

*Discussion of:*  
**“Real Estate Price Index Measurement:  
Availability, Importance, and New  
Developments” By Mick Silver  
& of: “Reconsidering the Purpose and Function  
of Real Estate Price Indices” By Robert Shiller**

David Geltner

MIT Center for Real Estate

Massachusetts Institute of Technology

Second IMF Statistical Forum:

Statistics for Policymaking—Identifying Macroeconomic  
and Financial Vulnerabilities

Washington, DC

November, 18–19, 2014

In Dubai, they're convincing themselves not to be worried...



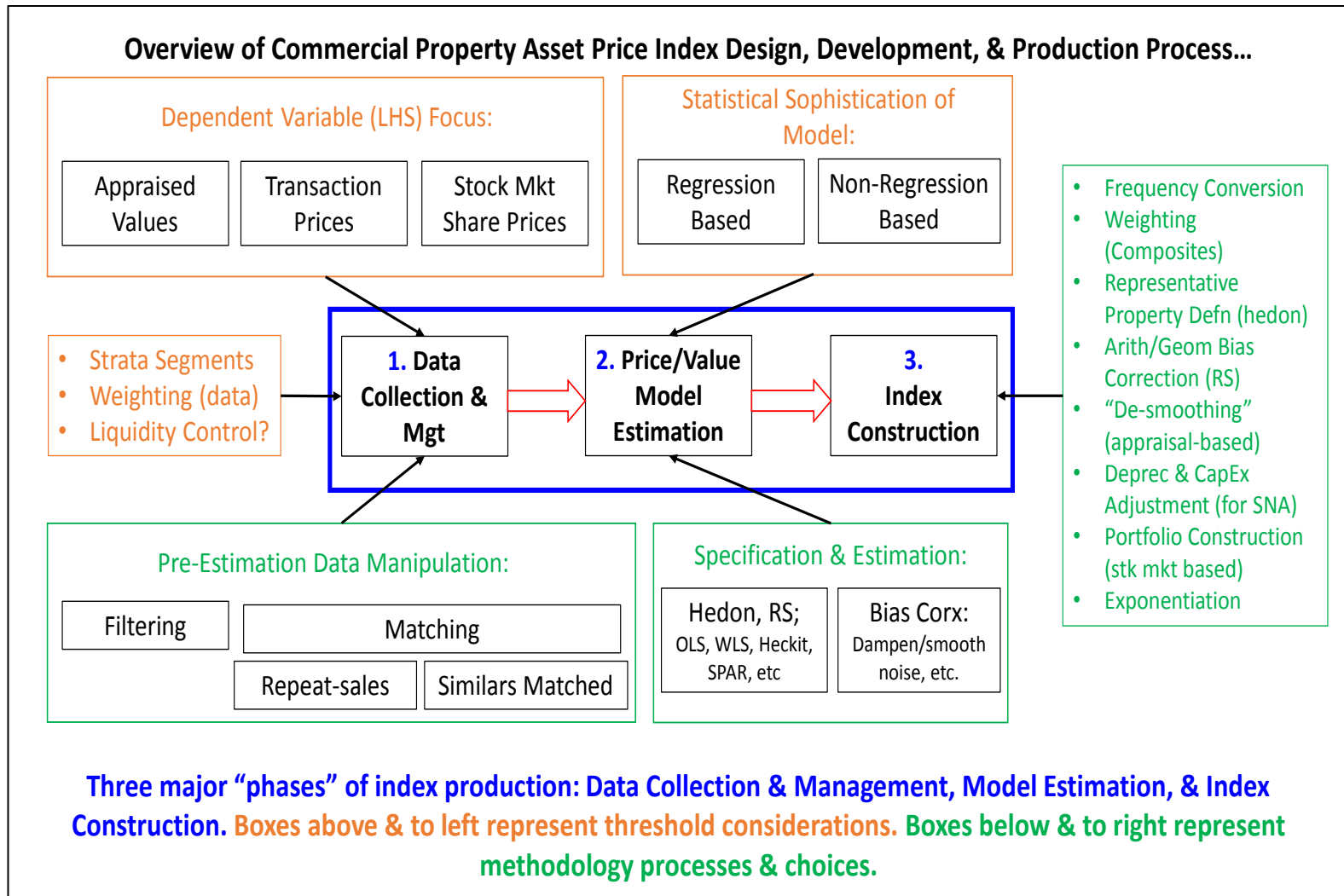
But maybe some good price indices indicating where prices currently are compared to where they have been in the past would be more helpful...

*How shall we develop such indices for commercial property?...*

# Topics:

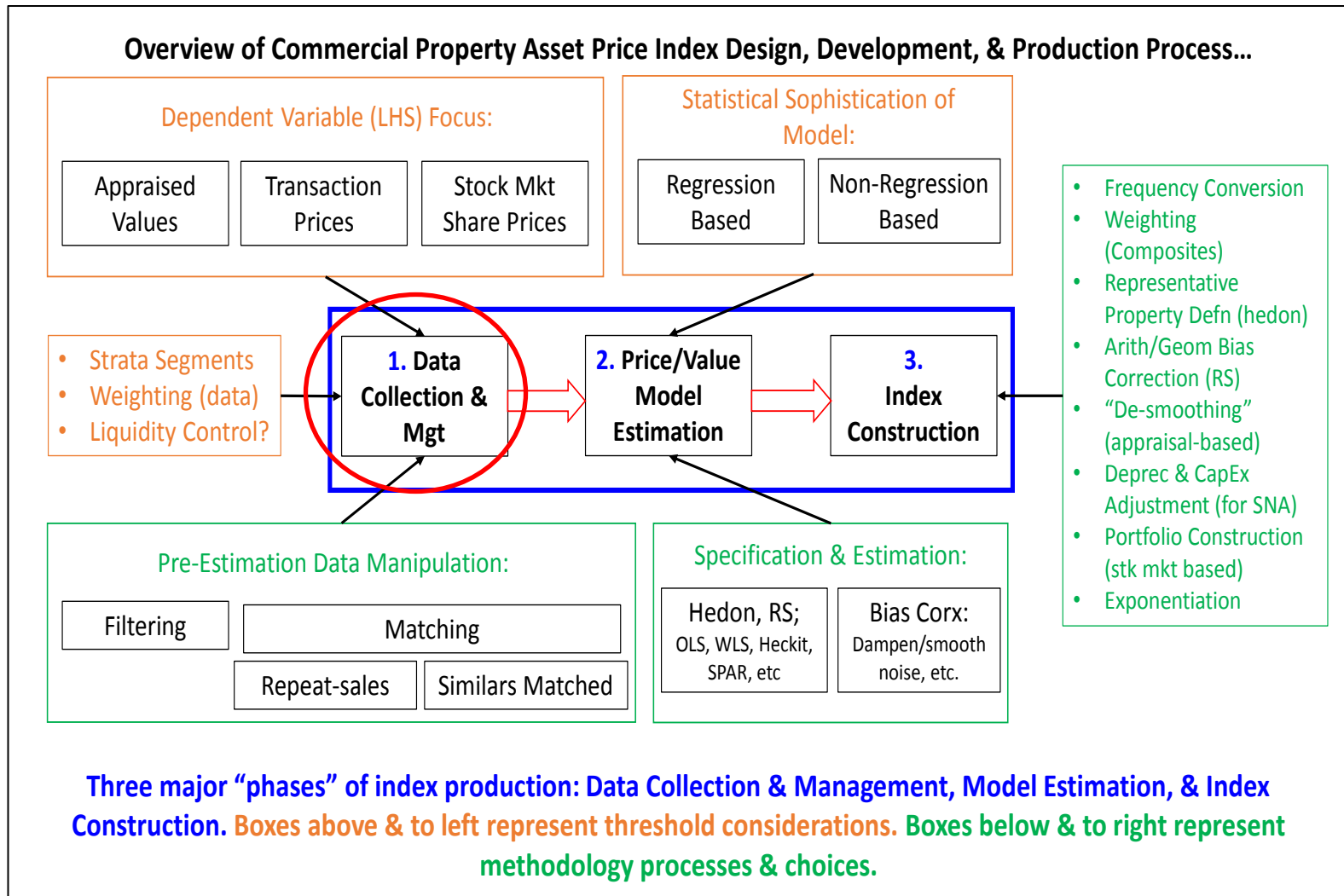
1. Mick Silver: Addressing the problem of *Scarce Data...*
2. Robert Shiller: Should improving our measurement of prices have the form of setting up new *markets rather than just improving our econometrics?*

# Three major phases of index production: Pre-estimation, Estimation, Post-estimation...



Scarce data can be addressed in any/all of these phases...

# Pre-estimation: Data manipulation, such as matched pseudo-pairs (McMillen, Guo et al, ...)

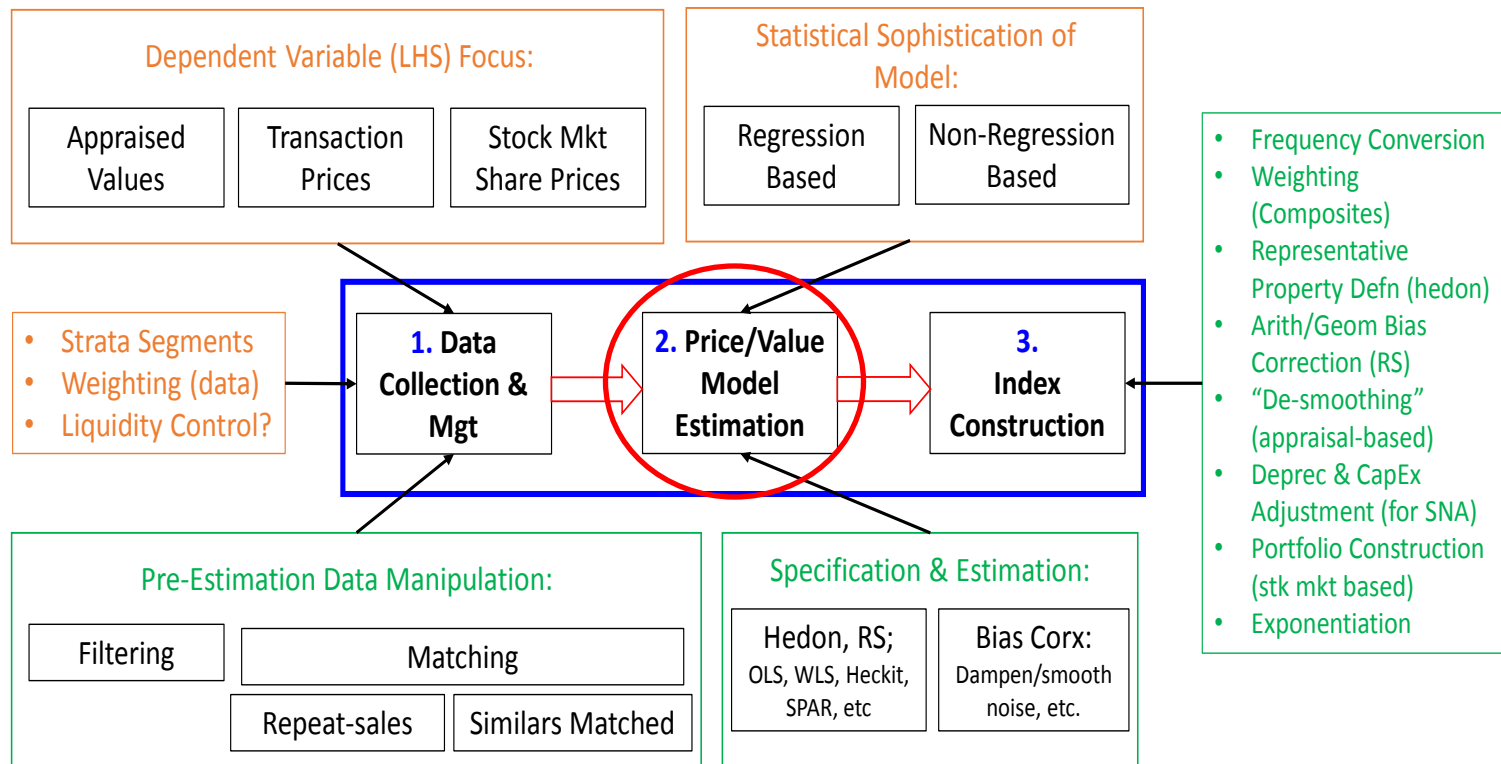


Scarce data can be addressed in any/all of these phases...

# Estimation: Bayesian techniques, Filters, Hierarchical fitting, SAR (Goetzmann, Francke, Chegut & Eichholtz, ...)



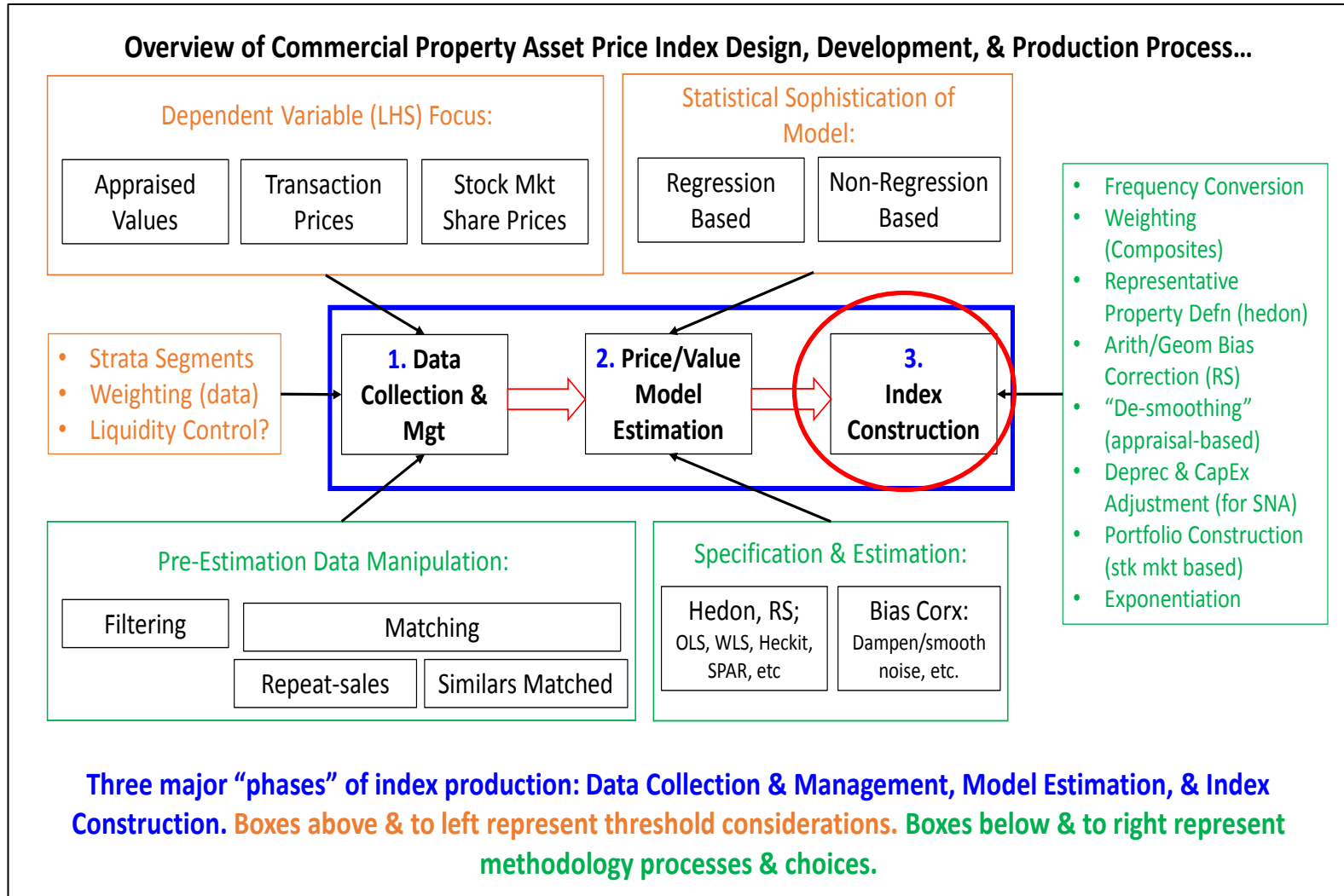
Overview of Commercial Property Asset Price Index Design, Development, & Production Process...



Three major "phases" of index production: Data Collection & Management, Model Estimation, & Index Construction. Boxes above & to left represent threshold considerations. Boxes below & to right represent methodology processes & choices.

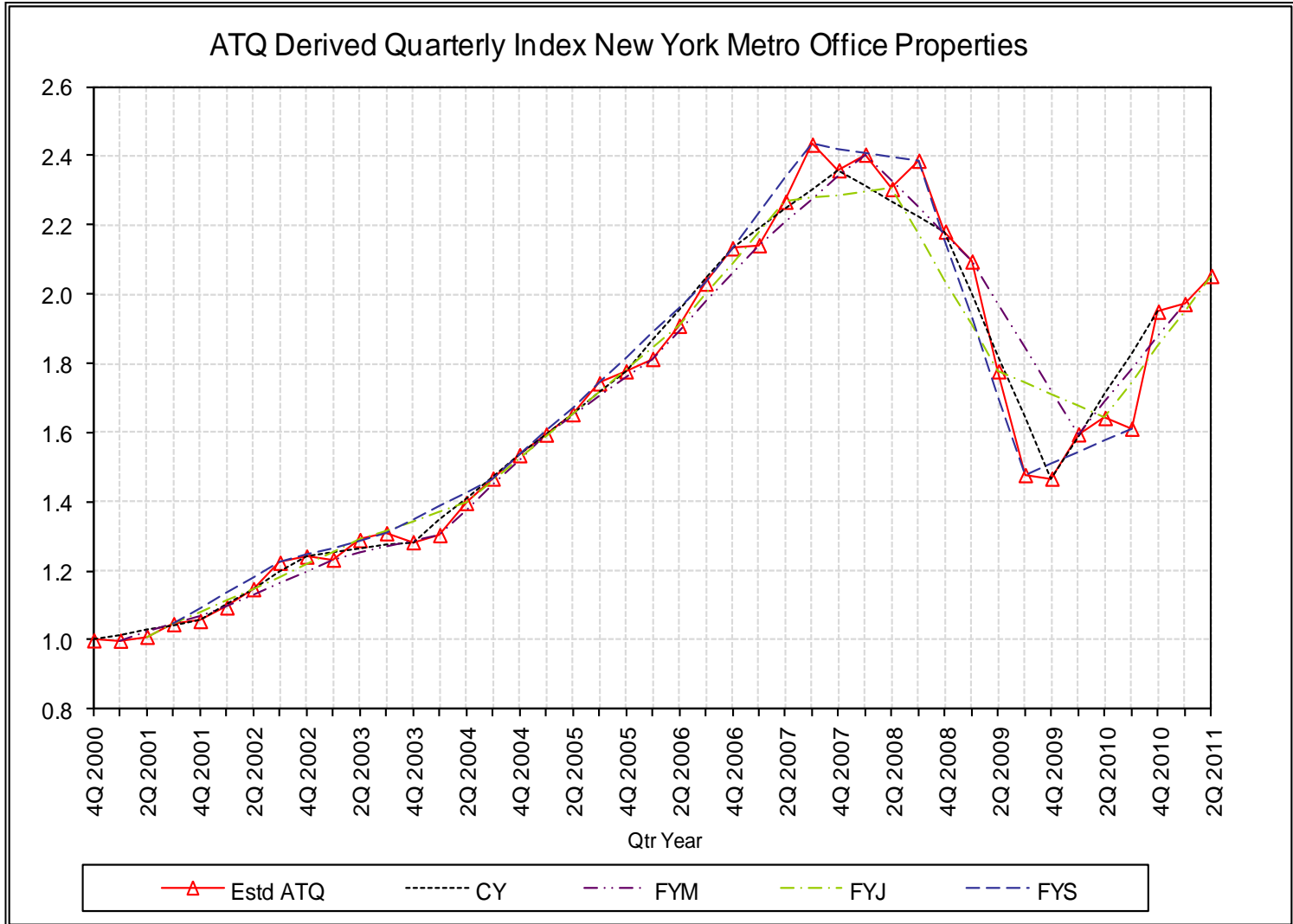
Scarce data can be addressed in any/all of these phases...

# Post-estimation: Frequency conversion, Smoothing (Bokhari-Geltner, Hodrick-Prescott, ...)



**Scarce data can be addressed in any/all of these phases...  
Procedures not mutually exclusive, can be complementary.**

# Illustration of 2SFC Post-estimation frequency conversion procedure, Annual-to-Quarterly, quadruples effective sample size for quarterly index, can be applied to any type of index (BLMBE – Best Linear Minimum Bias Estimator)...





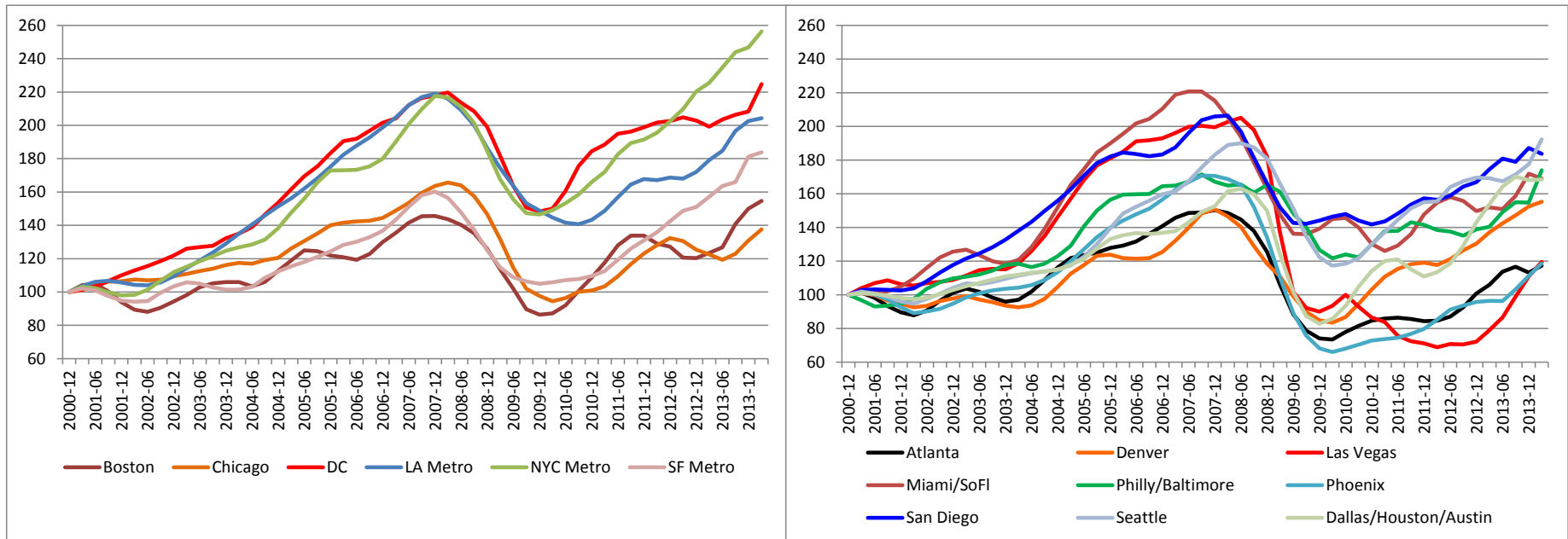
Highly “granular” indices possible using 2SFC:

**Repeat-Sales** Transaction Price Based Indices of Commercial Property

We find approx 500 RS obs/decade is usually sufficient

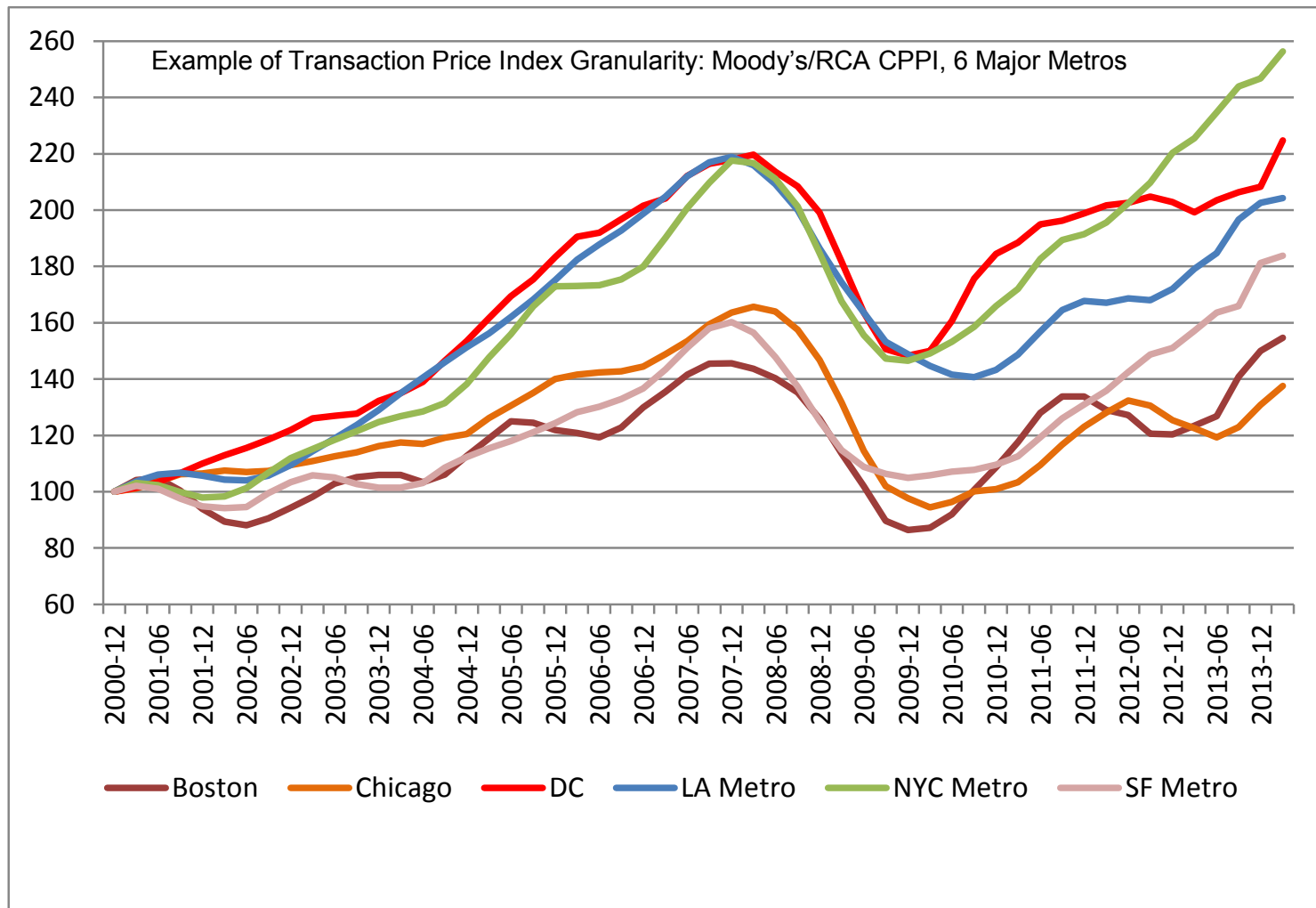
Only scarce data treatment is in 3<sup>rd</sup> phase (post-estimation)...

“RCA CPPI”: Metro-Level CRE Price Indices



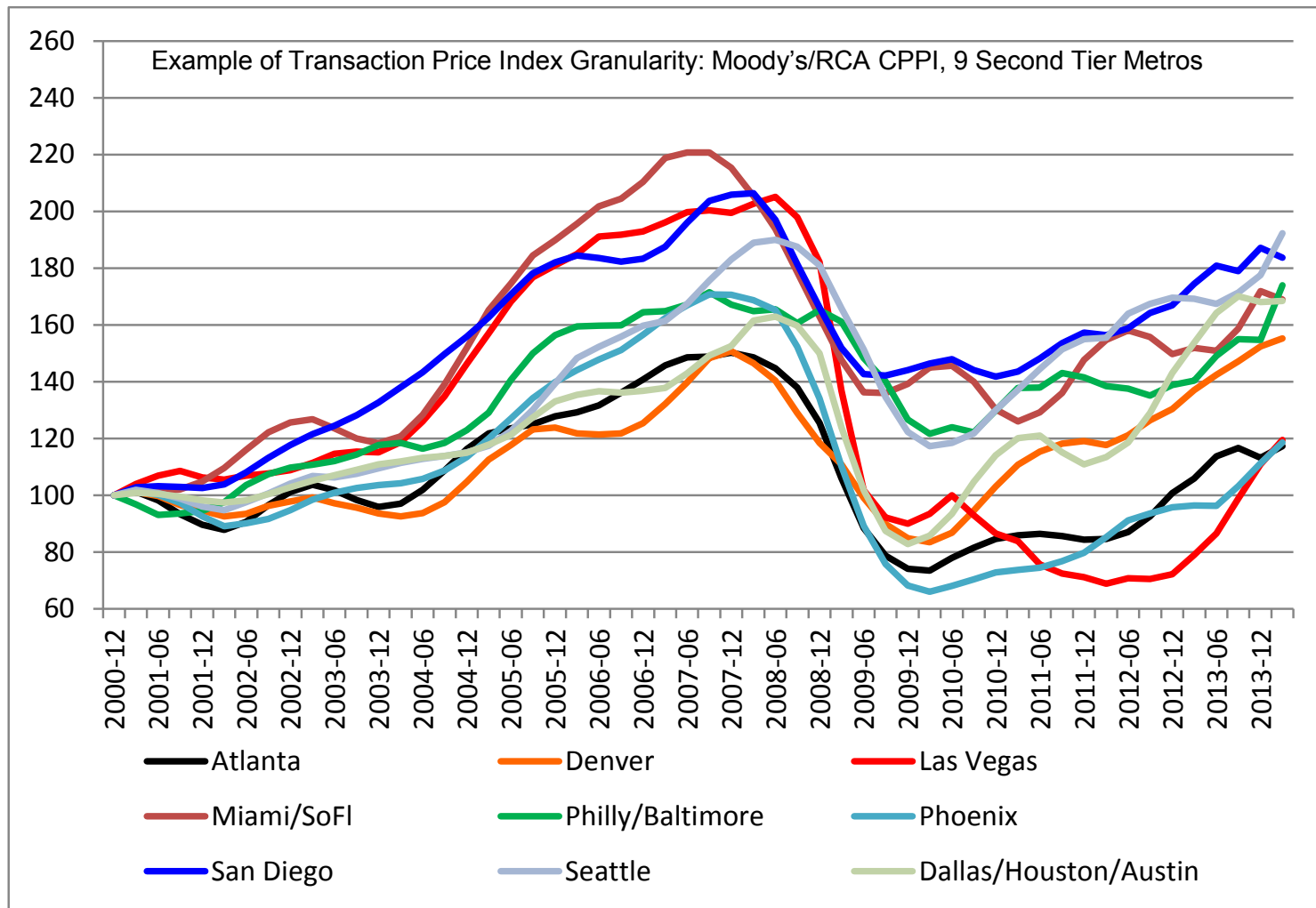
Based on methodology developed at MIT, series contains over 180 granular CRE price indices by metro area, property type (sector), investor type, location (CBD vs Suburbs), etc.

# RCA CPPI: Major Markets...



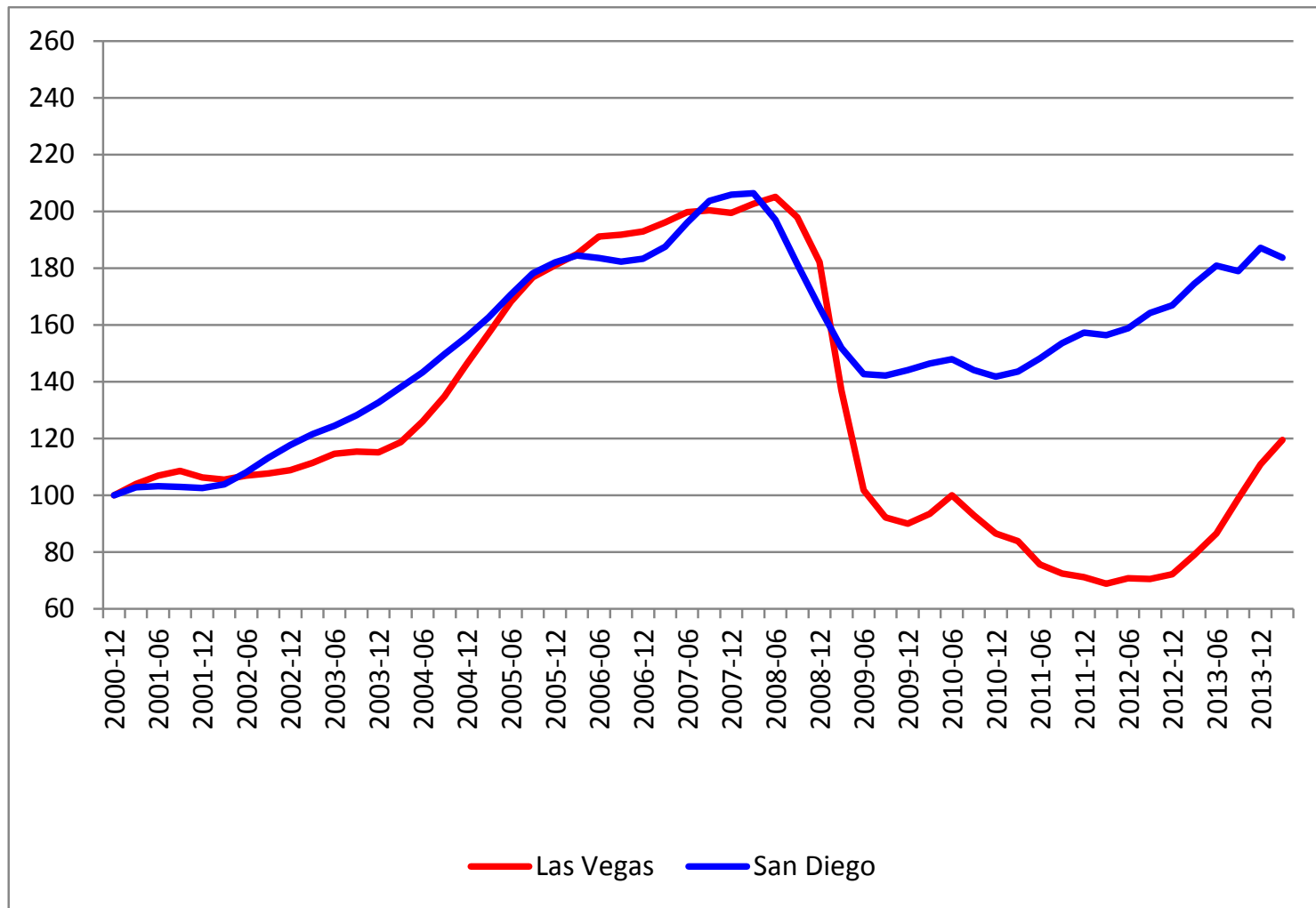
**Boston , New York, Wash DC, Chicago, San Fran, LA:**  
 International capital “Gateway” markets, supply-constrained: different pricing dynamics.

# RCA CPPI: Top Non-Major Markets (same scale)...



Phila, Atlanta, Miami, TX-3, Denver, Seattle, Phoenix, Las Vegas, San Diego:  
 “Second tier,” less supply-constrained, harder hit & slower recovery but big capital now moving in.

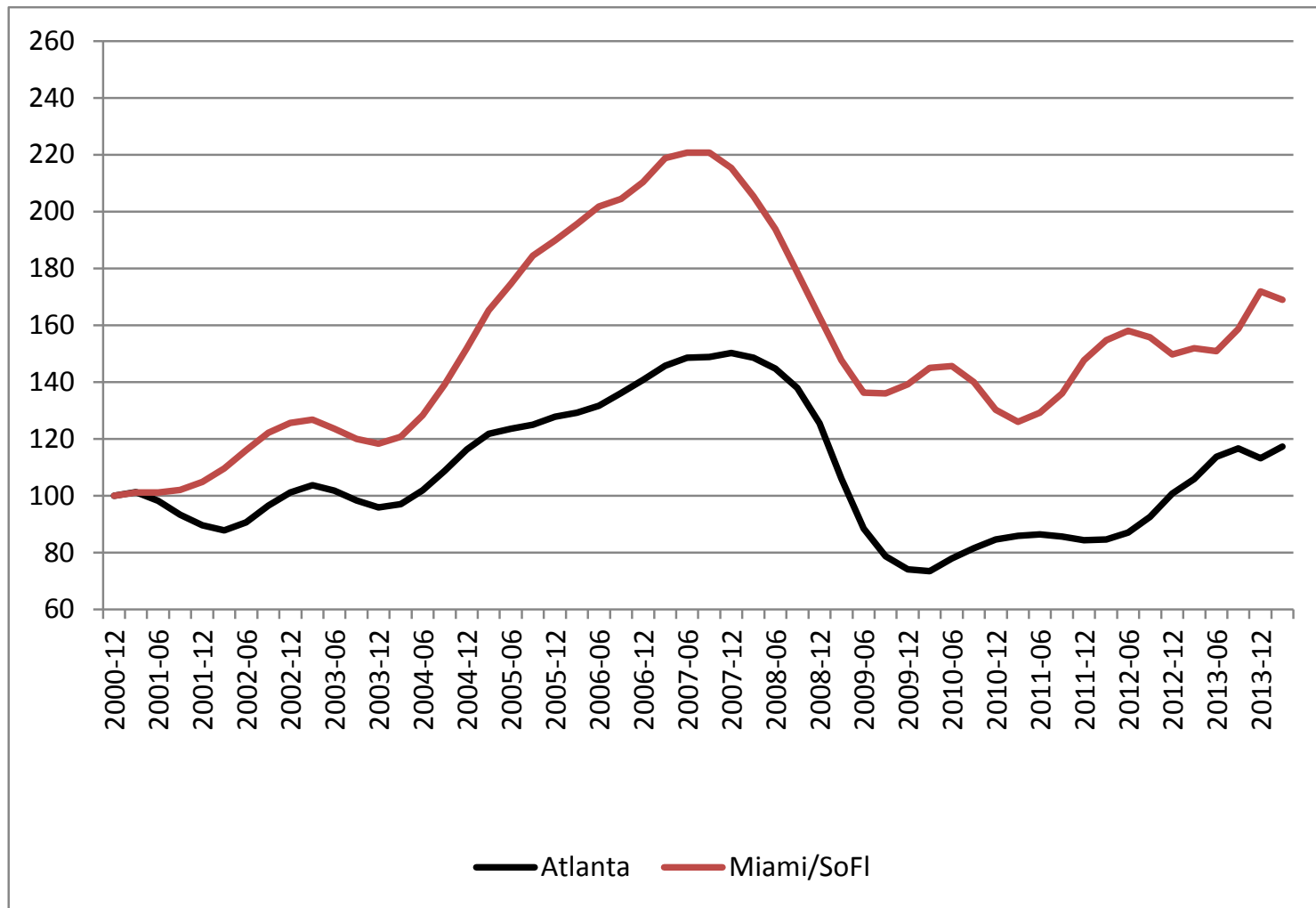
San Diego & Las Vegas are “near” each other, but different economic bases, & different space market supply elasticity...



Each market somewhat unique. There will always be idiosyncratic stories.

Las Vegas also had particularly aggressive lending during boom.

**Miami & Atlanta** are both in Southeast, but different economic bases, different land availability, & **Miami** draws **Latin American capital**...



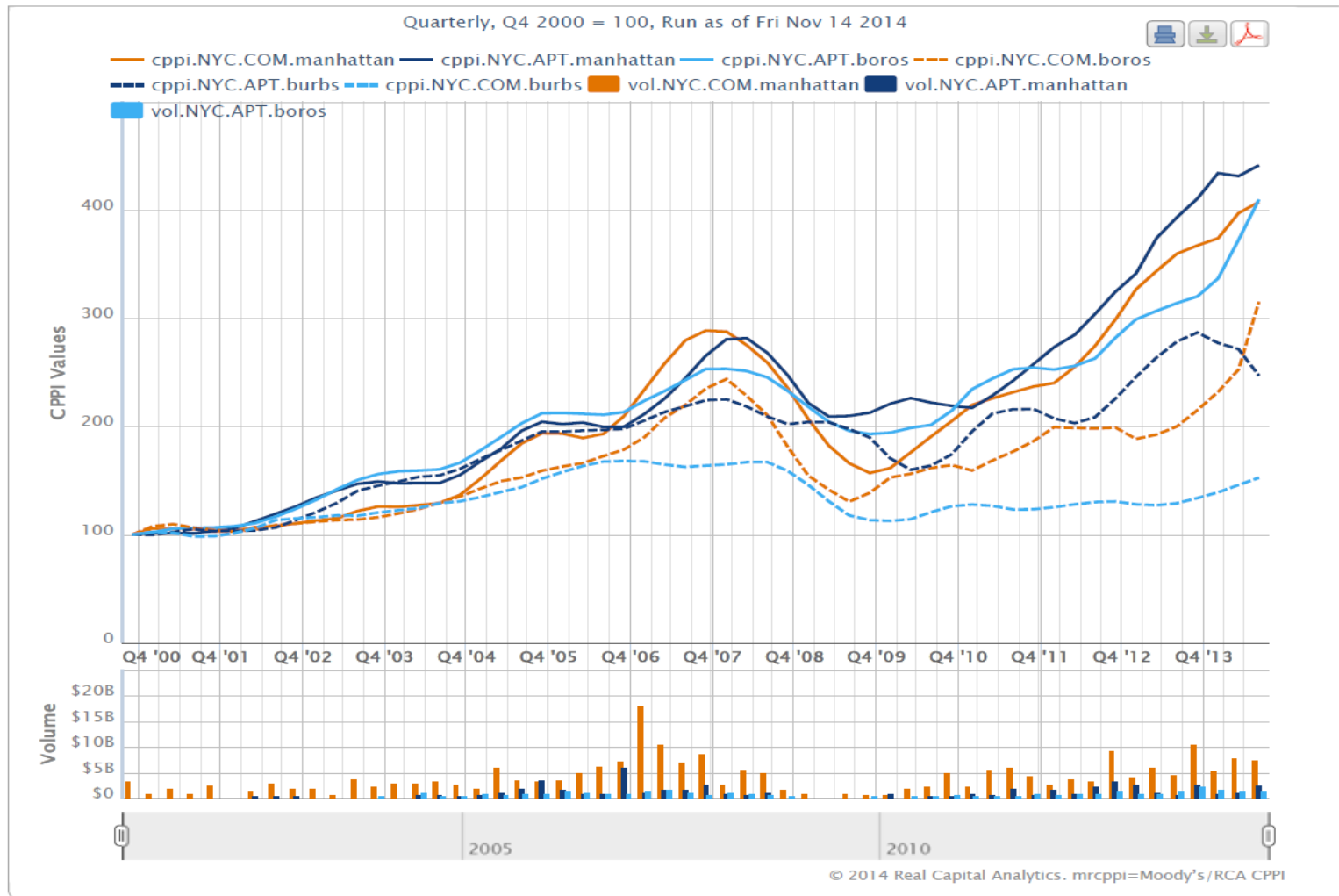
Each market somewhat unique. There will always be idiosyncratic stories.

**Miami** got particularly over-built during boom (condo boom/bust drove apartment sector pricing, led to early crash). **Atlanta** very elastic supply.

# More examples of granular indices possible with RCA **repeat-sales** data: New York City Commercial & Apartment Indices: Manhattan, Boros, & Burbs...



Each market somewhat unique. There will always be idiosyncratic stories.

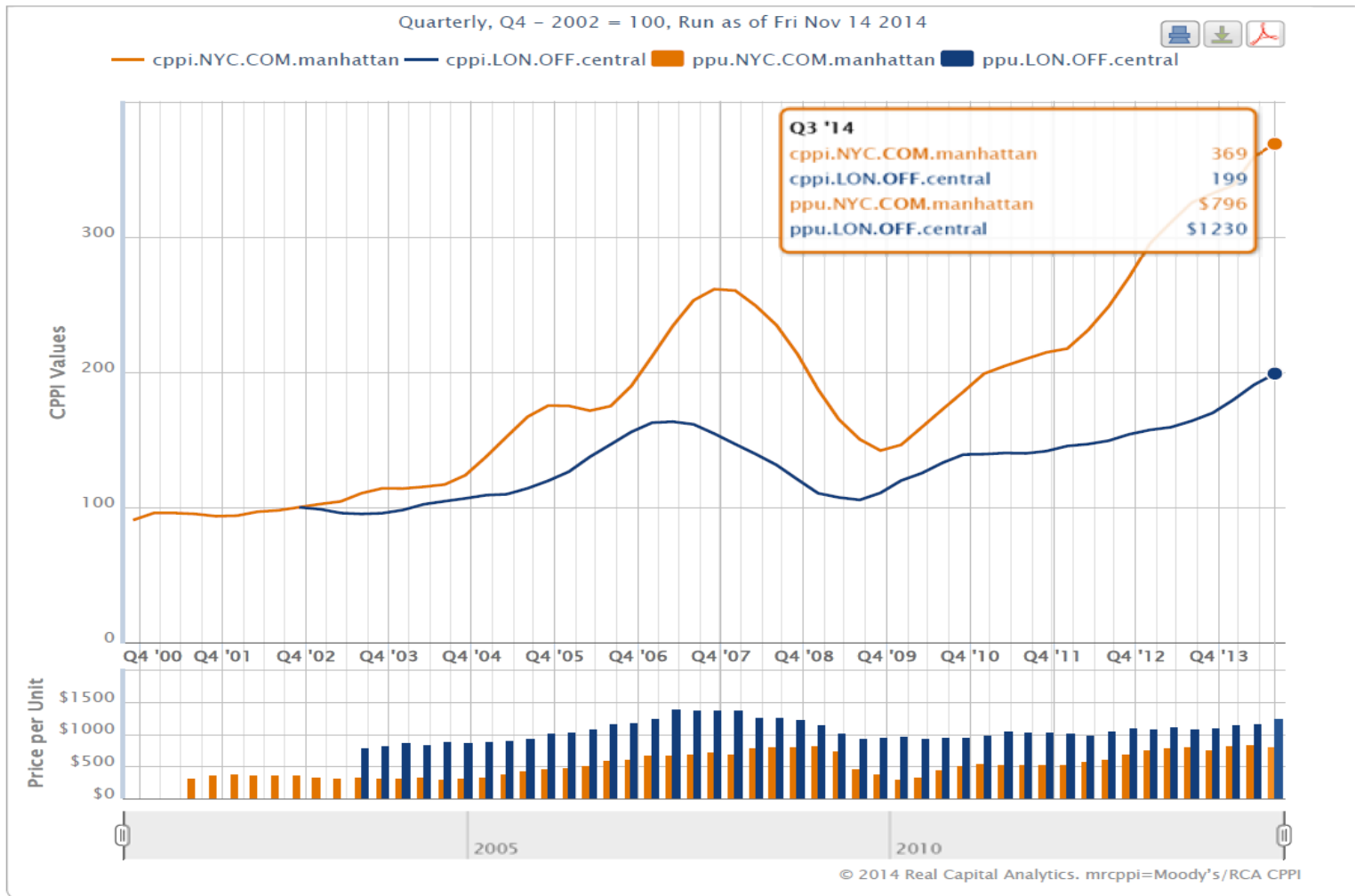


**The city & apartments are surging, suburban offices languishing.**

# More examples of granular indices possible with RCA repeat-sales data: **Manhattan Commercial** vs **Central London Offices**...



Each market somewhat unique. There will always be idiosyncratic stories.

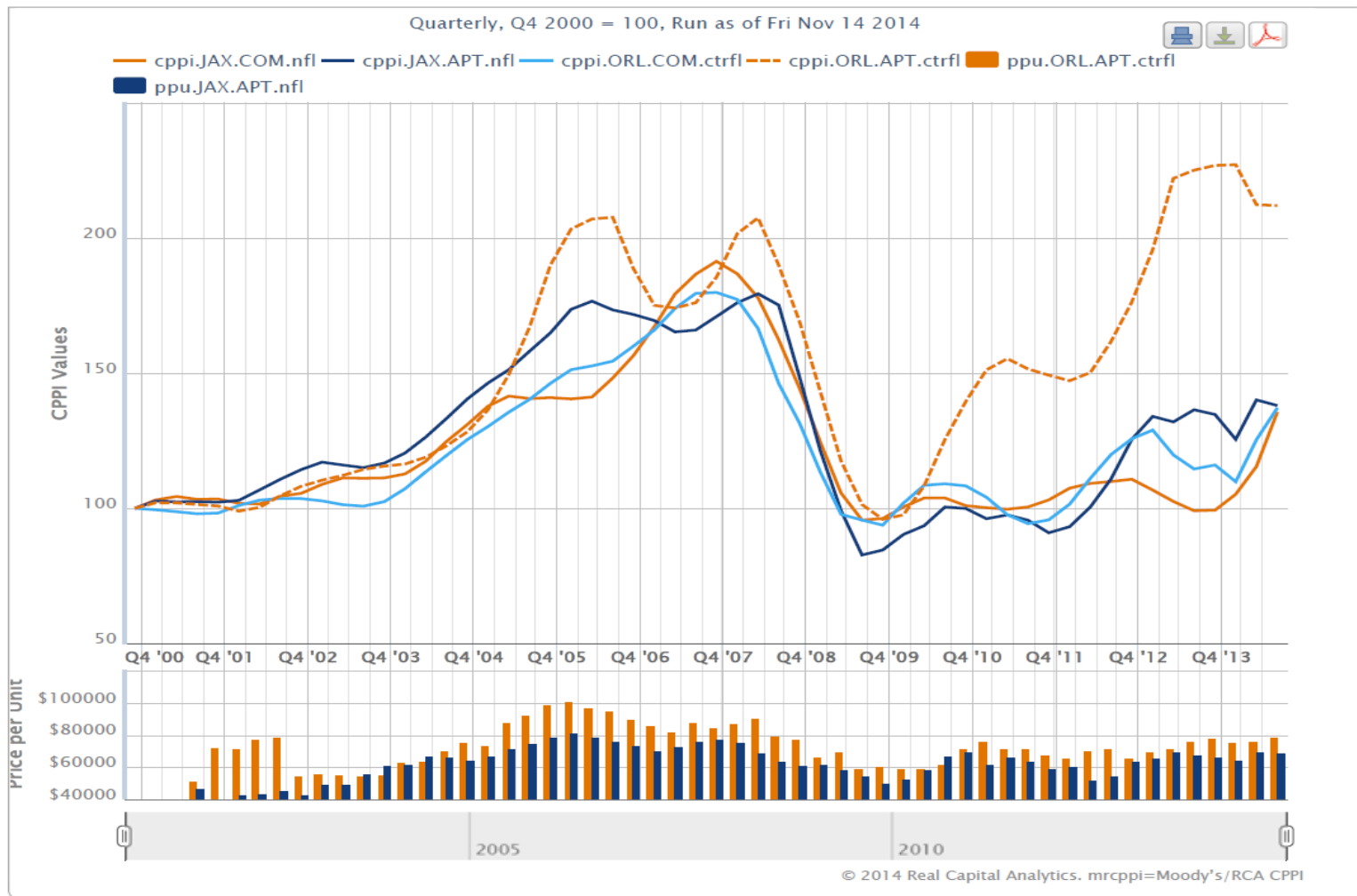


**Manhattan** price growth exceeding **Central London**, but **Central London** price levels (/SF) still higher.

# More examples of granular indices possible with RCA **repeat-sales** data: Smaller markets: Orlando & Jacksonville FL, Commercial & Apartments



Each market somewhat unique. There will always be idiosyncratic stories.



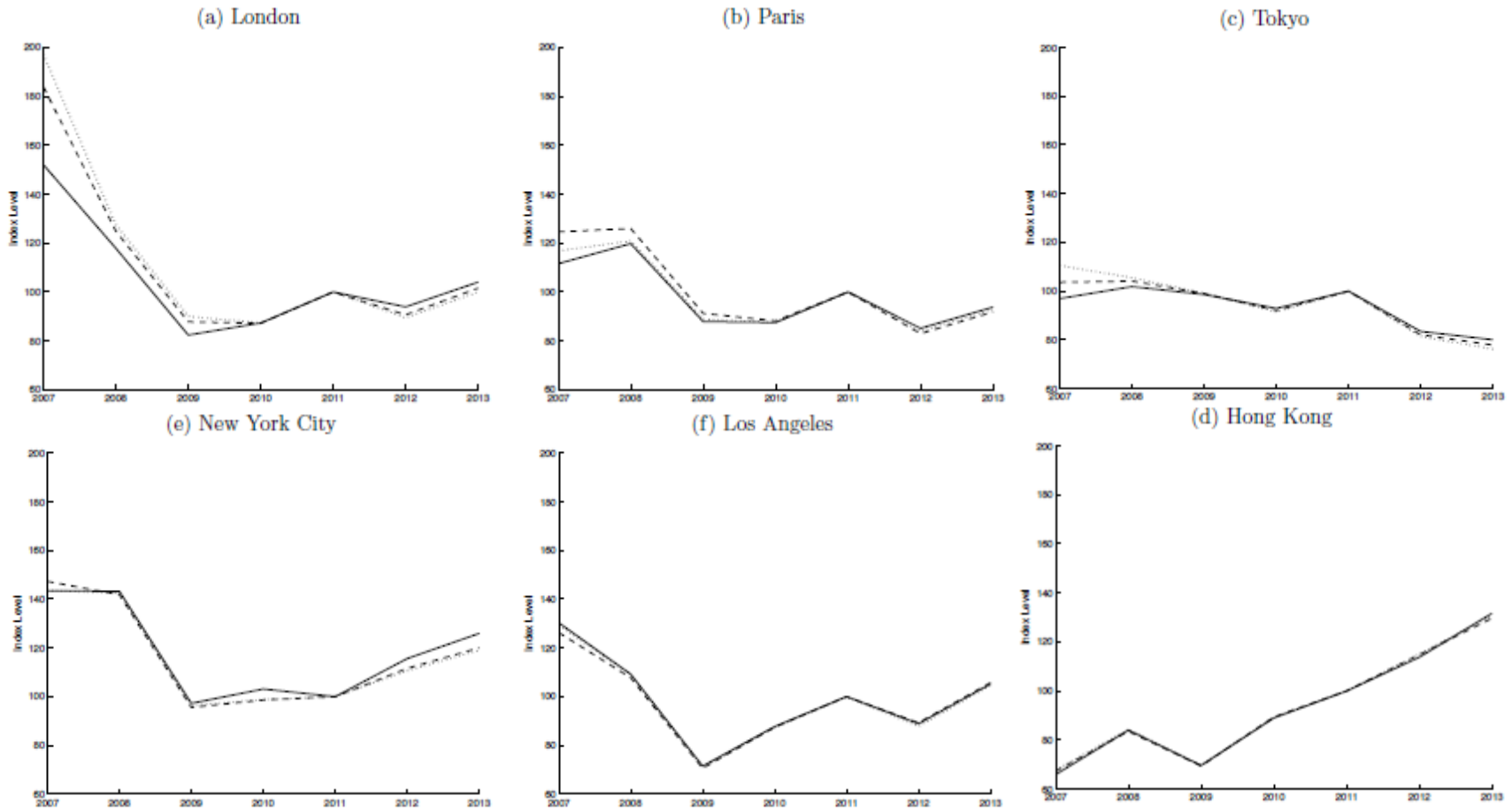
**Orlando apt prices very volatile but recently surging, price/unit reflects upscale unit purchases during bubble.**



RCA CPPIs use only 3<sup>rd</sup>-stage (post-estn) scarce data treatments. Recent Eichholtz-Chegut-Rodrigues paper (RCA data) found little effect of SAR:

Figure 2: Hedonic, Spatial and Spatial-Temporal Global Office Property Price Indicators  
Transactions US \$ 10 million and Greater - 2007 to 2013

--- Spatial    ..... Spatial-Temporal    — Hedonic



## Spatial Dependence in International Office Markets

Andrea M. Chegut<sup>a</sup>, Piet M. A. Eichholtz<sup>b</sup>, Paulo J. M. Rodrigues<sup>b</sup>

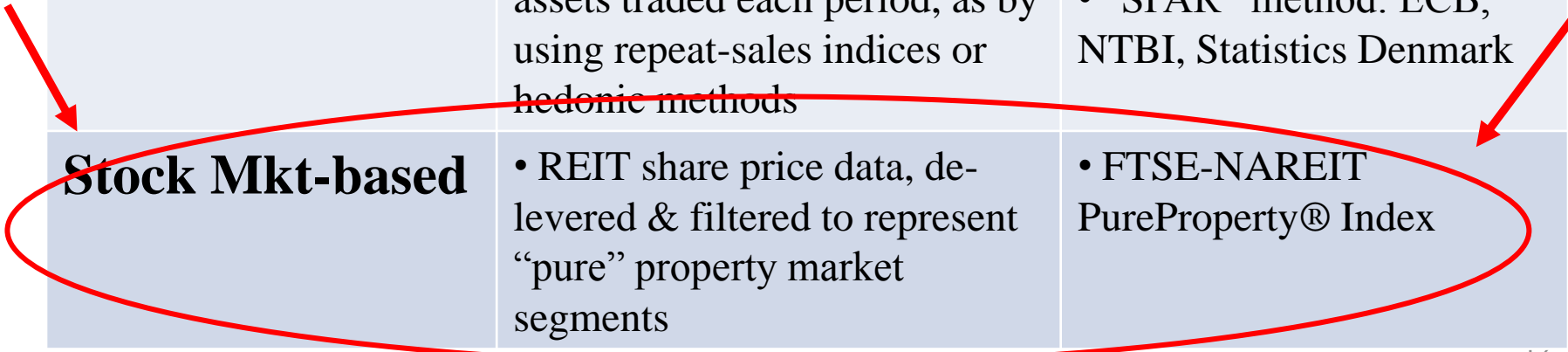
# Topics:

1. Mick Silver: Addressing the problem of *Scarce Data...*
2. Robert Shiller: Should improving our measurement of prices have the form of setting up new ***markets rather than just improving our econometrics?***

# Stock Market Based Indices

## Three Major Types/Sources of CPPIs

Index Type:	Source	Examples
<b>Appraisal-based</b>	<ul style="list-style-type: none"><li>• Based on professional appraisals of individual properties</li><li>• Typically self-reported by investmt mgrs. (ERISA)</li></ul>	<ul style="list-style-type: none"><li>• NCREIF Property Index (NPI)</li><li>• Investment Property Databank (IPD)</li></ul>
<b>Transactions-based</b>	<ul style="list-style-type: none"><li>• Based on actual prices of traded properties in private asset mkt</li><li>• Need to control for “apples vs oranges” problem different assets traded each period, as by using repeat-sales indices or hedonic methods</li></ul>	<ul style="list-style-type: none"><li>• Moody’s/RCA CPPI</li><li>• RCA CPPI (US,UK,Jap)</li><li>• CoStar Commercial Repeat-Sales Index (CCRSI)</li><li>• “SPAR” method: ECB, NTBI, Statistics Denmark</li></ul>
<b>Stock Mkt-based</b>	<ul style="list-style-type: none"><li>• REIT share price data, de-levered &amp; filtered to represent “pure” property market segments</li></ul>	<ul style="list-style-type: none"><li>• FTSE-NAREIT PureProperty® Index</li></ul>



# Stock Market Based Indices

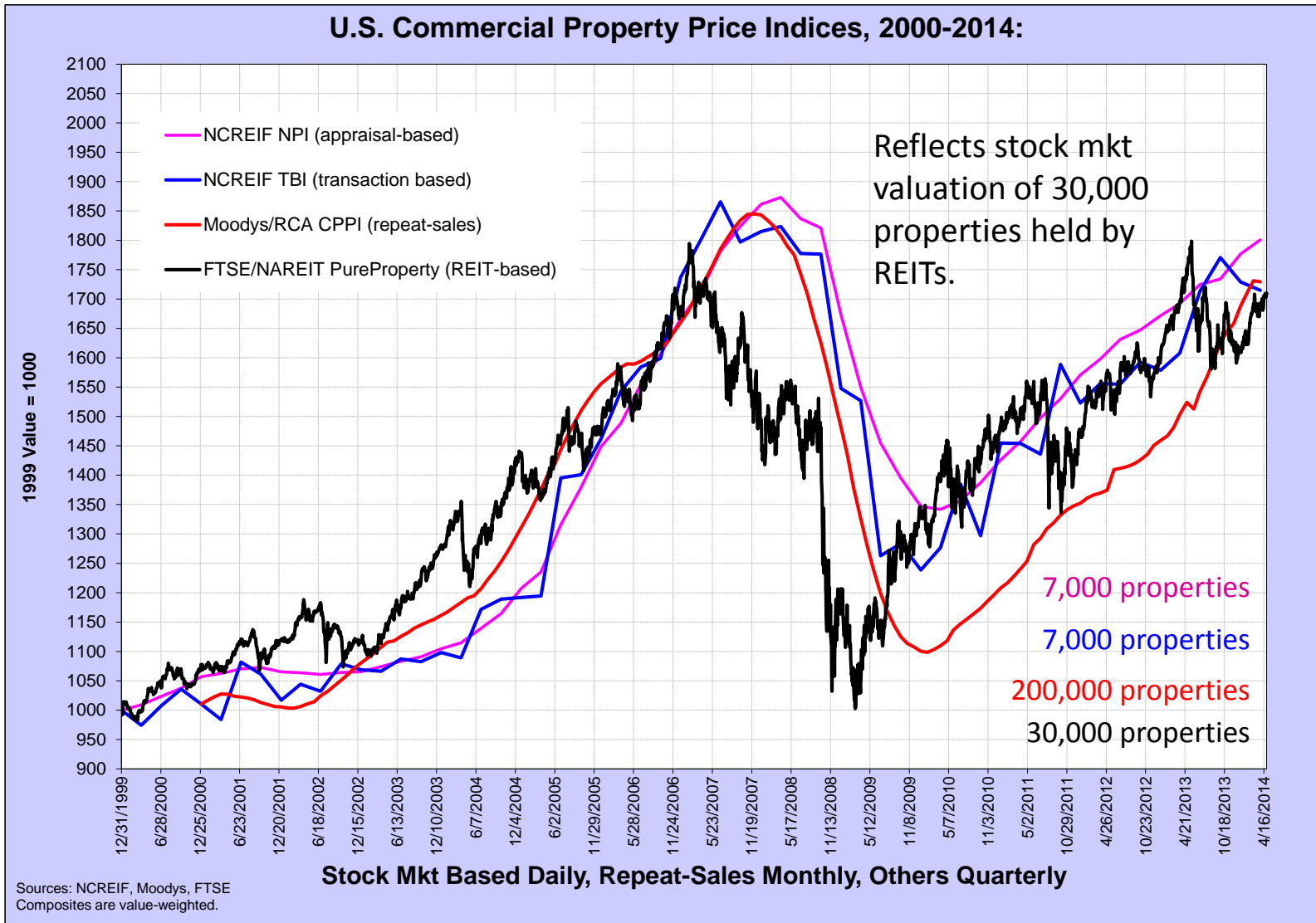
## Three Major Types/Sources of CPPIs

<b>Index Type:</b>	<b>Strengths</b>	<b>Weaknesses</b>
<b>Appraisal-based</b>	<ul style="list-style-type: none"><li>• Can be available when others not (for properties appraised more often than sold)</li><li>• Strong profession &amp; tradition in some countries</li></ul>	<ul style="list-style-type: none"><li>• Opinions not actual prices</li><li>• Tend to lag &amp; smooth market values</li><li>• Can be subject to influence</li></ul>
<b>Transactions-based</b>	<ul style="list-style-type: none"><li>• Actual prices directly reflect mkt equilibrium (sup &amp; dem)</li><li>• Objective info, less susceptible to manipulation</li></ul>	<ul style="list-style-type: none"><li>• Requires large historical database</li><li>• Statistical models</li><li>• Can be “noisy”</li><li>• Can be subject to revisions</li></ul>
<b>Stock Mkt-based</b>	<ul style="list-style-type: none"><li>• REITs (or listed property “pure plays”) traded in many countries</li><li>• Uses information efficiency &amp; liquidity of stock mkt</li><li>• Leading indicator, daily updates</li><li>• Not dependent on individual property sales data</li></ul>	<ul style="list-style-type: none"><li>• Some countries have few REITs, or short history, or thin market</li><li>• Information only indirect about actual property mkt</li><li>• Requires de-levering</li><li>• Reflects idiosyncrasies of stock mkt</li></ul>

# Stock Market Based Indices

Four Indices of U.S. Commercial Property Prices, 2000-14:

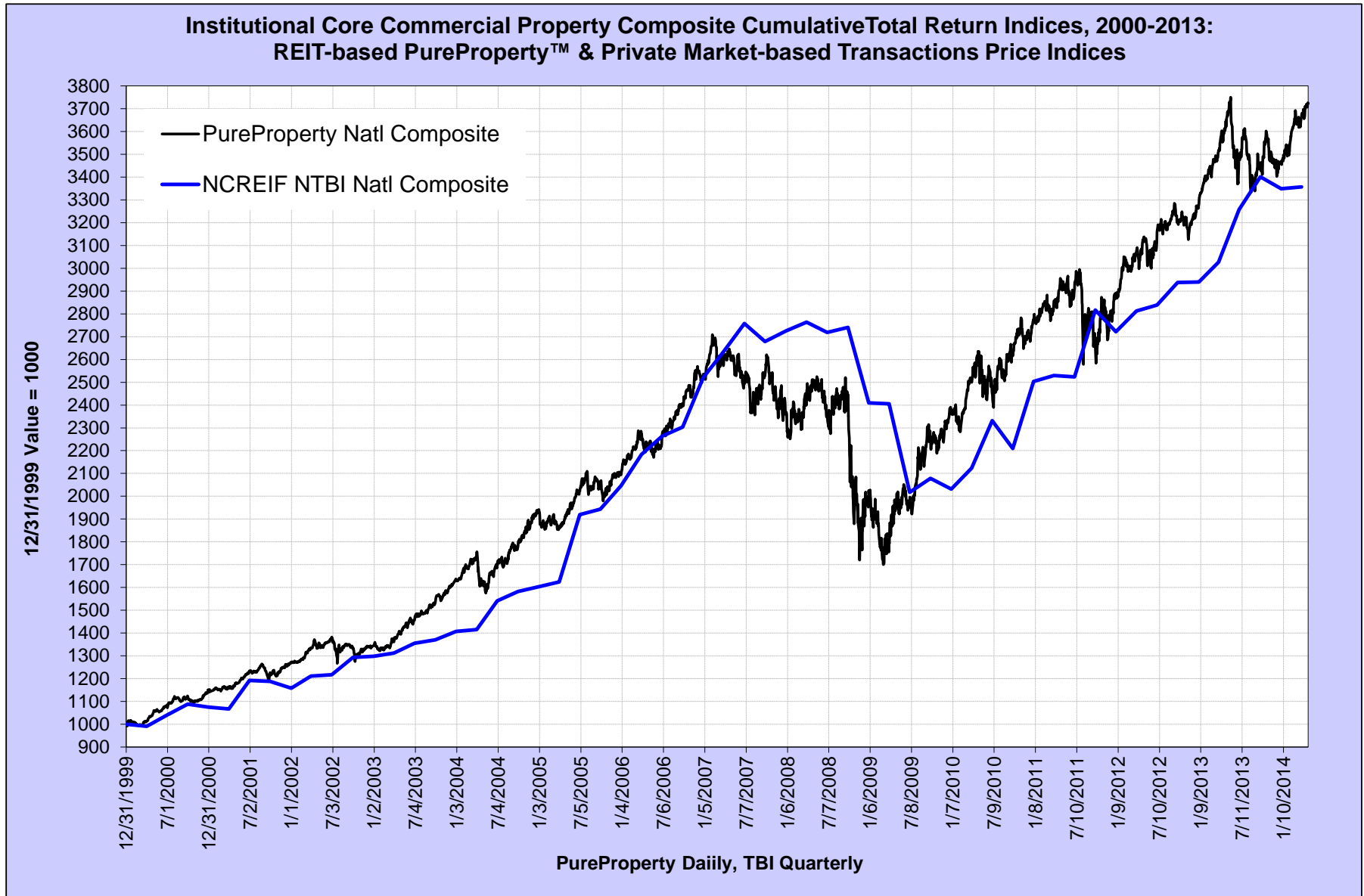
**Stk Mkt Based**, **Transaction (SPAR)**, **Transaction (Repeat-Sales)**, **Appraisal-Based**



**Similar overall picture, but Stock Market Based index leads in time, and is higher frequency (daily).**

# Stock Market Based Indices

Stock Market Based Index appears more volatile than **SPAR** index, but this is an illusion of greater frequency...

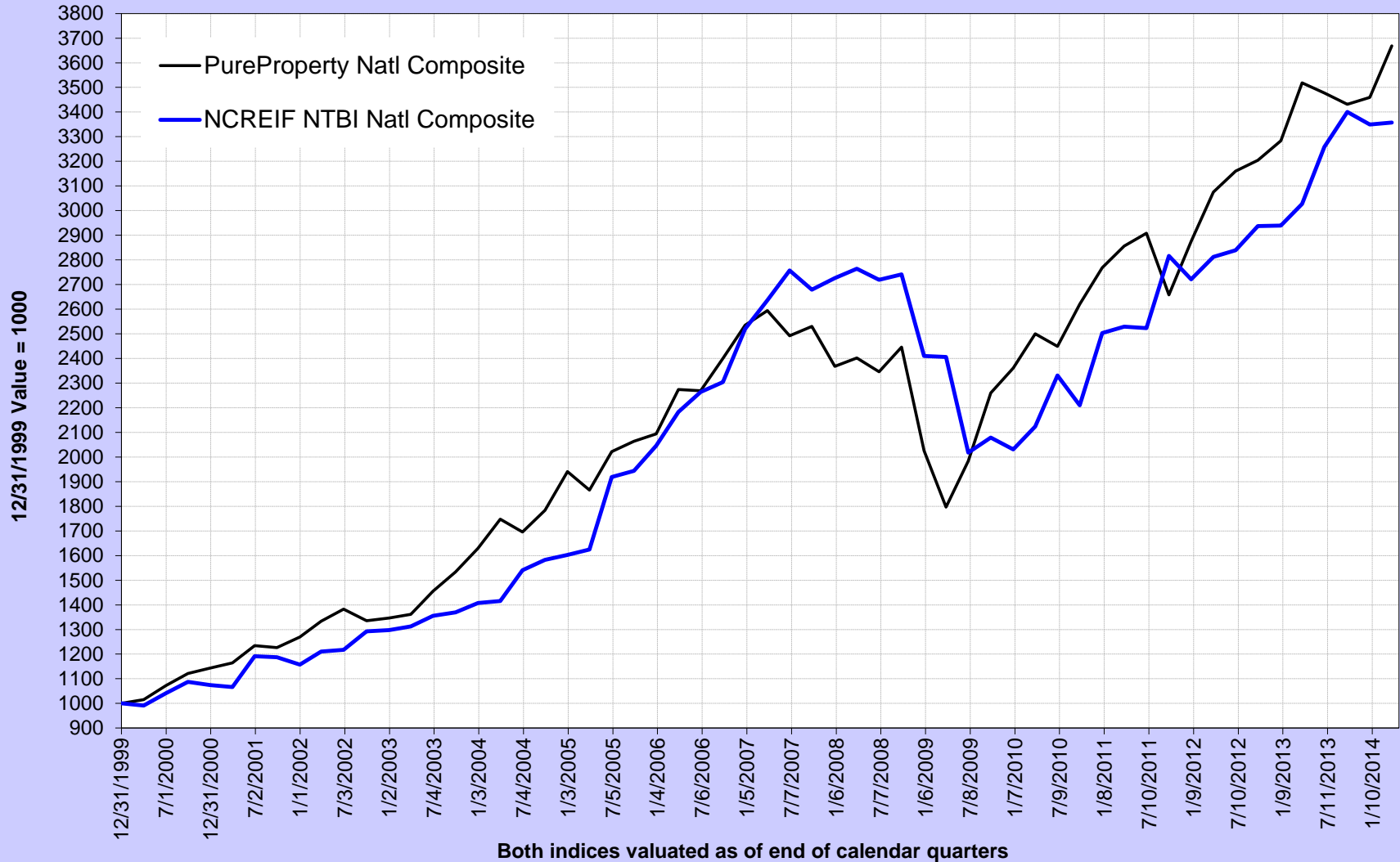


# Stock Market Based Indices

Shown at same frequency (qtrly), both indices similar volatility

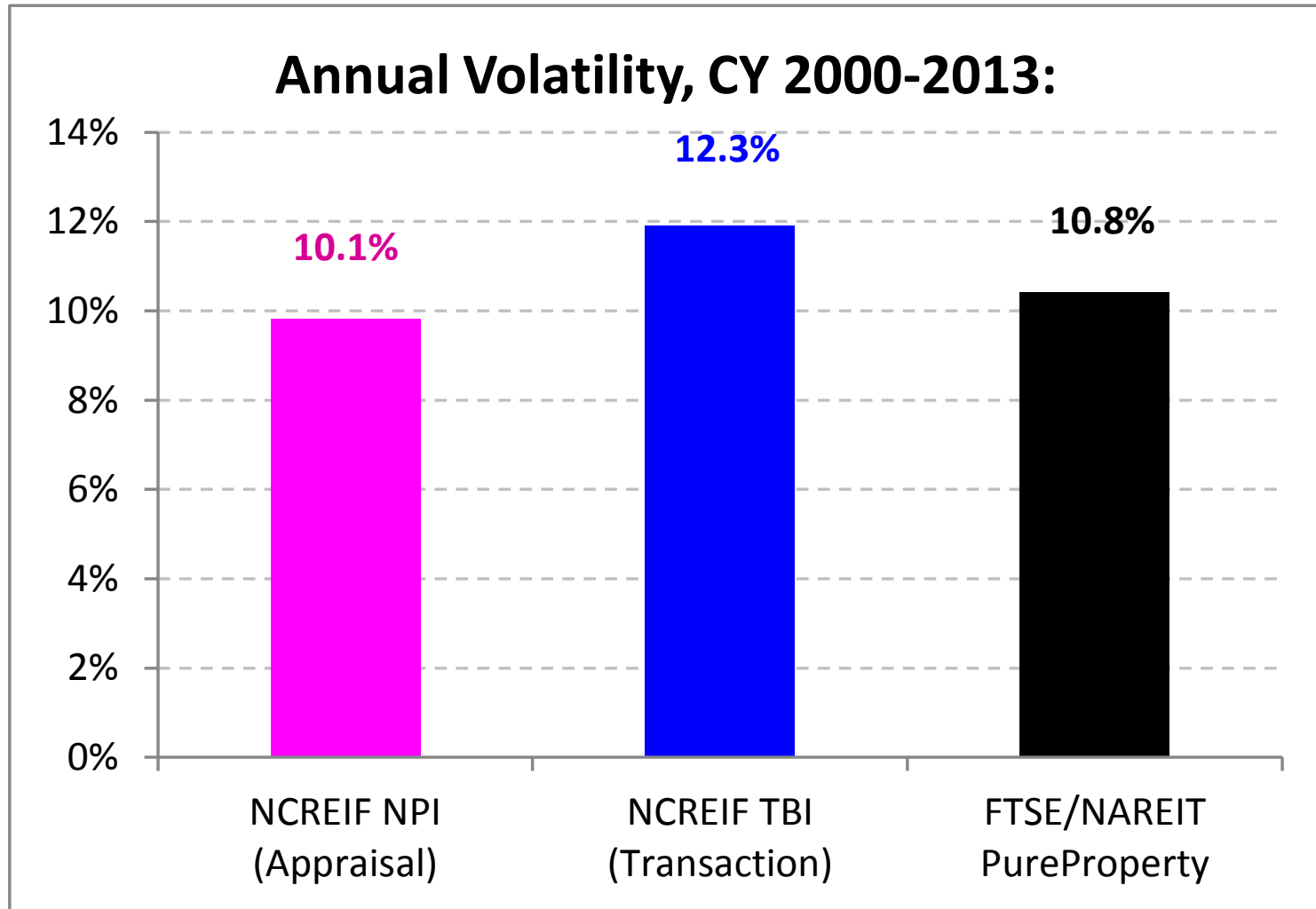
**Stock Mkt Based *leads* SPAR.**

Institutional Core Commercial Property Composite Cumulative Total Return Indices, 2000-2013:  
REIT-based PureProperty™ & Private Market-based Transactions Price Indices



# Stock Market Based Indices

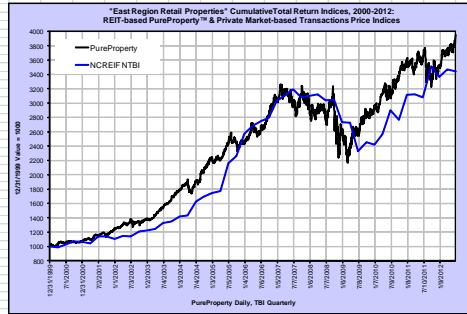
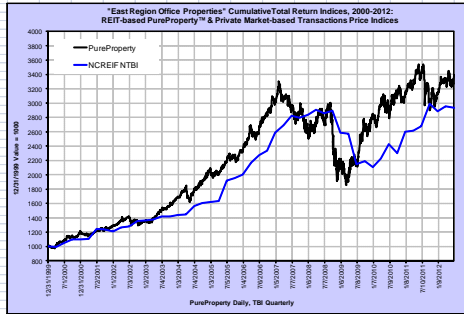
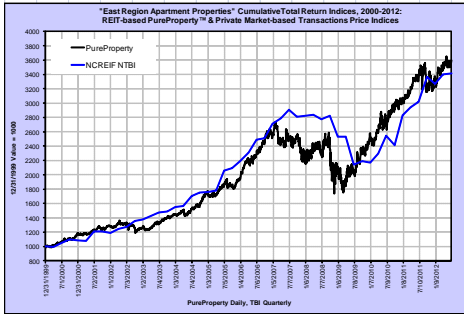
Annual Frequency Volatility of **Appraisal-based**, **Transaction-based (SPAR)**, and **Stock Market Based...**



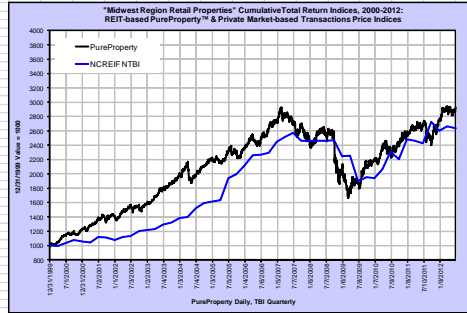
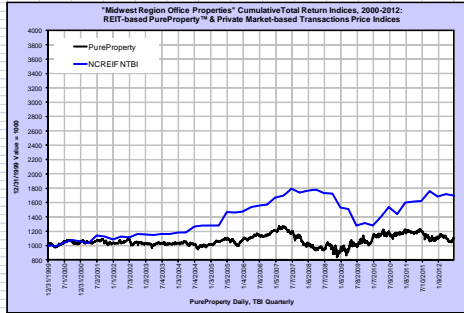
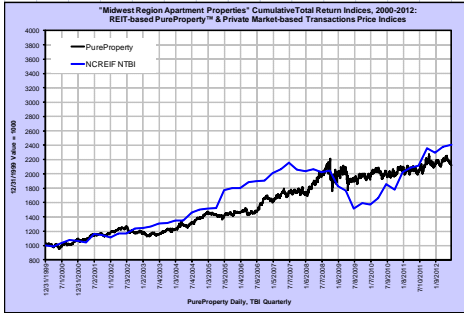


# Stock Market Based Sector/Region Combination Indices:

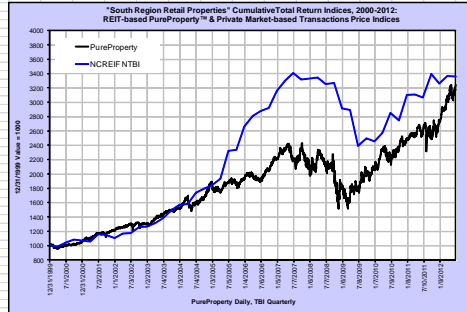
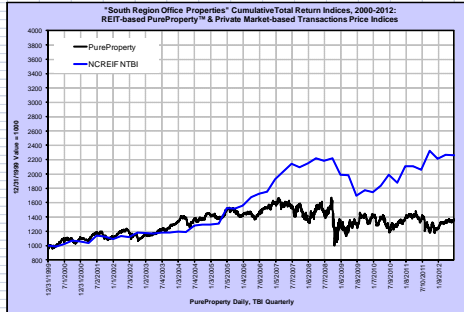
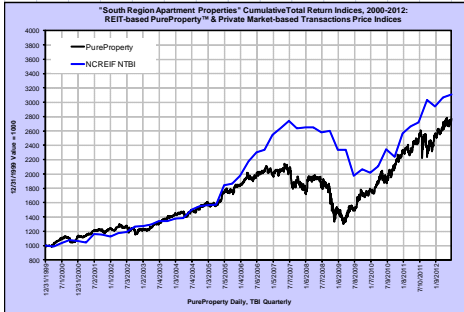
**East:**  
A, O, R  
➔



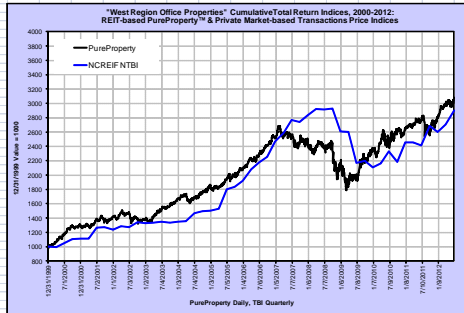
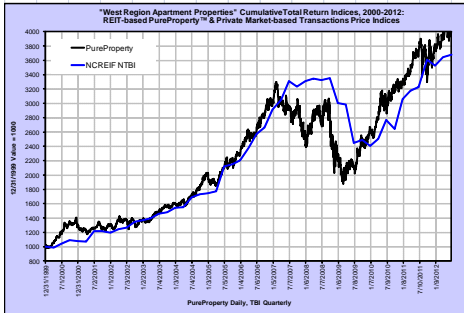
**Midwest:**  
A, O, R  
➔



**South:**  
A, O, R  
➔



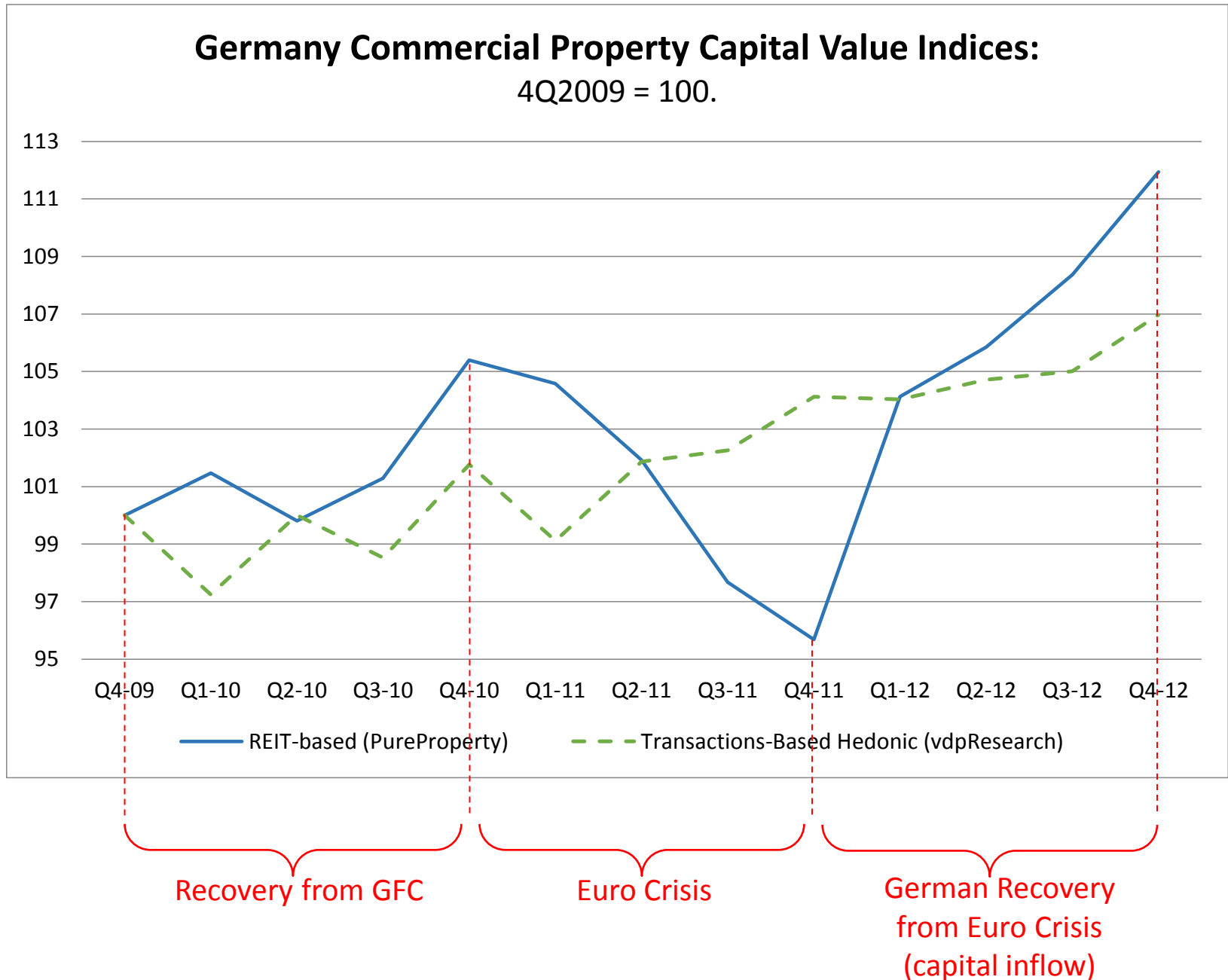
**West:**  
A, O  
➔



**Stock Market Based  
vs  
NCREIF TBI (SPAR)  
2000-2012**

**All charts same scale.**

# Stock Market Based vs Transaction Price Based (hedonic) Indices of German CRE Prices:



# How Stock Market Based Indices work...

To simplify for illustration, suppose:

- 2 market segments: **Office** & **Industrial**; Returns = “RO”, “RI”.
- 2 firms: **Firm 1** & **Firm 2**; Returns = “R1”, “R2”.
- Both firms with no debt and no investment other than in properties.

Suppose: **Firm 1**: 75% Office, 25% Industrial.

**Firm 2**: 25% Office, 75% Industrial.

Construct two portfolios:

- **Office Portfolio**: \$150 Long **Firm 1** + (-\$50) Short **Firm 2**.
- **Industrial Portfolio**: (-\$50) Short **Firm 1** + \$150 Long **Firm 2**.

## Office Portfolio Return:

$$\begin{aligned} &= \left(\frac{150}{100}\right)R1 - \left(\frac{50}{100}\right)R2 = \left(\frac{150}{100}\right)\left(\frac{3}{4}RO + \frac{1}{4}RI\right) - \left(\frac{50}{100}\right)\left(\frac{1}{4}RO + \frac{3}{4}RI\right) \\ &= \left(\left(\frac{150}{100}\right)\left(\frac{3}{4}\right) - \left(\frac{50}{100}\right)\left(\frac{1}{4}\right)\right)RO + \left(\left(\frac{150}{100}\right)\left(\frac{1}{4}\right) - \left(\frac{50}{100}\right)\left(\frac{3}{4}\right)\right)RI \\ &= \left(\left(\frac{9}{8}\right) - \left(\frac{1}{8}\right)\right)RO + \left(\left(\frac{3}{8}\right) - \left(\frac{3}{8}\right)\right)RI = (1)RO + (0)RI = RO. \quad \leftarrow \text{Pure Office} \end{aligned}$$

## Industrial Portfolio Return:

$$\begin{aligned} &= -\left(\frac{50}{100}\right)R1 + \left(\frac{150}{100}\right)R2 = -\left(\frac{50}{100}\right)\left(\frac{3}{4}RO + \frac{1}{4}RI\right) + \left(\frac{150}{100}\right)\left(\frac{1}{4}RO + \frac{3}{4}RI\right) \\ &= \left(-\left(\frac{3}{8}\right) + \left(\frac{3}{8}\right)\right)RO + \left(-\left(\frac{1}{8}\right) + \left(\frac{9}{8}\right)\right)RI = (0)RO + (1)RI = RI. \quad \leftarrow \text{Pure Indust} \end{aligned}$$

# Stock Market Based Indices, Advantages:

(where feasible)

- They are based on asset value indications from public stock exchanges, which are known to be highly fast and efficient information aggregation arenas, as a result, stock market based indices tend to be leading indicators for major turning points in the private (direct) property asset market.
- Stock market based indices can be produced at a daily frequency, far greater frequency than other types of indices.
- Stock market based indices represent liquid prices at which trades can actually be executed, thus representing true economic “opportunity costs,” in that sense consistent with SNA specifications.
- Stock market based indices are IRIs (as defined in Chapter 4) which can measure total investment returns (including income) as well as capital returns or asset price changes.
- Stock market based indices are not dependent on individual asset transaction sales or on appraisal valuations, obviating the small sample problem as well as problems caused by “portfolio sales.”

# Stock Market Based Indices, Disadvantages:

- Do not directly track the prices of property assets within the private (direct) property market.
- They are fund or entity level metrics that include the effect of fund or entity (firm) level management, including dividend policy and retained earnings.
- Require de-levering (de-gearing) equity share price returns.
- Capital returns reflect depreciation and capital expenditures, and may also reflect scale expansion (retained earnings) of the REITs, thus requiring adjustment before they can be directly used in SNA applications in the national balance sheet. However, this is ***not a disadvantage*** for the purpose of *“macroeconomists & central banks’ need to identify bubbles, the factors that drive them, instruments that contain them, and to analyze their relation to recessions”* (M.Silver)
- Reflect the valuations of the properties held by the firms traded on the stock exchange, which may not be perfectly representative of all commercial property.
- Many countries do not yet have sufficiently large or well established sectors of specialized real estate investment firms (REITs, or “REIT-like” firms and listed unit trusts) trading in their stock markets.

## Overall Conclusions (my own, cld b wrong):

1. Mick Silver: Addressing the problem of *Scarce Data*... **DG: We can do quite a bit with scarce data, in many ways, I think RS indices hold great promise w few obs.**
2. Robert Shiller: Should improving our measurement of prices have the form of setting up new *markets rather than just improving our econometrics*? **DG: “Yes!”, & REITs in stk mkt are a great resource for CPPIs.**