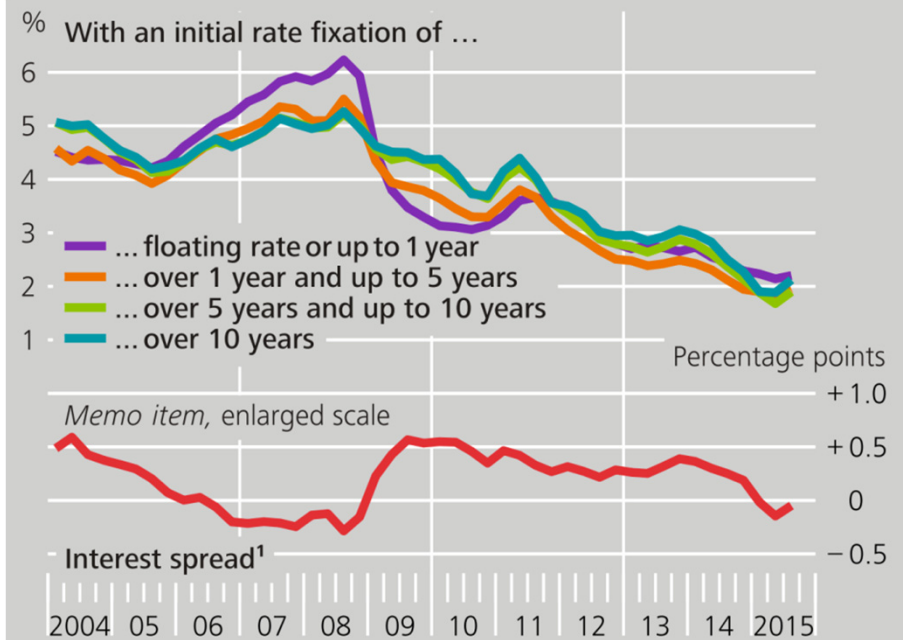


* Data for MFIs adjusted for statistical changes. **1** Including self-employed persons and sole traders. **2** Excluding self-employed persons and sole traders.

Deutsche Bundesbank

2 Nov 2015, 09:33:56, S3PR0120B.Chart

Interest rates on loans to households in Germany for house purchase*



* Data based on the monthly new business of the MFI interest rate statistics for secured and unsecured loans, excluding overdraft loans. **1** Calculated as the difference between the interest rate with an initial rate fixation of over 5 years and up to 10 years and the interest rate with an initial rate fixation of over 1 year and up to 5 years.

Deutsche Bundesbank

2 Nov 2015, 09:36:39, S3PR0123.Chart

3. The Bundesbank's dashboard

- 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.

3. The Bundesbank's dashboard

http://www.bundesbank.de/Navigation/EN/Statistics/Enterprises_and_households/System_of_indicators/system_of_indicators.html



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Homepage > Statistics > Enterprises and households > System of indicators for the German residential property market



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Orders received

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Prices

System of indicators for the German residential property market

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System of indicators for the German residential property market



Overview of system of indicators

(Source: Bundesbank)

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
01.09.2015 | 219 KB, PNG
- Price indices for rental housing in Germany
01.09.2015 | 185 KB, PNG
- Standard indicators to evaluate residential property prices in Germany
01.09.2015 | 253 KB, PNG
- Price-to-rent ratio for apartments in Germany
01.09.2015 | 172 KB, PNG
- Rents for apartments in Germany

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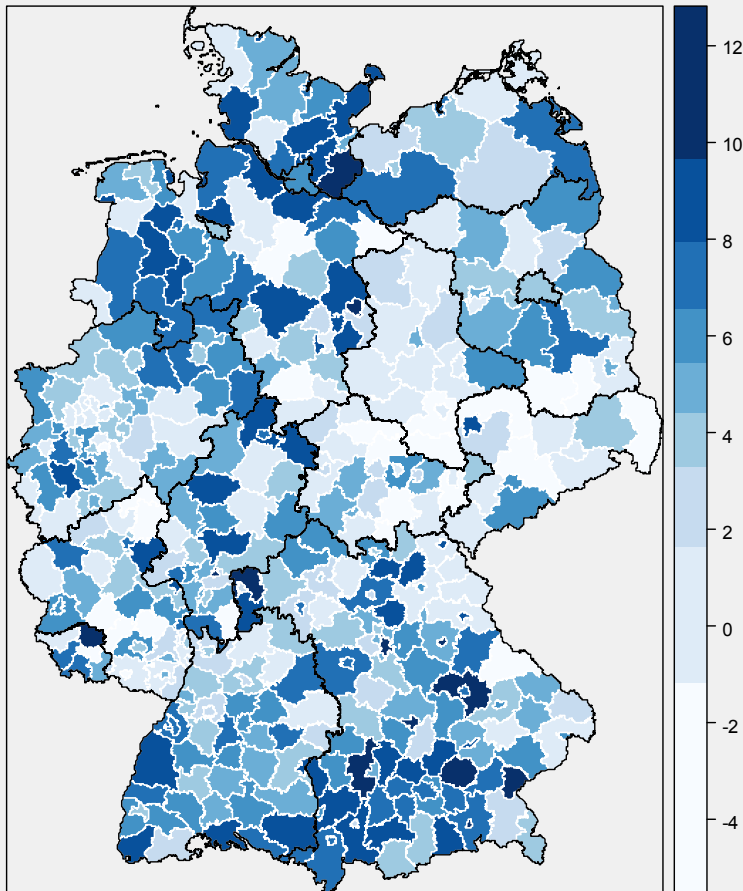
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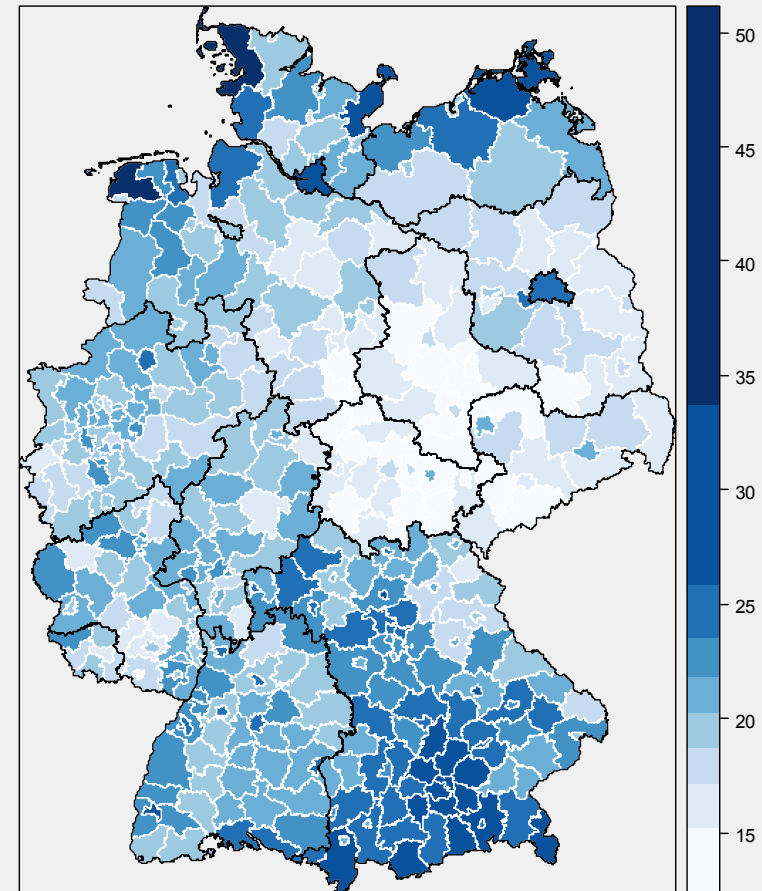
Show data basket

4. Spatial dependencies

Price changes from 2013 to 2014, in %



Price-to-rent ratio in 2014



Bundesbank calculations based on price data provided by bulwiengesa AG.

4. Spatial dependencies

- Although the **differences in price rises** between the regions **diminished** again in 2014, **waning price dynamics** did not reduce **existing gaps** between Southern and Northern Germany as well as Western and Eastern Germany.
- **Special effects in prices** are **attributable to tourism**, particularly at the North Sea and Baltic coasts.
- The **steep rise in prices** has so far been **largely confined to regions with an urban character**.
- 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**.

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