Real Estate Price Index Measurement: Availability, Importance, and New Developments

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Real Estate Price Indexes

- **Residential property price indexes: the hard area**
  - **Problems:**
    - Infrequent transactions on heterogeneous properties.
    - Generally secondary data sources: coverage, methodology and other tradeoffs.
  - **Achievements.**
  - **Some country illustrations.**
  - **Does measurement matter?**
- **Commercial property price indexes: the really hard area**

Coverage:

Geographical (capital, national, cities)

Type (sfh, apartment, terrace)

Vintage(existing, new)

Cash/loan limit

Residency

Quality-mix adjustment:

Hedonic characteristics

Repeat sales

Mix-adjusted

SPAR

Land registry

Lender

Realtor/Estate agent

Buyer

Builders (new)

Price:

Asking, transaction, appraisal

Weight:

Stock/transaction

Private/administrative data:

Timeliness

Reliability/transparency/reputational risk

Longevity

Achievements

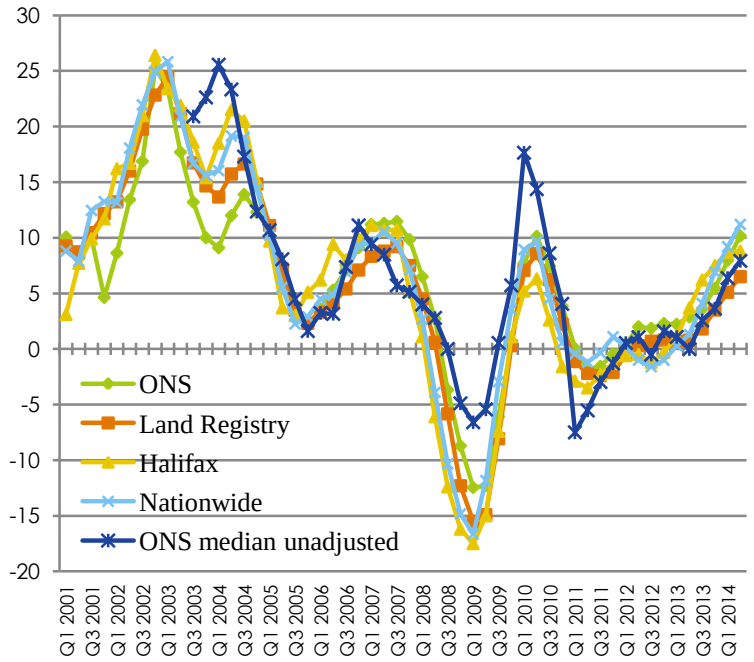
- **Handbook on Residential Property Prices Indices (RPPIs), 2013:** http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/methodology/hps/rppi_handbook

- **Data dissemination:**
  - IMF's Global Housing Watch
  - Bank for International Settlements' (BIS) Residential Property Price Statistics
  - Others include: Eurostat; OECD; ECB; Federal Reserve Bank of Dallas; Havers

- **Encouragement to compile HPIs:**
  - Included as Recommendation 19 of the IMF/FSB G-20 Data Gaps Initiative (DGI);
  - Prescribed: within the list of IMF Financial Soundness Indicators (FSIs)
  - Adherence to IMF's new tier of data standards, the Special Data Dissemination Standard (SDDS) plus.

Country illustrations: UK - Feast

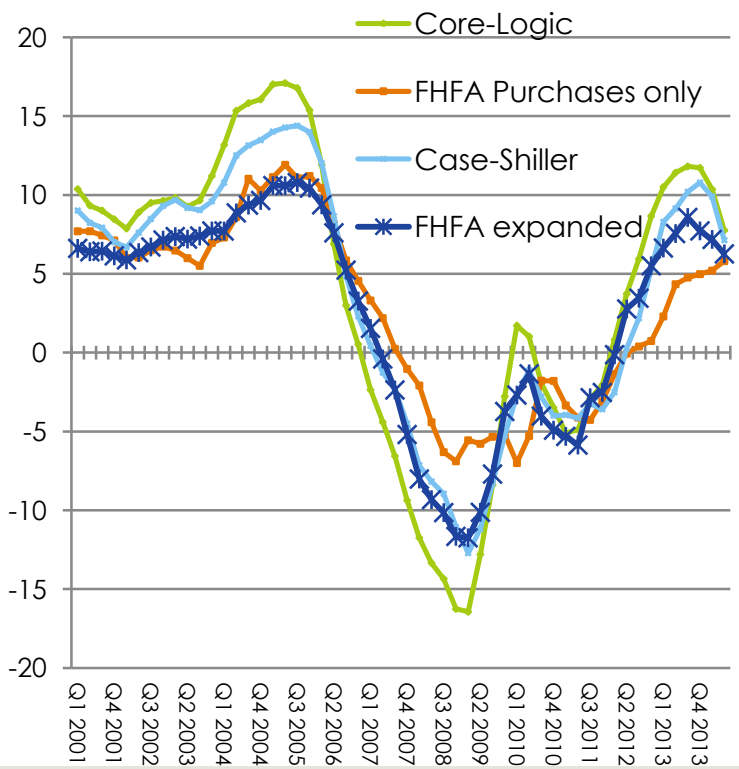
UK (E&W): house price indexes, annual quarterly rates



- Also: LSL Acadata HPI (Land registry) and Rightmove (realtor) and two expert opinion survey.
- 2008Q4 coming into the trough
  - - 8.7 (ONS)
  - -12.3 (Land registry)
  - -16.2 (Halifax)
  - -14.8 (Nationwide)
  - - 4.9 (ONS median unadjusted).
- Methodology and data source matter.

Country illustrations: US - Repeat sales HPIs:

United States: house price indexes, annual quarterly rates



Repeat sales

- CoreLogic
- Case-Shiller
- Federal Housing Finance Agency (FHFA) purchases only
- FHFA expanded-data

- How repeat sales applied matters: FHFA more muted down-weighting than CS: 2.67 percentage points (absolute difference from CS in price change 2006Q3-2007Q3) Leventis (2008);
- Coverage matters. FHFA "extended data" and "purchases only": 4.6 percentage points of difference in 2008Q4.

Country illustrations: Making your own luck

France: Notaires-INSEE index: apartment and house prices

- Monopolistic network of notaries who draw up deeds and collect stamp duty. Estimated 4,600 notary practices (2003).
- "Notaires-INSEE" 1983 apartments in Paris – not mix-adjusted
- Separate hedonic regressions for apartments and houses (Paris and Provinces) by 300 zones comparing transaction prices of fixed bundles of characteristics. Hedonic coefficients updated every 2 years and weights chain-linked.

UK: ONS Mix-adjusted HPI

- Council of Mortgage Lenders' survey.
- 1969: 5% sample of mortgage transactions of "…a number of building societies."
- From 1993: building societies to all mortgage lenders;1993-2002 monthly sample 2—3,000.
- 2003: 5% sample each lender increased to 100%.
- 2012: average 27,000 monthly transactions; 75-80% of mortgage market; excludes cash sales.
- Pre-2003 hedonic mix-adjusted potential 300 cells; post-2003: 100,000 cells; chain-linked.

More formally: does HPI measurement matter?

- **Take quarterly HPIs** from 2005:Q1 to 2010:Q1 for 24 countries, 157 series. Regress on:
- ….measurement and coverage explanatory variables.
- Use a fixed country and time effect panel estimator.

Coverage

- **Age (benchmark: all residences)**
  - New: newly-built residences only;
  - Xist: existing residences excl newly-built.
- **GeoCoverage (benchmark: national)**
  - Capital: major city;
  - Urban: urban areas;
  - BCities: big cities, say population exceeds 100,000;
  - Rural: rural areas
- **Type (benchmark: single family houses and apartments)**
  - Sfh: single family houses
  - Apt: apartments

Methodology

- **Quality-mix adjustment (benchmark: unit price)**
  - Hed: hedonic adjustment;
  - SqM: price per square metre;
  - SPAR: sale price appraisal ratio;
  - MixAdjust: mix adjust (stratify)
  - Repeat: repeat purchase
- **Price (benchmarked on transaction)**
  - Ask: Asking price
  - Appr: Appraisal price (tax)
- **Fixed/Changing Weight (benchmark: fixed base)**
  - Chain: chained annual
  - Roll: rolling period
  - Unw: unweighted
- **Weight (benchmark: transactions)**
  - Wstock : stock of dwellings
- **Weight –higher level (benchmark: value)**
  - Wquanity: quantity shares
  - Wprice: relative base price
  - Wsqm: relative size (sq. m.)
  - Wpop: population shares
- **Aggregation (benchmark: geometric)**
  - Arith: Arithmetic

Table 2, Fit of measurement variables in moving window regression: time varying

RbarSq including: 11/20/2014

	Time; Country; Measurement	Country; Measurement	Measurement	Measurement/Coverage Coverage	Measurement/Coverage Methodology
05 Q1	0.322	0.211	0.102	0.015	0.079
05 Q2	0.253	0.242	0.120	0.016	0.099
05 Q3	0.282	0.273	0.126	0.023	0.099
05 Q4	0.330	0.324	0.148	0.083	0.114
06 Q1	0.365	0.358	0.120	0.025	0.100
06 Q2	0.416	0.409	0.103	0.004	0.090
06 Q3	0.347	0.343	0.085	0.003	0.081
06 Q4	0.286	0.282	0.070	0.003	0.069
07 Q1	0.266	0.265	0.077	0.009	0.075
07 Q2	0.182	0.177	0.100	0.051	0.095
07 Q3	0.181	0.175	0.110	0.066	0.093
07 Q4	0.193	0.193	0.110	0.074	0.081
08 Q1	0.264	0.254	0.153	0.101	0.116
08 Q2	0.303	0.281	0.195	0.129	0.146
08 Q3	0.343	0.324	0.234	0.128	0.194
08 Q4	**0.358**	**0.342**	**0.216**	**0.114**	**0.164**
09 Q1	**0.405**	**0.369**	**0.228**	**0.118**	**0.174**
09 Q2	**0.445**	**0.408**	**0.267**	**0.158**	**0.211**
09 Q3	**0.456**	**0.444**	**0.257**	**0.137**	**0.194**
09 Q4	**0.401**	**0.397**	**0.175**	**0.068**	**0.087**
10 Q1*	0.413	0.415	0.099	0.020	0.051

Measurement matters most when it matters, as we go into and during recessions

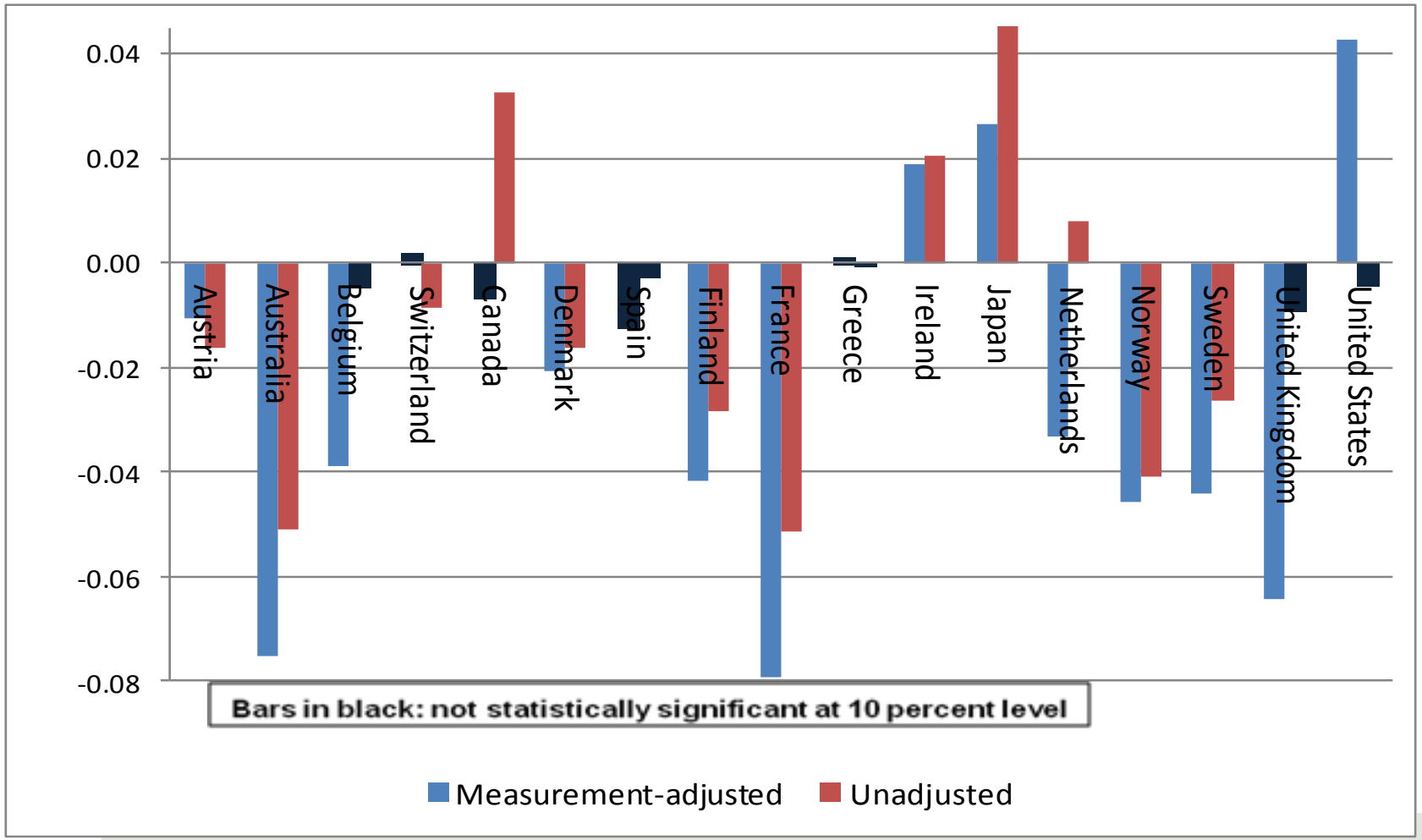
Does it matter in modeling?

- Deniz Igan and Prakash Loungani (2010)
- Illustrative model applied as they did (specification, dynamics, estimator) for both our measurement-adjusted and unadjusted HPIs.
- Rationale in Igan and Loungani.

Table 4, Pooled regression results for house price indexes

Dependent variable	House price index, log quarter-on-quarter change:				
				Excluding: Affordability-lagged	
	Igan and Loungani (2010)	Measurement-adjusted estimates	Unadjusted estimates	Measurement-adjusted estimates	Unadjusted estimates
Affordability, lagged	-0.0517*** (0.0158)	-0.291* (0.1772)	-0.174 (0.1201)	-0.085** (0.037)	-0.077*** (0.0271)
Income per capita, change	0.431*** (0.0684)	0.392*** (0.1516)	0.519*** (0.0917)	0.395* 0.142	0.520*** (0.0919)
Working-age pop, change	0.999*** (0.1970)	0.735* 0.3941	0.494** (0.2354)	0.754* (0.411)	0.503** (0.2438)
Stock prices, change	**0.0044* (0.0026)**	**-0.017** (0.0086)**	**-0.007 (0.0071)**	**-0.016*** (0.010)**	**-0.00604 (0.0077)**
Credit, change	0.0190*** (0.0053)	0.165*** (0.0268)	0.191*** (0.0253)	0.156** (0.031)	0.186*** (0.0273)
Short-term interest rate	-0.0009** (0.0004)	-0.010** (0.0046)	-0.006** (0.0025)	-0.010 (0.005)	-0.006*** (0.0025)
Long-term interest rate	**-0.0006 (0.0004)**	**0.000001*** 0.0000**	**0.000 (0.0000)**	**0.000006*** (0.0000)**	**0.000002 (0.0000)**
Affordability, lag, squared	-0.0019* (0.0012)	-0.014 (0.0121)	-0.007 (0.0085)		
Construction costs, change	0.129*** (0.0366)	0.320* (0.1671)	0.312* (0.1709)	0.285* (0.172)	0.295* (0.1738)
Constant	-0.243*** (0.0554)	-1.267** (0.6384)	-0.838** (0.4232)	-0.553** (0.247)	-0.504*** (0.1796)

Country-specific parameter estimates for stock prices



Commercial property price indices: really hard

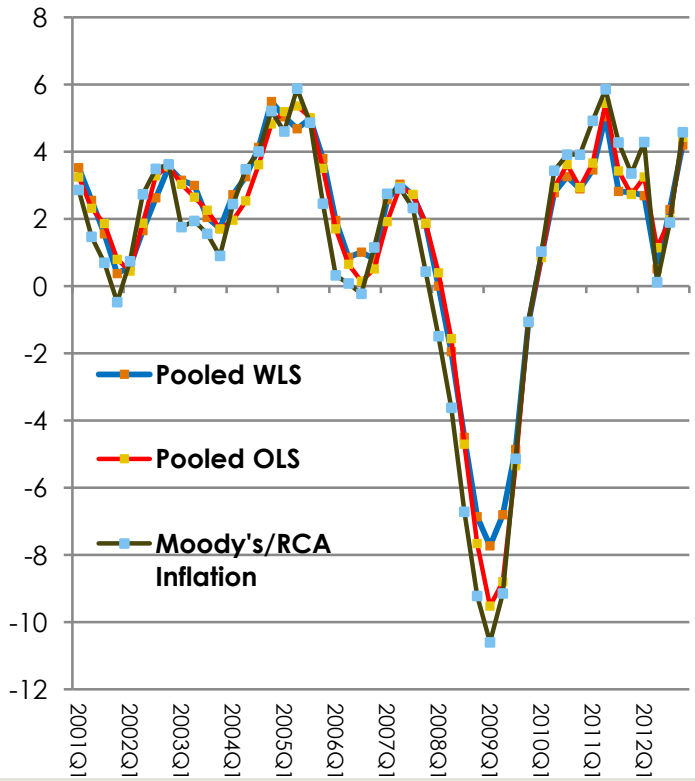
- Highly heterogeneous and very few transactions
- Appraisal data limitations for CPPI measurement
- Advantages to aggregating within regression framework.
  - Quality adjustment: hedonic/repeat sales
  - Confidence intervals
  - Inclusion of other variables – conditioning
  - **More efficient estimators for sparse data;** *use counts data;*
- How to aggregate in regression framework
  - **Get rid of omitted variable bias and use for weights**

Data

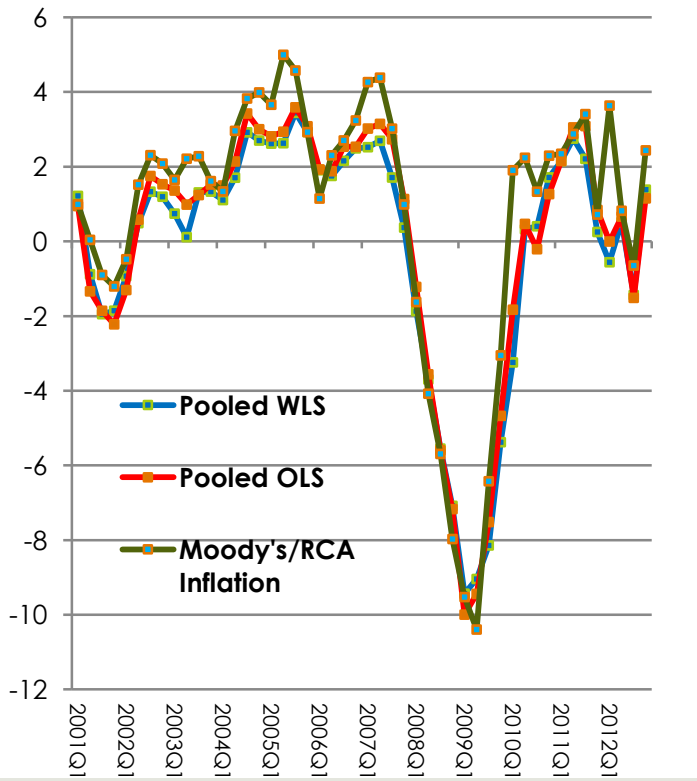
- Panel data of transaction-based US CPPI quarterly series from 2000:Q4 to 2012:Q4 by 34 metro areas for each of "apartments" and "core commercial properties."
- Each metro area CPPI estimated using repeat sales method.
- Data provided by Real Capital Analytics (RCA) – *acknowledge help*.
- Silver and Graf (2014)

OLS and WLS estimates

US apartment property price inflation: q-on-q rates



US core commercial property price inflation: q-on-q rates



Two way fixed effect spatial autoregressive model: an opportunity to use weights in regression aggregation

$$\mathbf{Y}_{n,t} = \rho \mathbf{W}_n \mathbf{Y}_{n,t} + \mathbf{Z}_{\mu} \boldsymbol{\mu}_n + \mathbf{Z}_{\gamma} \boldsymbol{\gamma}_t + \mathbf{V}_{n,t} \boldsymbol{\mu}_n \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where $\mathbf{W}_n$ is a $n \times n$ row-standardized spatial physical proximity weight matrix and ρ the estimated spatial autoregressive parameter .

The matrix of partial derivatives of $\mathbf{Y}_{n,t}$ with respect to a change in a dummy time variable, is:

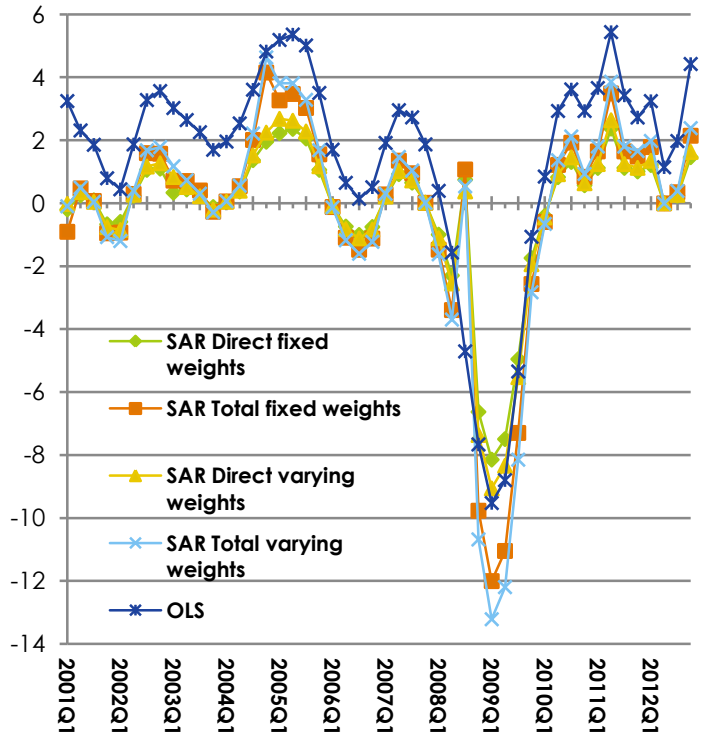
$$\frac{\partial \mathbf{Y}_{n,t}}{\partial \mathbf{Z}_{\gamma}} = \boldsymbol{\gamma}_t \left(\mathbf{I}_{\mathbf{n}} - \rho \mathbf{W}_n \right)^{-1} = \mathbf{B}_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The spatial direct effects are not $\boldsymbol{\gamma}_t$ but are given for each area *n* by the diagonal elements of $\mathbf{B}_t$.

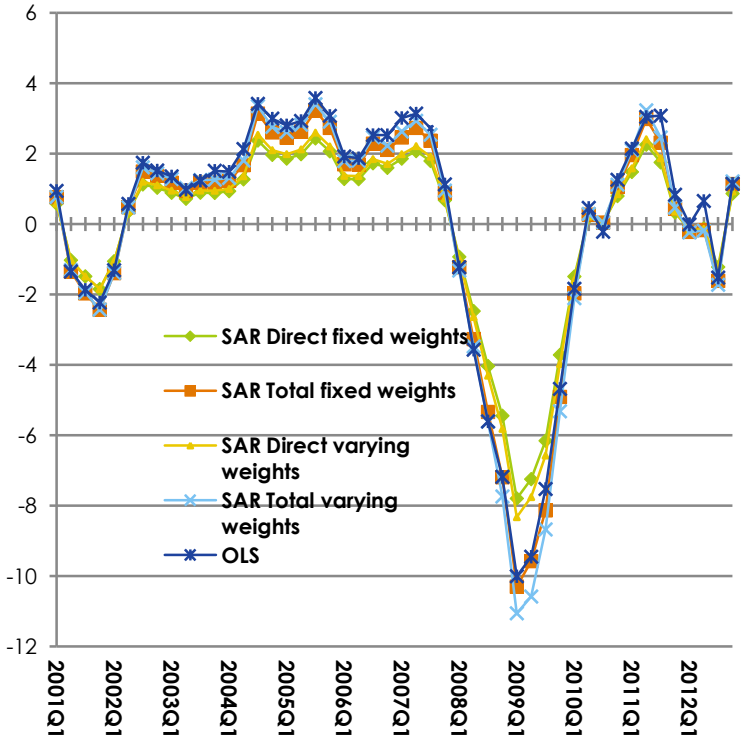
In fixing bias, we also found an opportunity to weight the aggregation.

Fixed and varying (chained) weights

Apartments



Core commercial



Transaction-data and appraisal-based price indexes

- Both need further research and data development to serve as CPPI in countries where transaction data are sparse