

The rationale behind a multi-indicator approach to real estate price analysis

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1) Introduction

What is a multi-indicator approach?

– Suite of price indices

- produced by a number of **public and private providers**
- using **separate data sources** and **various methodologies**
- differing in terms of **periodicity, timeliness, breakdowns, length** of time series, etc.
- satisfying the standards of **proper statistical measurement**

Alternative approach:

- **Definitive real estate price indices produced by official statistics.**
- This requires predominance over competitors regarding all relevant index properties.

1) Introduction

- Current situation in Germany:
 - Residential: non-dominating official price indices
 - Commercial: no official price indices
- The diversity of real estate prices has been documented in many studies, for example:
- Silver (2011 and 2014) pointed out the similarities and dissimilarities of multiple price indicators within countries and studied the implications for economic modelling.

1) Introduction – Dimensions of the multi-indicator approach

– The multi-indicator approach includes a data source and a policy use dimension.

Data source / Data provider

- Destatis
- vdp
- Bulwiengesa AG
- Hypoport
- JLL



The co-existence of indicators measuring the same or closely related phenomena reveal measurement uncertainty.

Analytical and policy use

- macroeconomic
- macroprudential
- banking supervision
- etc.



The diverse users' needs might call for more than one indicator to analyse real estate price developments.

2) Setting up the analyses

– Available data for the analyses:

Object types	residential	<i>of which</i>		multi-family	commercial	<i>of which</i>	
	real estate (RPPI)	houses	apartments	dwellings (MDPI)	real estate (CPPI)	office	retail
Coverage	<i>Germany</i>	<i>Germany</i>	<i>Germany</i>	<i>Germany / 127 towns and cities</i>	<i>Germany / 127 towns and cities</i>	<i>Germany / 127 towns and cities</i>	<i>Germany / 127 towns and cities</i>
Number of data providers	4	3	3	2	2	2	2
Coverage	<i>7 major cities</i>	<i>7 major cities</i>	<i>7 major cities</i>	<i>7 major cities</i>	<i>7 major cities / 6 major cities</i>	<i>7 major cities / 6 major cities</i>	<i>7 major cities / 6 major cities</i>
Number of data providers	2	2	2	2	2	2	2

– Measurement unit: annual percentage change of the price index

– Period under consideration: 2007 - 2017

3) Measurement uncertainty due to different data sources

– Qualitative measures:

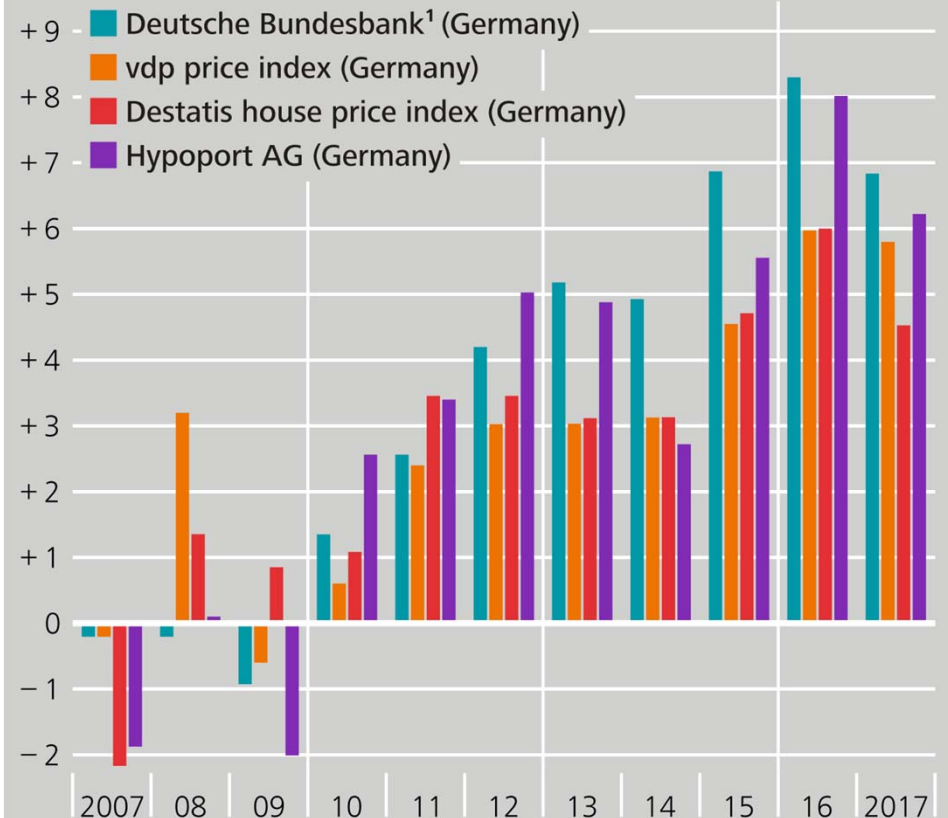
- **Uniform or mixed signals** with respect to the
 - ...direction of change
 - ...change in momentum

– Quantitative measures:

- **Mean deviation**
→ Measure of bias
- **Mean absolute deviation**
→ Measure of dispersion
- **(Root) mean squared deviation**
→ Measure of dispersion

Residential property prices in Germany

Year-on-year percentage change



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

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3a) Relative frequencies of uniform and mixed signals – Results

- High probability that indicators signal a uniform direction of change. Even higher probability for indicators which cover seven major cities.
- The probability of a uniform change in momentum is somewhat lower, but for most object types still high enough to provide valuable information.

as a percentage

event	residential real estate	<i>of which</i>		multi-family dwellings	commercial real estate	<i>of which</i>		
		houses	apartments			office	retail	
<i>A. Germany as a whole</i>								
uniform direction of change	82	91	73	91	82	100	55	
uniform change in momentum	60	60	40	70	60	70	90	
<i>B. seven largest German cities</i>								
uniform direction of change	100	91	100	100	82	100	100	
uniform change in momentum	50	50	40	60	70	80	30	

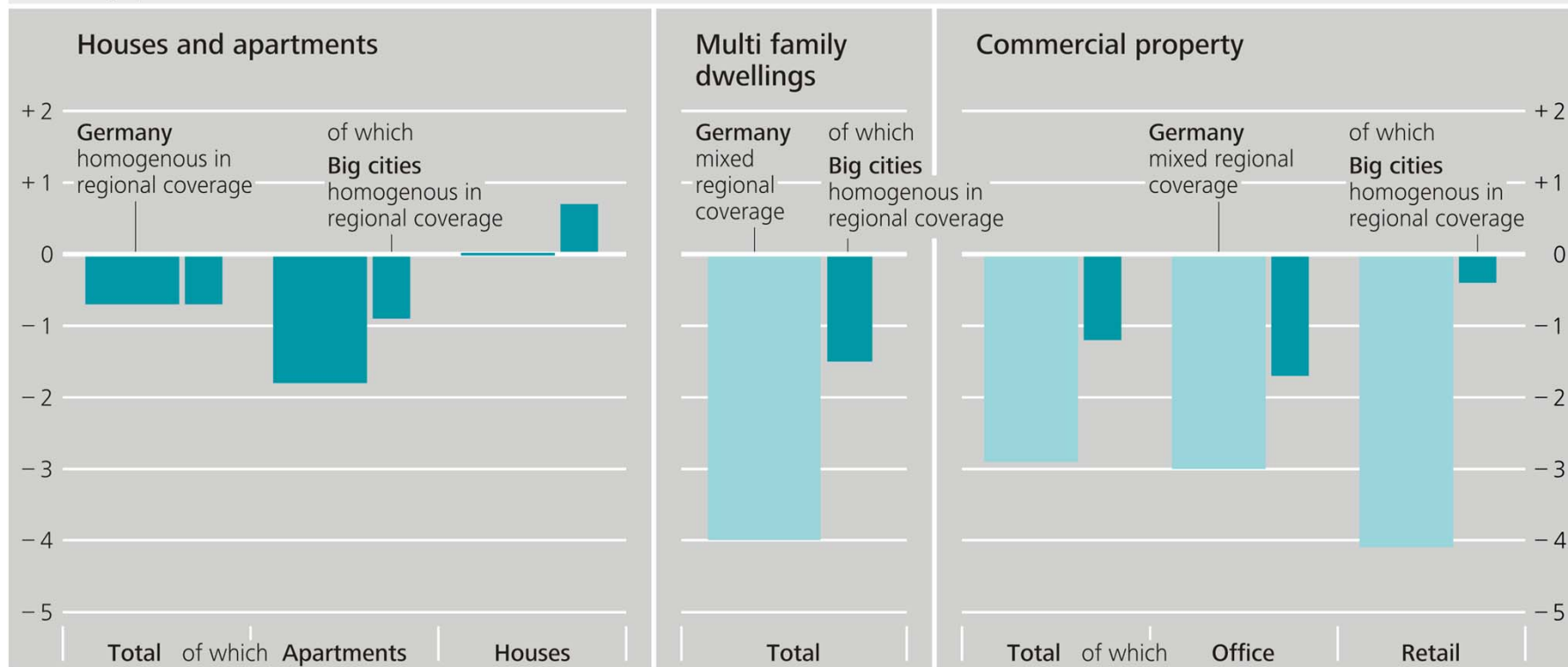
Time period: 2007-2017. Number of data providers considered: Four for houses and apartments as a whole, three for houses and apartments separately and two for multi family dwellings as well as for commercial property

3b) Measures of bias and dispersion – Mean deviation

- RPIs show price trends of similar strength.
- MDPIs and CPPIs suffer from coverage mismatch.

Mean deviation of annual price changes in real estate property*

Percentage points¹



* Number of data providers considered: Four for houses and apartments as a whole, three for houses and apartments separately, two for multi family dwellings and commercial property and two for big cities. bulwiengesa AG indicators serve as benchmark. ¹ Average over period from 2007 to 2017.

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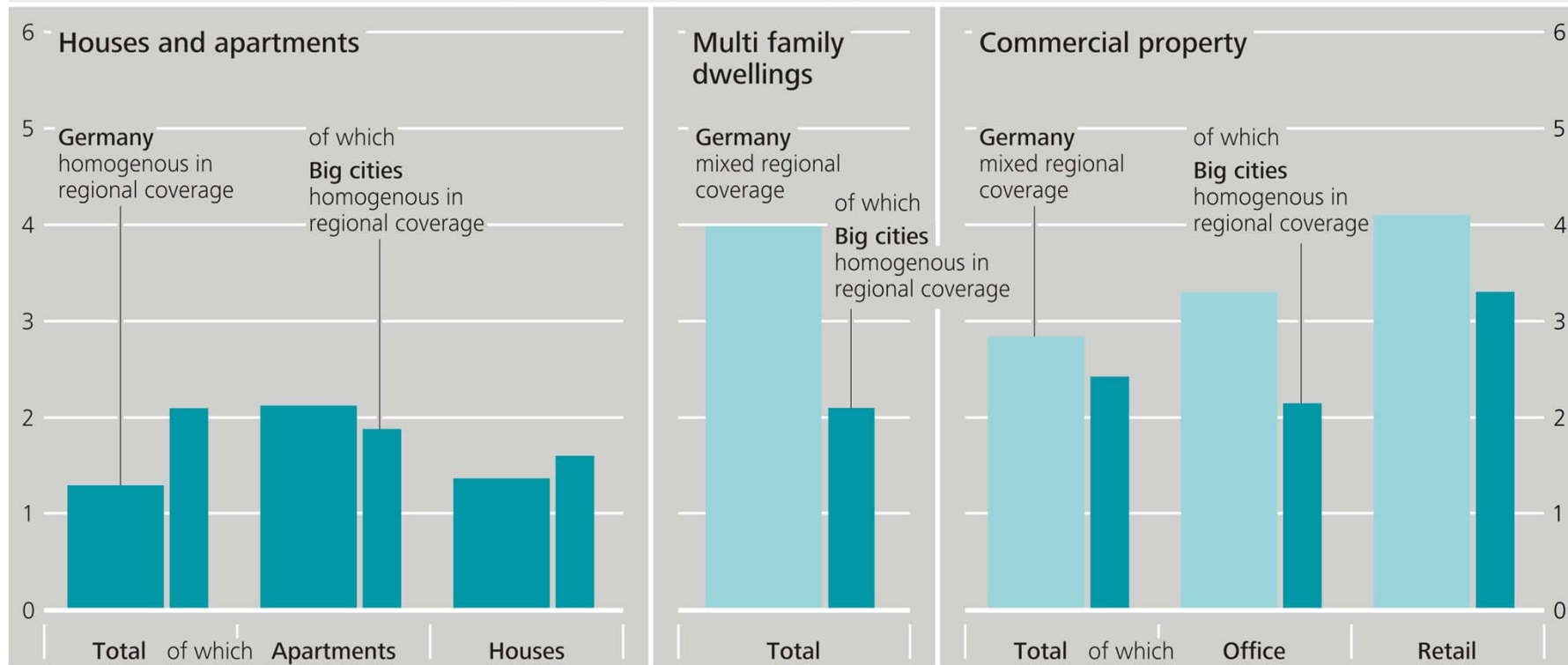
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3b) Measures of bias and dispersion – Mean absolute deviation

- Dispersion relatively small for RPPIs. (Comparison with price volatility)
- MDPI and CPPI more dispersed mainly because of coverage mismatch.

Mean absolute deviation of annual price changes in real estate property*

Mean absolute deviation from benchmark index percentage change (in percentage points)¹



* Number of data providers considered: Four for houses and apartments as a whole, three for houses and apartments separately, two for multi family dwellings and commercial property and two for big cities. bulwiengesa AG indicators serve as benchmark. ¹ Average over period from 2007 to 2017.

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3c) Disentangling data source and weighting effects – Idea

\hat{p} = price change	Data Source		
		vdp	bulwiengesa AG
Weighting	vdp	\hat{p}^{vdp}	
	BBK	\hat{p}^{hyb}	\hat{p}^{bul}

– Decomposing the difference of the price change of vdp data and bulwiengesa data:

$$\hat{p}^{vdp} - \hat{p}^{bul} = (\hat{p}^{vdp} - \hat{p}^{hyb}) + (\hat{p}^{hyb} - \hat{p}^{bul})$$

3c) Disentangling data source and weighting effects – Method

- **Mean Deviation:**

$$MD^{vdp,bul} = \frac{1}{T} \sum_{t=1}^T (\hat{p}_t^{vdp} - \hat{p}_t^{bul})$$

$$MD^{vdp,bul} = \underbrace{\frac{1}{T} \sum_{t=1}^T (\hat{p}_t^{vdp} - \hat{p}_t^{hyb})}_{\text{Weighting effect}} + \underbrace{\frac{1}{T} \sum_{t=1}^T (\hat{p}_t^{hyb} - \hat{p}_t^{bul})}_{\text{Source effect}}$$

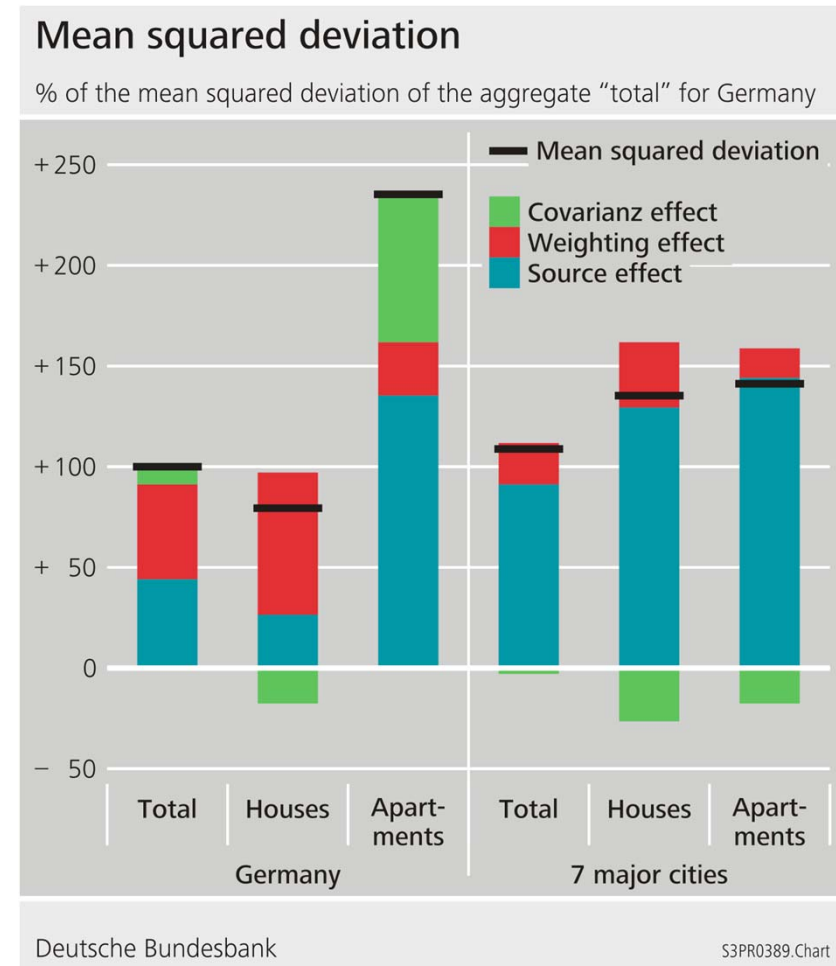
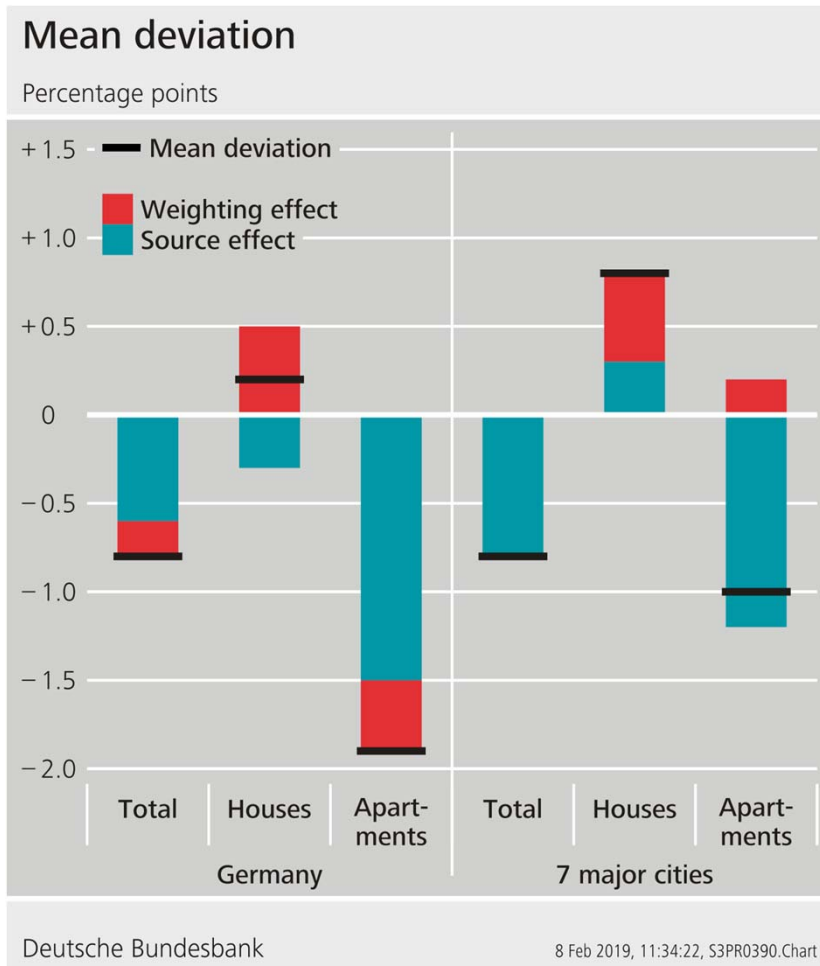
- **Mean squared deviation:**

$$MSD^{vdp,bul} = \underbrace{\frac{1}{T} \sum_{t=1}^T (\hat{p}_t^{vdp} - \hat{p}_t^{hyb})^2}_{\text{Weighting effect}} + \underbrace{\frac{1}{T} \sum_{t=1}^T (\hat{p}_t^{hyb} - \hat{p}_t^{bul})^2}_{\text{Source effect}} + \underbrace{\frac{2}{T} \sum_{t=1}^T (\hat{p}_t^{vdp} - \hat{p}_t^{hyb})(\hat{p}_t^{hyb} - \hat{p}_t^{bul})}_{\text{Covariance effect}}$$

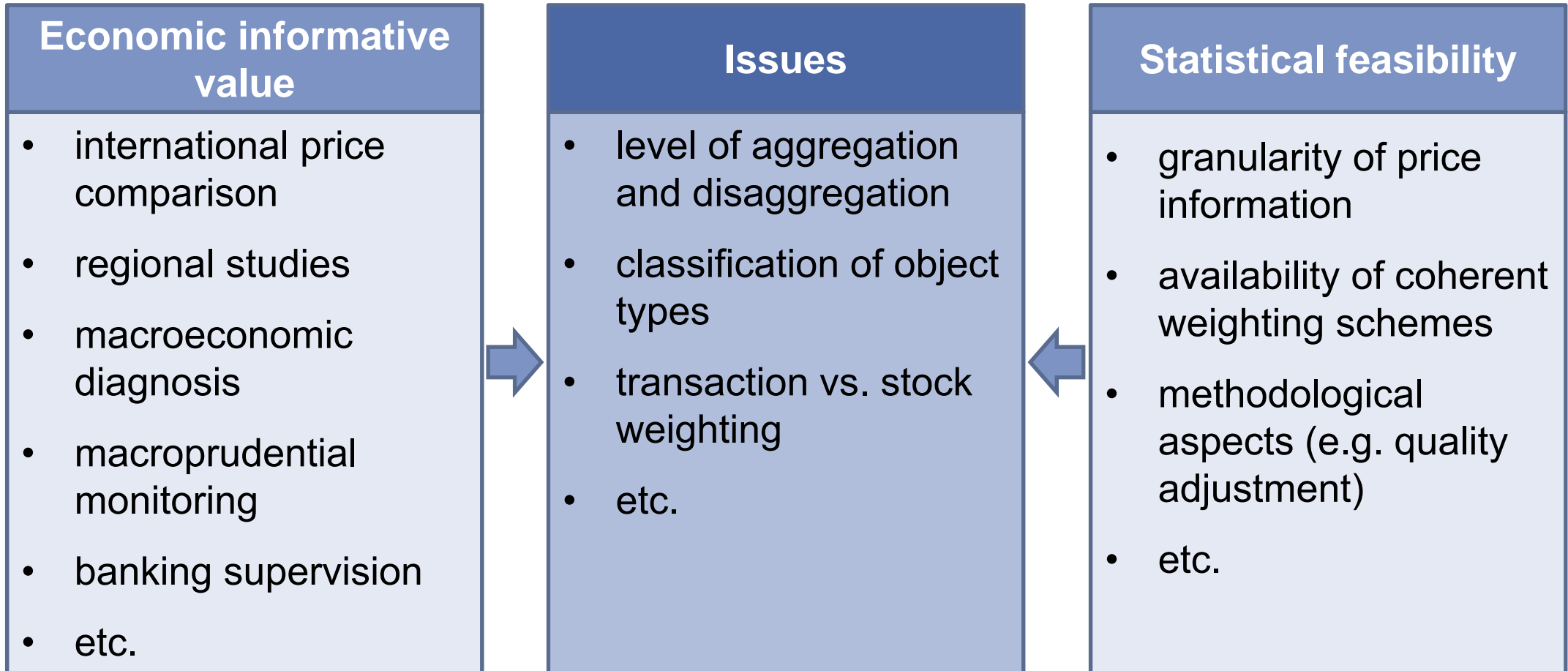
3c) Disentangling data source and weighting effects – Results

→ The source effect and the weighting effect are typically non-compensating.

→ The source effect mostly exceeds the weighting effect.



4) The multi-indicator approach and the users' needs



4) The multi-indicator approach and the users' needs – Outlook

definition	houses and apartments		multi-family dwellings		office	retail	
	owned by enterprises	owned by private households		owned by private households			owned by enterprises
		rented out	owner-occupied				
Credit Requirements Regulation (CRR)	residential				commercial		
ESRB recommendation on closing real estate data gaps	commercial	residential		commercial			
Broadest definition of commercial real estate in Eurostat (2017)	commercial		residential	commercial			

- Calculating price indices for residential and commercial property with respect to the several definitions.
- Validating the measurement uncertainty of these price indices.

5) Conclusion

- In the current stadium of imperfect data provision, a multi-indicator approach is a **robust strategy to distil the relevant information** for real estate analyses with a **contained risk of creating confusion**.
 - High probability that indicators send uniform signals.
 - Bias and dispersion are relatively small if coverage mismatch is absent.
 - Measurement uncertainty is due more to different data sources than weighting schemes.
- Regarding the **data source dimension** of the multi-indicator approach, official statistics is expected to provide dominant RPPIs. For CPPIs and MDPIs a multi-indicator approach is likely to persist due to the lack of official indicators.
- With respect to the **policy use dimension**, a multi-indicator approach is useful to consider different definitions for real estate, different weighting schemes and regional breakdowns.