Disentangling Rent Index Differences: Data, Methods and Scope

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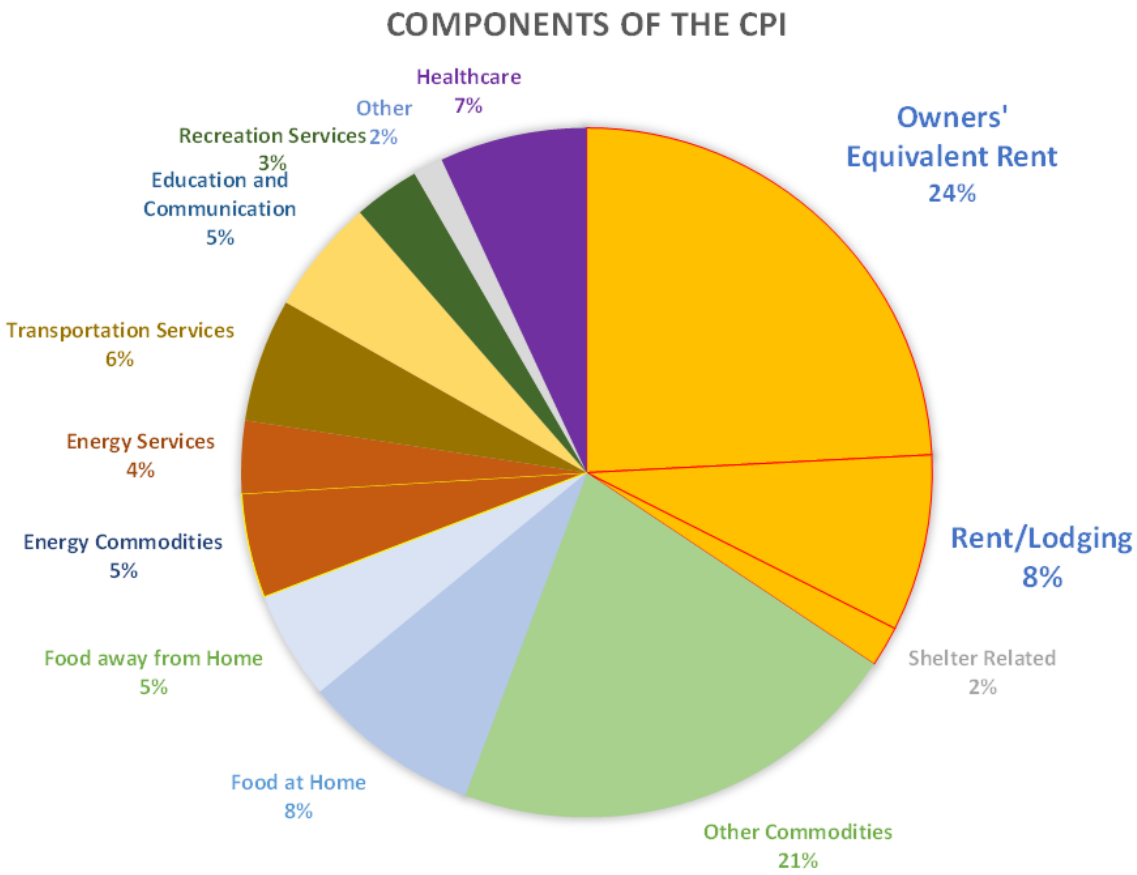
Motivation


COMPONENTS OF THE CPI
Healthcare
7%
Other
2%
Recreation Services
3%
Education and
Communication
5%
Transportation Services
6%
Energy Services
4%
Energy Commodities
5%
Food away from Home
5%
Food at Home
8%
Other Commodities
21%
Shelter Related
2%
Rent/Lodging
8%
Owners'
Equivalent Rent
24%

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- Since CPI computes housing costs for homeowners using OER method, rent drives 32% of CPI and almost 15% of PCE;
  even bigger percentages of "core" measures.

  → can't have an accurate CPI without accurate rent measurement.

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  → can't have an accurate CPI without accurate rent measurement.

- Over past decade or so, several new rent data sources emerged, allowing construction of new rent indexes
  (e.g., Zillow, CoreLogic, Apt. List).

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- Alternative indexes can tell very different stories.

	Zillow	CPI
2021Q1	15.5%	4.1%
2023 Jan	6.9%	8.6%

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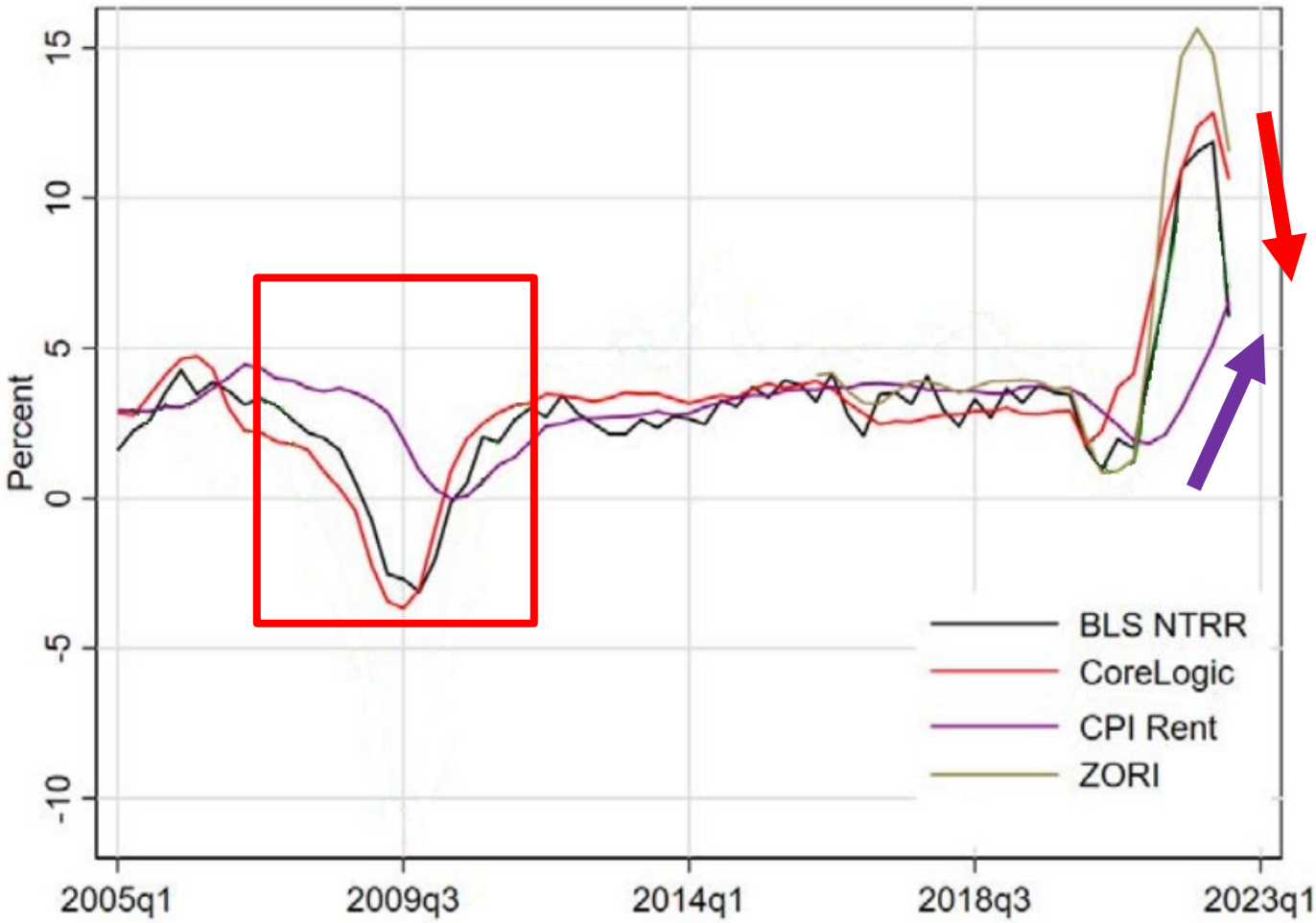
- Is Zillow capturing "market" rent?
  Is there a problem with how CPI measures rent growth?
- Huge implications: Social Security payments, monetary policy, …

Several Rent Indexes (through 2022Q3)



Chief questions we answer

- What accounts for the differences, and do they reflect a problem in CPI rent measurement?
- Should CPI approach rent measurement differently, using alternative approaches/data?

Outline

- Rent and OER in the CPI
  - Approach to owners' shelter costs
  - Construction
- SFRI and ZORI
  - Data and construction
- Approach to determine cause of divergence
- Results and conclusions
- (If time: forecasting issues, and two practical issues)
- Is there a case for a change in CPI?

Rent and OER in the CPI

How CPI measures shelter inflation

- For renters:
  - Measure rent growth *in a neighborhood* by:

    average growth

    in contract rent

    in a fixed sample of rental units

    in that neighborhood.

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- Growth in OER is measured the same way as rent: average rent growth in neighborhood.*
  - Different weights, to reflect that owned homes are typically bigger.
  - Remove utilities from rents.
- Same approach (housing consumption = service flow, valued at OER) is taken in the national accounts.

* Excluding rent-control units.

CPI Rent Sample and Quality Control

- Currently ~40,000 rental units
- = a random sample reflecting the entire urban rental market universe.
- Quality:
  - Only rent changes used, so any fixed quality addressed
  - Various adjustments for quality changes, e.g. aging, structural, changes in utilities provision/amenities

Technical details

- Random sample of US urban rental stock; every year, 1/6 is replaced.
- Sample divided into 6 parts ("panels"): January, Feb., …, June.
- On any given rental unit, collect rent only every 6 months (eg Jan – July, Feb – Aug,…)
  - Notice that rent may have changed, e.g., 4 months ago. This is a "detection" lag.

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- Notice that CPI collects rents on entire tenant universe, not just on new tenants this month.

Technical details

1. Adjust rents for unit aging, major renovations, change in provision of utilities, …
2. Compute weighted average rent on all units in the panel this month, compared to weighted average rent on all those units 6 months ago.

- That's a 6-month growth rate; CPI converts to monthly rate by taking 6th root.

What question does CPI rent index answer?

- For the typical household in the economy, how much did average rent (or OER) grow this month?

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- *More accurately, at a monthly rate, how much on average have rents grown over past 6-? months*… recall detection lag:

  Jan CPI includes rent changes that occurred previous Feb-Aug.

How SFRI and Zillow measure rent growth

Sample: (A Portion of) New-Tenant Rents

- Sample:
  - SFRI: rentals in MLS data
    - Mostly detached rental units; tiny % is apartments
    - Mostly higher-quality units (not representative)
  - Zillow augments these data with other units; still not representative
  - (Apt. List, etc. from apartment rentals)
  - No adjustments for aging, quality change, …

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  - No adjustments for aging, quality change, …
- New tenants only

New-Tenant Rent Indexes

- These indexes answer the question:

  What happened to the rent for a new tenant in the economy this month?

- So, if index goes up this month, answers: how much more does a new tenant have to pay, than if they had happened to move in last month?

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- Does not reflect the rent experience of anyone.

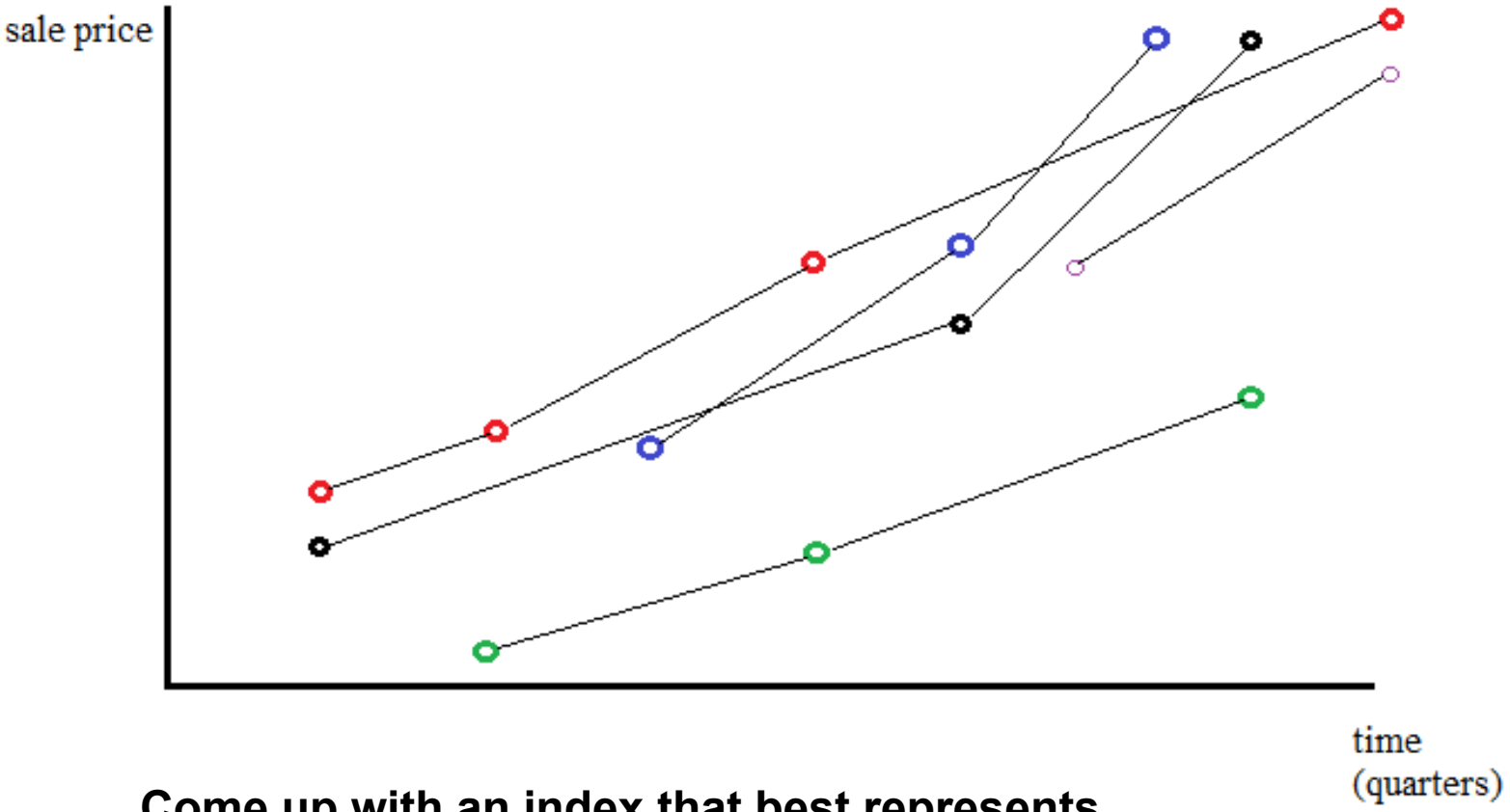
How are repeat-rent indexes constructed?

Same method as repeat-sale indexes

- Commonly used for house prices (Case/Shiller).
- Only use price changes to estimate growth in an index.
- Controls for any constant unit-level quality, but no control for changing quality over time (incl. aging).
- Data: units are observed intermittently (only when same unit sells again); need to combine all those long-duration price changes into an index with a value every quarter.
- "High-turnover" homes provide more data, and hence have a bigger influence on index.

- Used in SFRI, ZORI.

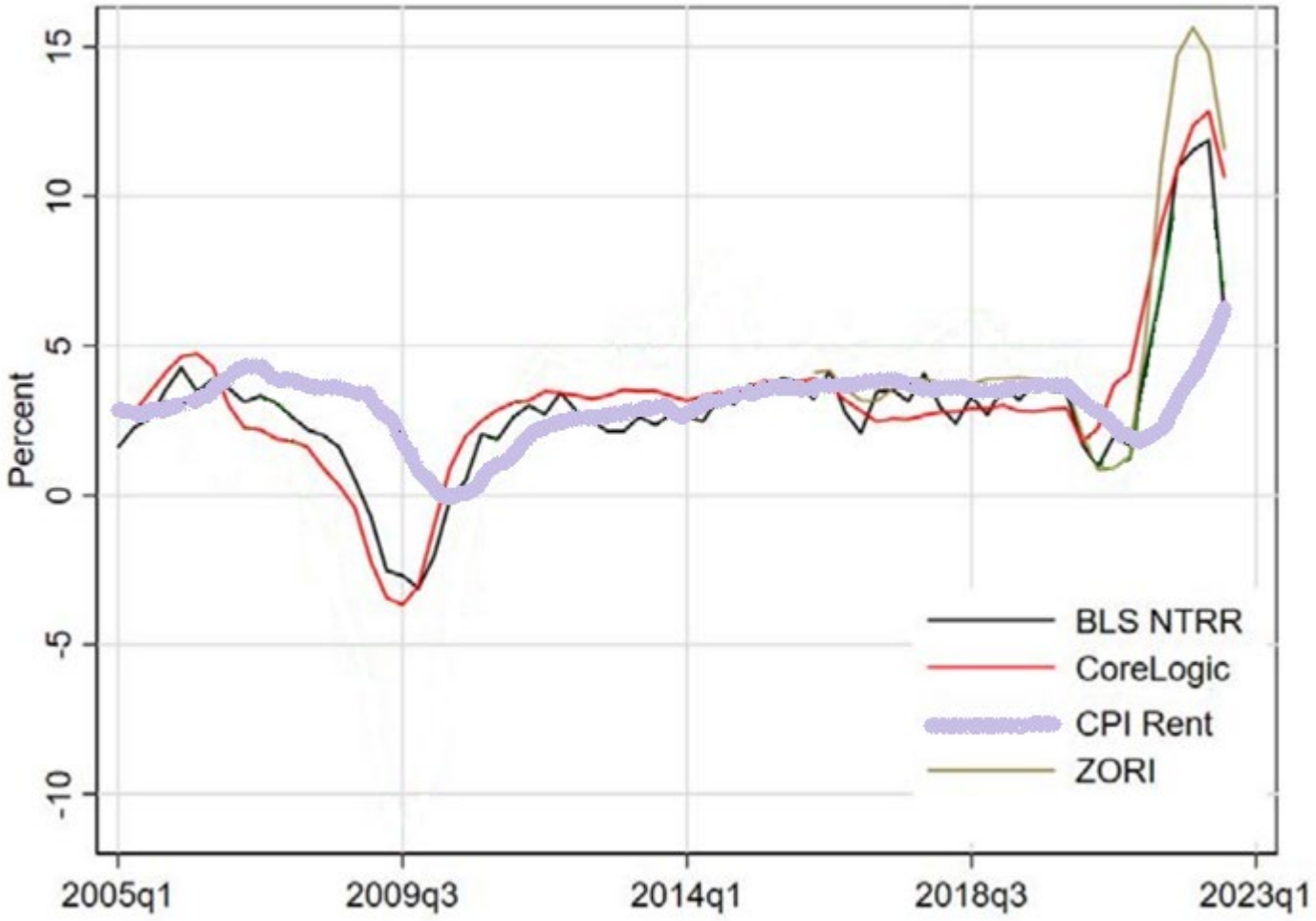
Repeat-sale indexes: Data



Come up with an index that best represents these price changes over time.

Analysis

Why is CPI rent is so different?



Possible answers

1. Sample: CPI rent sample is representative of entire rental stock;
   differences reflect fact that rent growth differs across different parts of the rental universe.
2. Adjustments for quality: CPI controls for quality changes, e.g. aging bias, major structural changes.
3. Construction method and lag: CPI rent/OER use different formulas than other indexes (e.g. 6^{th} root), and detect rent changes late.
4. New tenant rents vs. average rents: CPI collects rents from all tenants (average rents); others collect only new tenant rents.

Two New Indexes: NTRR and ATRR

- Constructed using official CPI rent microdata, using repeat-rent method. Differ in scope: new tenants vs. all tenants.

Same method and sample,
different scope.
Hence differences due to scope.

SFRI/ZORI→NTRR→ATRR→CPI rent

Same method and scope,
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Same sample and scope,
different method (& lag & vacancy treatment)
Hence differences due to method (&…)

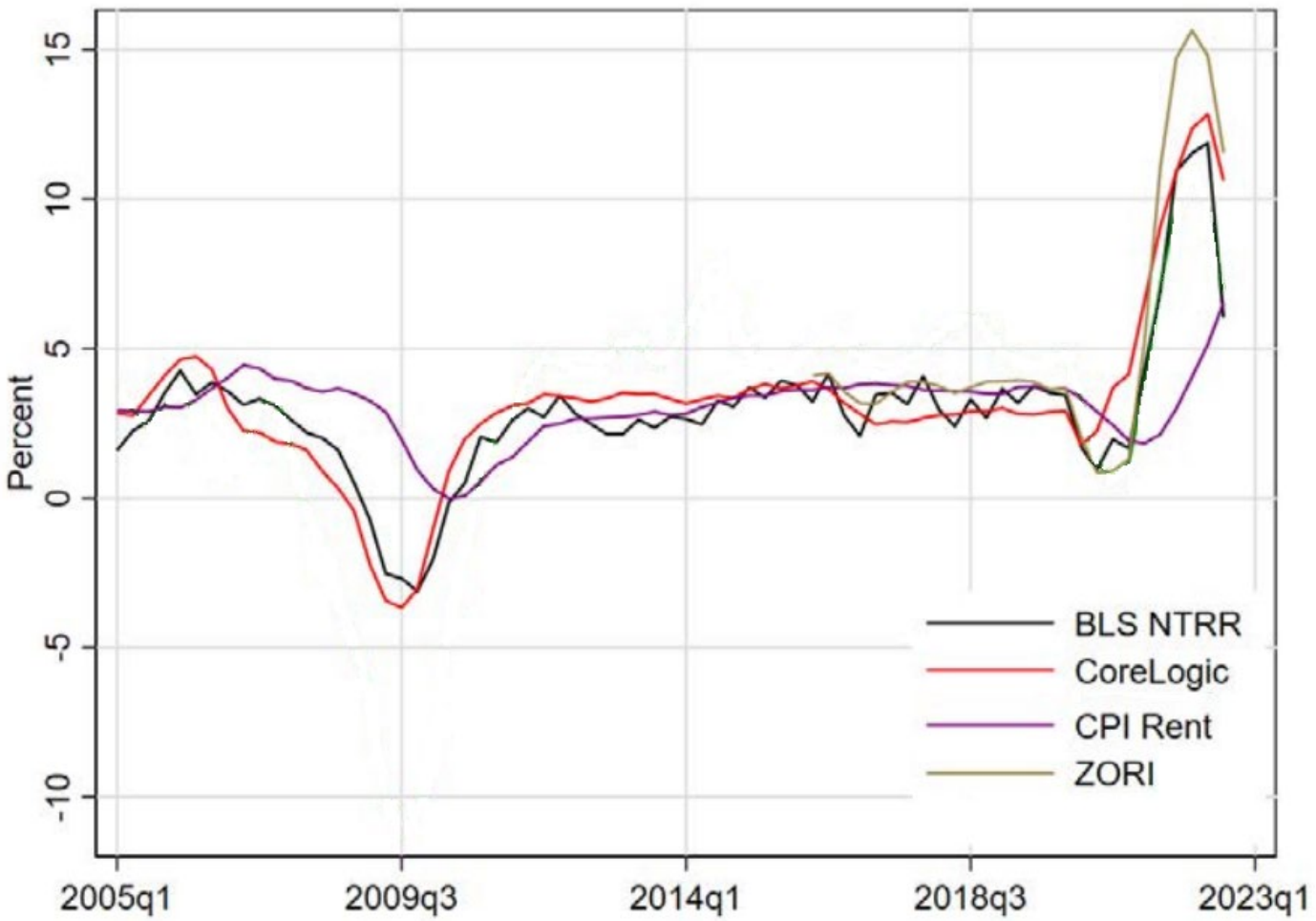
Detail on timing in NTRR and ATRR

- Ex post, we estimate move-in dates for all tenants, and determine month that rent changed, which is not necessarily the same as month of collection.
- No detection lag.

Summary of Main Findings

- Majority of inflation differential between CPI and others: all-tenant versus new-tenant basis.
- CoreLogic SFRI is a reasonably good approximation to our NTRR – despite being non-representative (MLS listings) and known structure-type inflation differentials (Adams/Verbrugge 2022, this study).
  (But *interesting difference at start of pandemic*…)
- ZORI not bad, but does not appear to be quite ready for prime time.
- New tenant indexes lead all-tenant indexes. But less useful for forecasting than one might think.
- NTRR is not suitable for real-time use in CPI, though still useful.
- Given the purpose of the CPI, we think it makes sense to track all-tenant rents.
  (Yes, the Fed is very aware of how net-tenant rents lead all-tenant rents.)

NTRR vs. SFRI: Surprisingly Similar

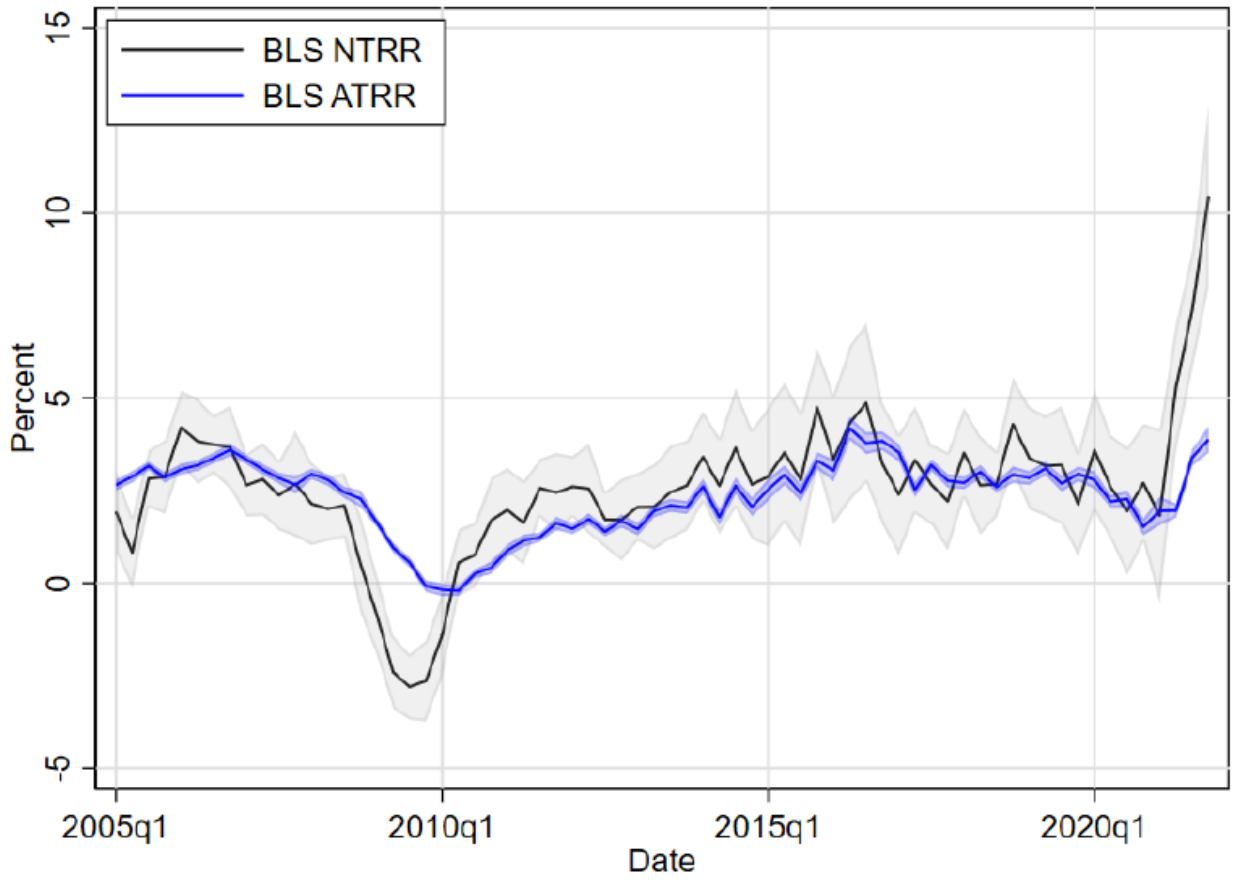


Rather remarkable: CoreLogic is based on MLS data, almost entirely higher-tier detached units (with no coverage in less wealthy areas, and with some cities missing).

Sample didn't make that much of a difference, except…

New-Tenant Repeat Rent vs All-Tenant RR

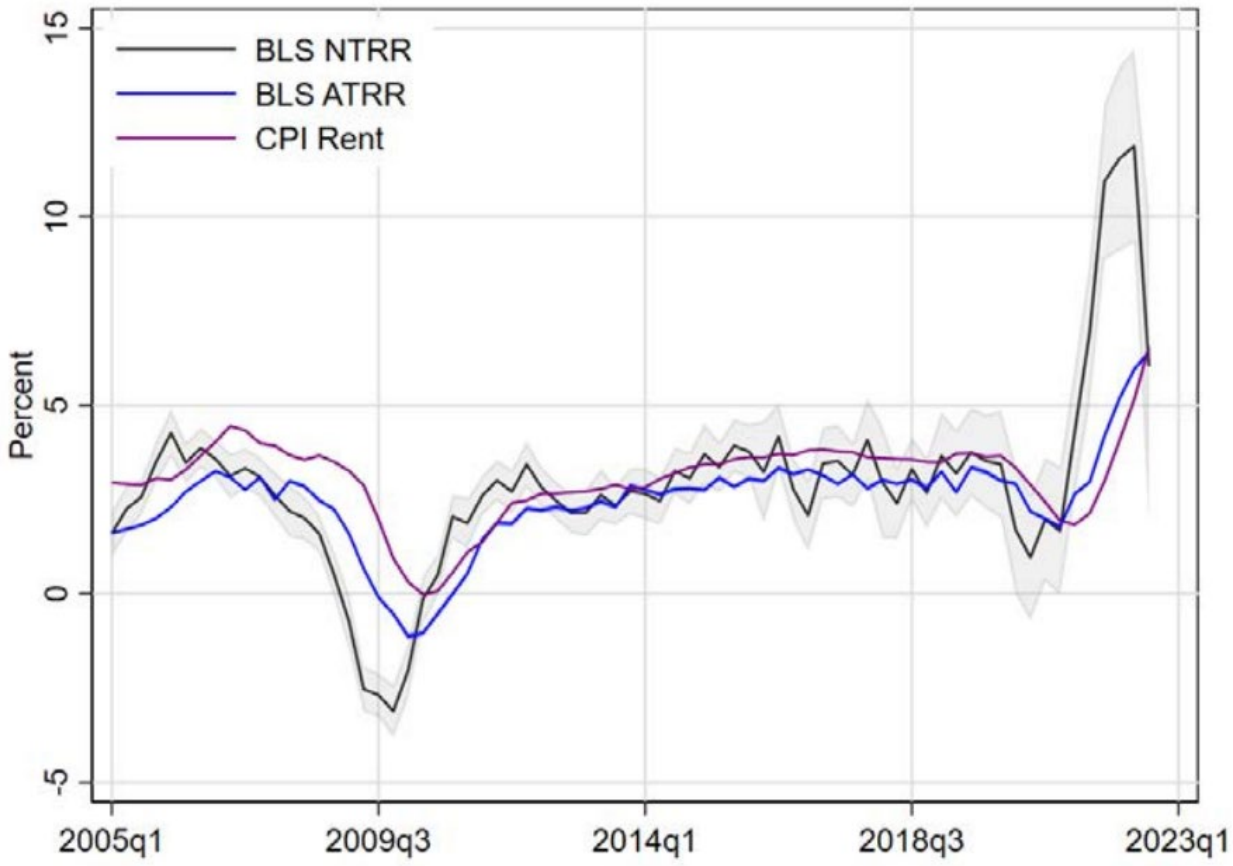
Figure 4: ATRR Against NTRR



NTRR vs ATRR, big differences when NTRR is moving sharply.

As one would expect, ATRR is smoother (should be at least a 4Q moving average), plus larger sample.

NTRR, ATRR and CPI Rent

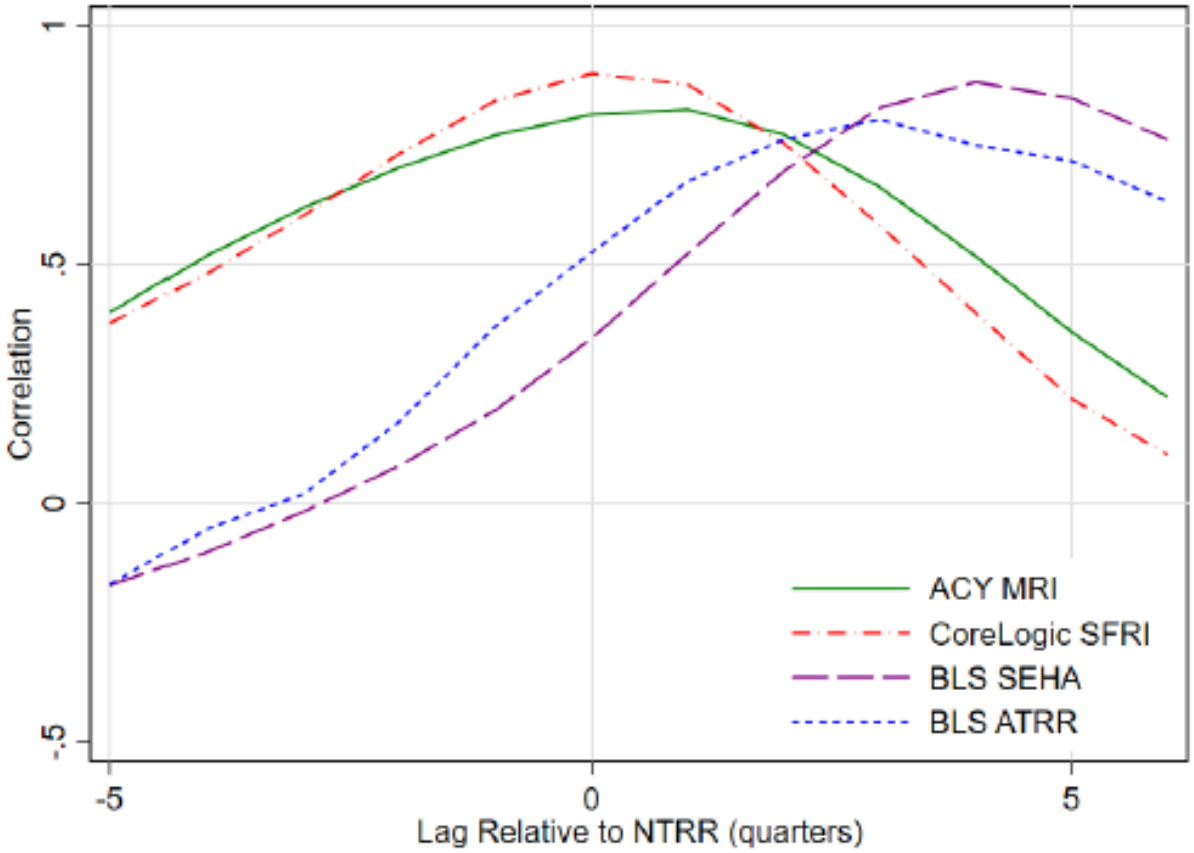


ATRR vs. CPI rent:
ATRR leads it a bit, differences are modest.

Forecasting CPI rent?

Cross correlations with NTRR

Figure 5: Cross Correlation

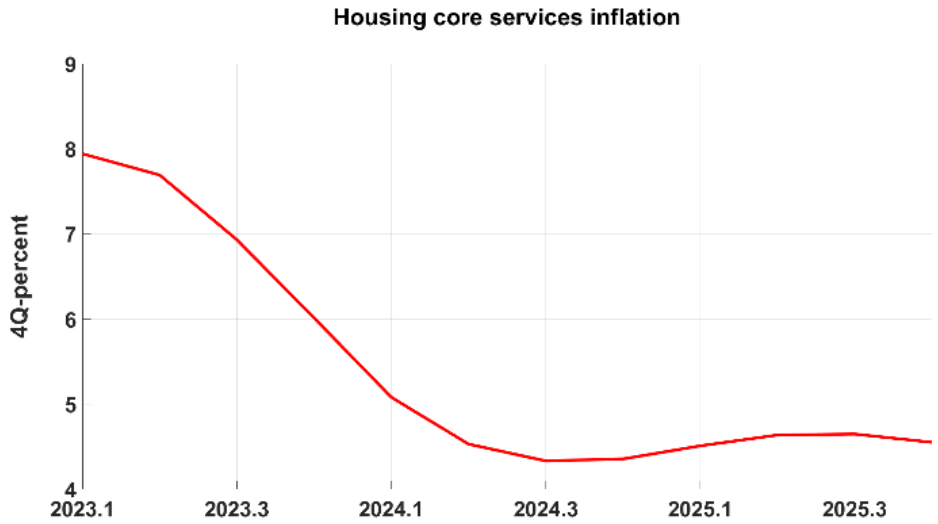


Note: Negative values of the x-axis correspond to a time series leading NTRR by that many periods.

Forecasting CPI rent

- SFRI leads CPI by quite a bit.
- While series are cointegrated, appears that cointegration term is not helpful for forecasting.
- Eyeball metric is a bit misleading; once lags of rent are included, not super-clear that that lags of SFRI are helpful.
- Simple models suggest that CPI should start going down "soon."
- Latest read was pretty hot, though…

This was my forecast (pre-Jan CPI), 4Q rate.



Taken from: Post-COVID Inflation Dynamics: Higher for Longer (with Saeed Zaman).

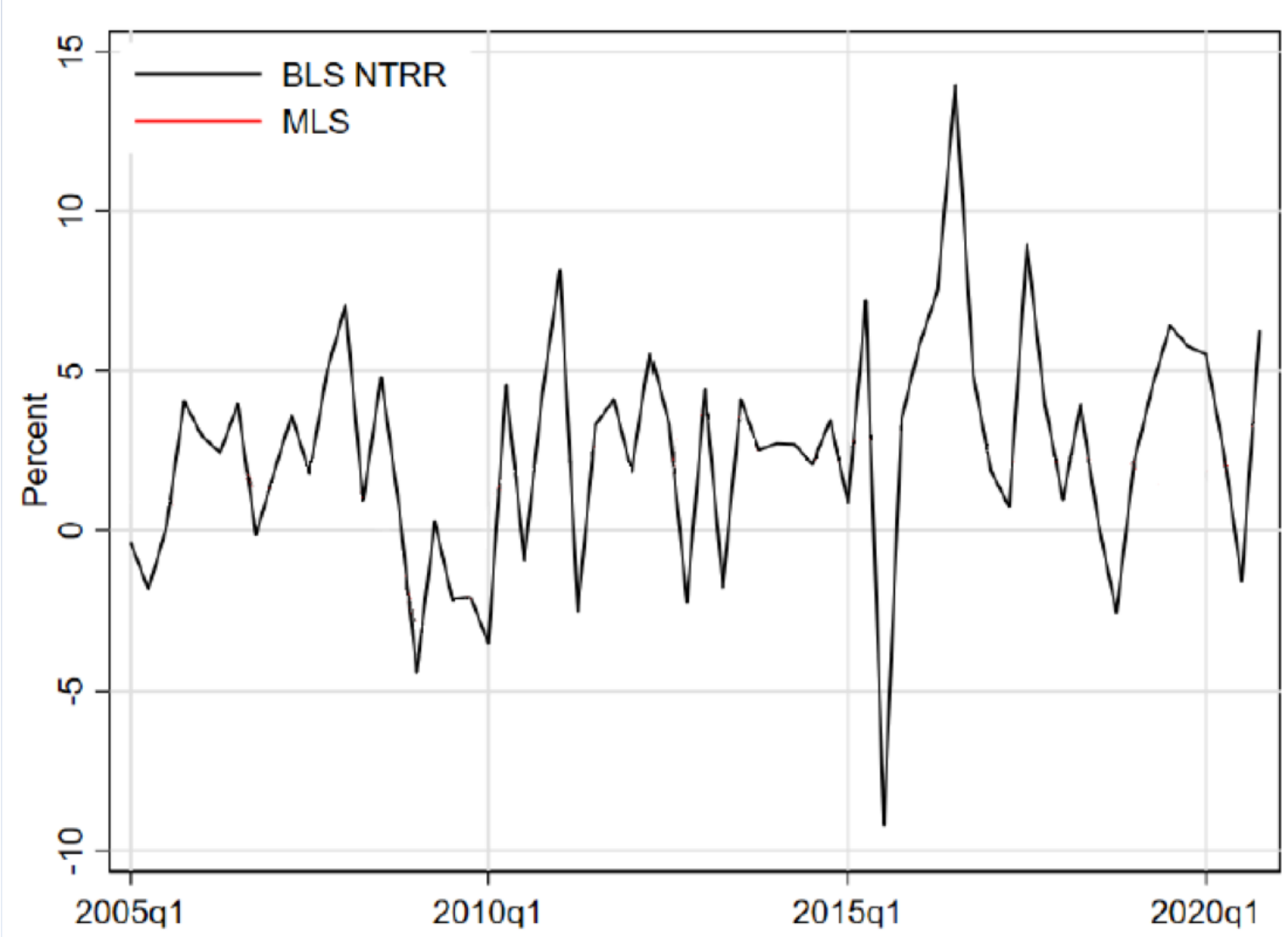
Assumes mild recession.
We see inflation at 2.6% by end of 2025.

Should CPI use NTRR?

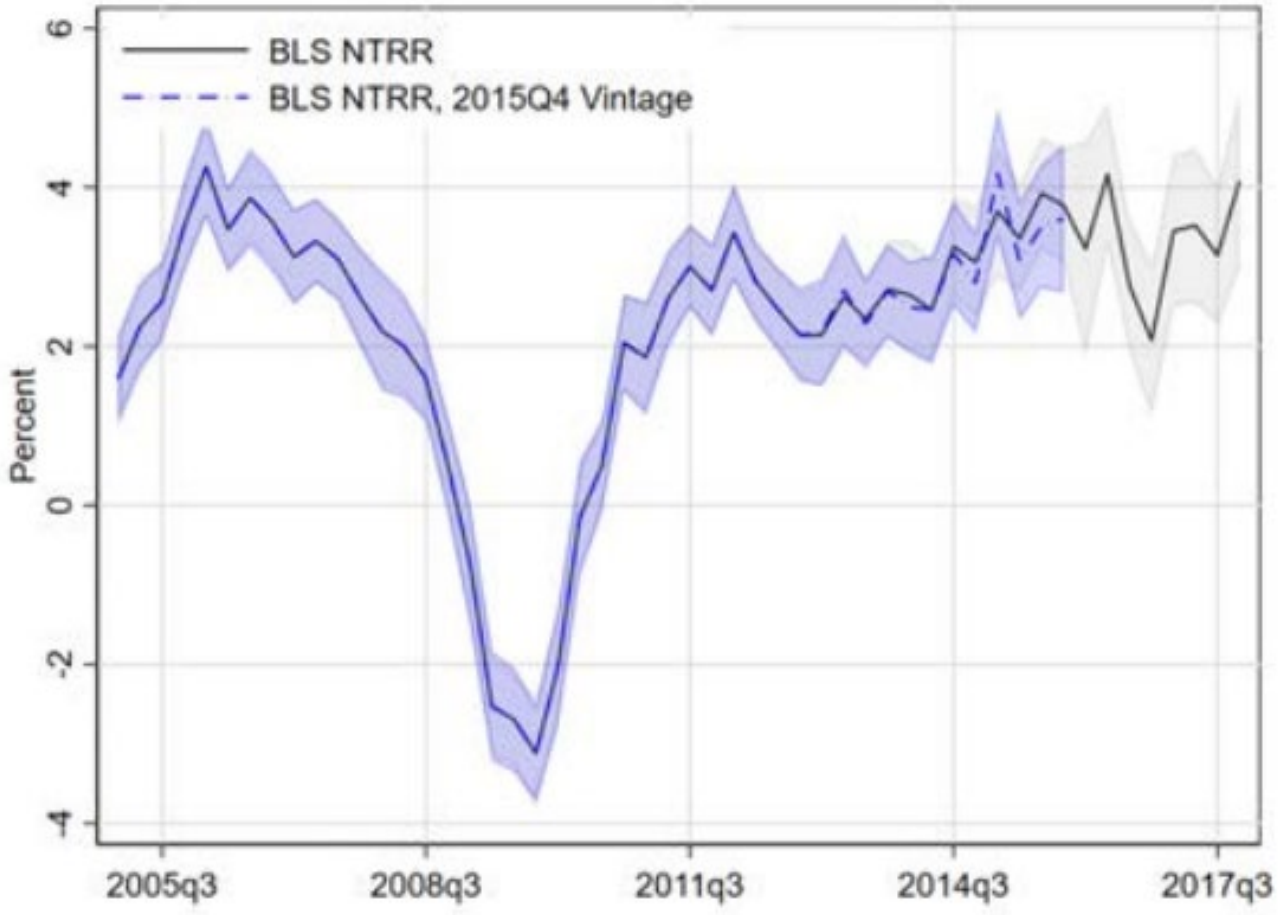
Two key practical issues for real-time use of repeat-rent in CPI

- For CPI use, need FAR bigger sample for accuracy.
- End effects & revisions.

NYC = largest BLS sample. NTRR is noisy.



End effects


BLS NTRR
BLS NTRR, 2015Q4 Vintage
Percent
6
4
2
0
-2
-4
2005q3
2008q3
2011q3
2014q3
2017q3

Rent and OER in CPI: A case for change?

- For CPI, we think it is difficult to make the case for NTRR (or SFRI).
- Theoretically, new-tenant rents don't match purpose of CPI (purchasing power for average household).
- Practically, there are huge end-point problems, and requires a very big sample.
- Easy to make the case that BLS should continue to produce NTRR.

Key Takeaways

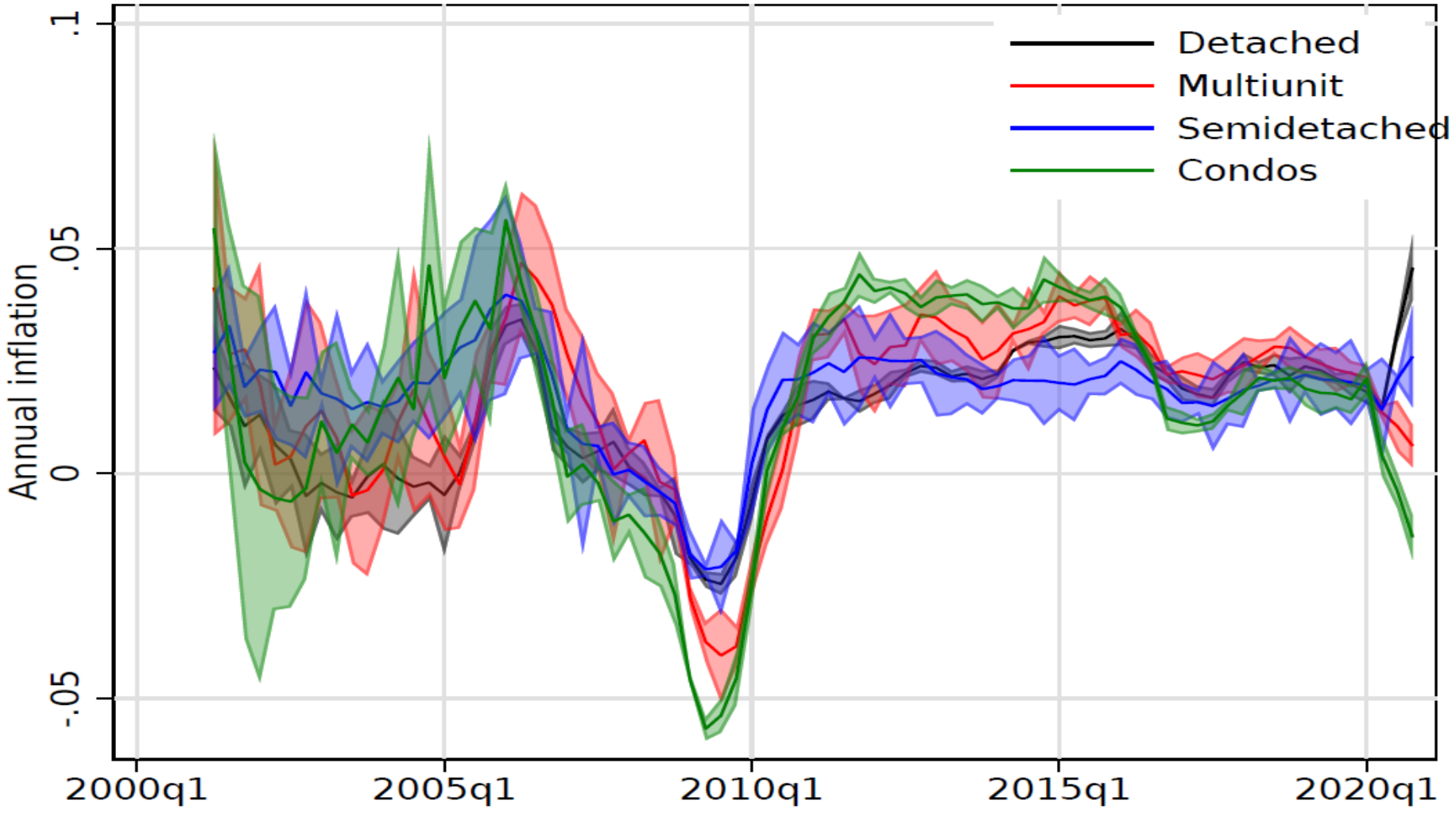
- We construct two repeat-rent indexes using CPI microdata.
- Main reason that outside indexes deviate from CPI rent: they are new-tenant indexes, not all-tenant indexes.
- CoreLogic has a surprisingly close relationship to NTRR over our sample, despite its non-representative nature (only detached, market tier, selected cities), no quality adj.
- Some, but only some, predictive content for CPI rent.
- Only CPI controls for changing quality over time (imperfectly).
- NTRR not suitable for real-time use in CPI (noisy, big revisions), not theoretically sound.

Appendix

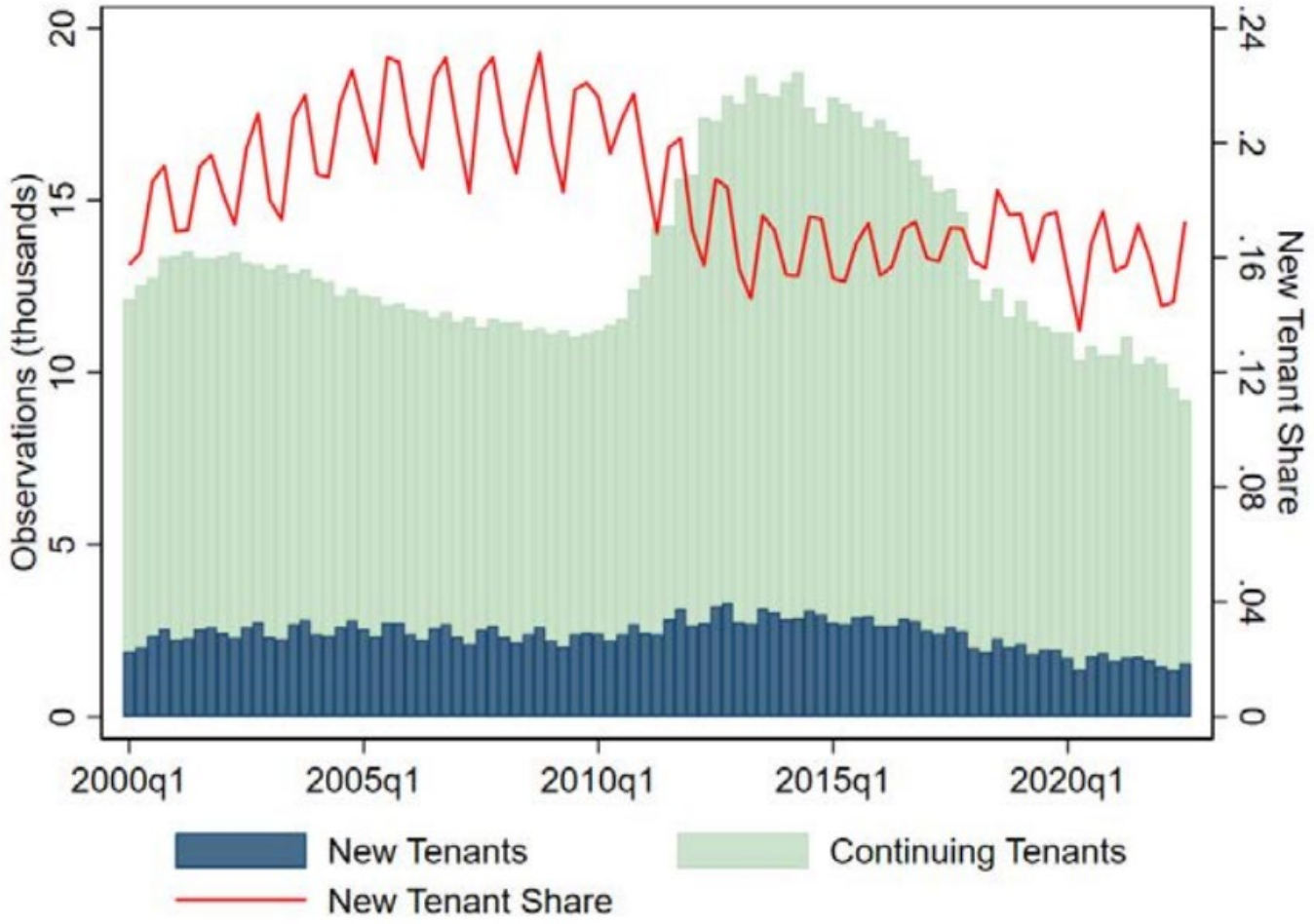
Related Literature

- Bias in CPI
  - Boskin et al. 1997, Lebow and Rudd 2003, Moulton 2018
- Bias/errors in CPI shelter; Impact of alternative approaches to shelter in CPI
  - Prescott 1997; Diaz and Luengo-Prado 2008; Verbrugge 2008; Beatty et al. 2009; Heston and Nakamura 2009; Garner and Verbrugge 2009; Diewert, Nakamura and Nakamura 2009; Crone, Nakamura and Voith 2010; Hill and Syed 2016; Ambrose, Coulson and Yoshida 2015, 2018, 2020; Goeyvaerts and Buyst 2019; Gindelsky, Moulton and Wentland 2019; Braga and Lerman 2020; Hill et al. 2020; Reher 2020, CNSTAT report (2022)
- Repeat rent indexes
  - ACY 2015, Chen and Boesel 2016 (CoreLogic), J. Clark 2020 (Zillow)
- Housing studies that use CoreLogic, Zillow

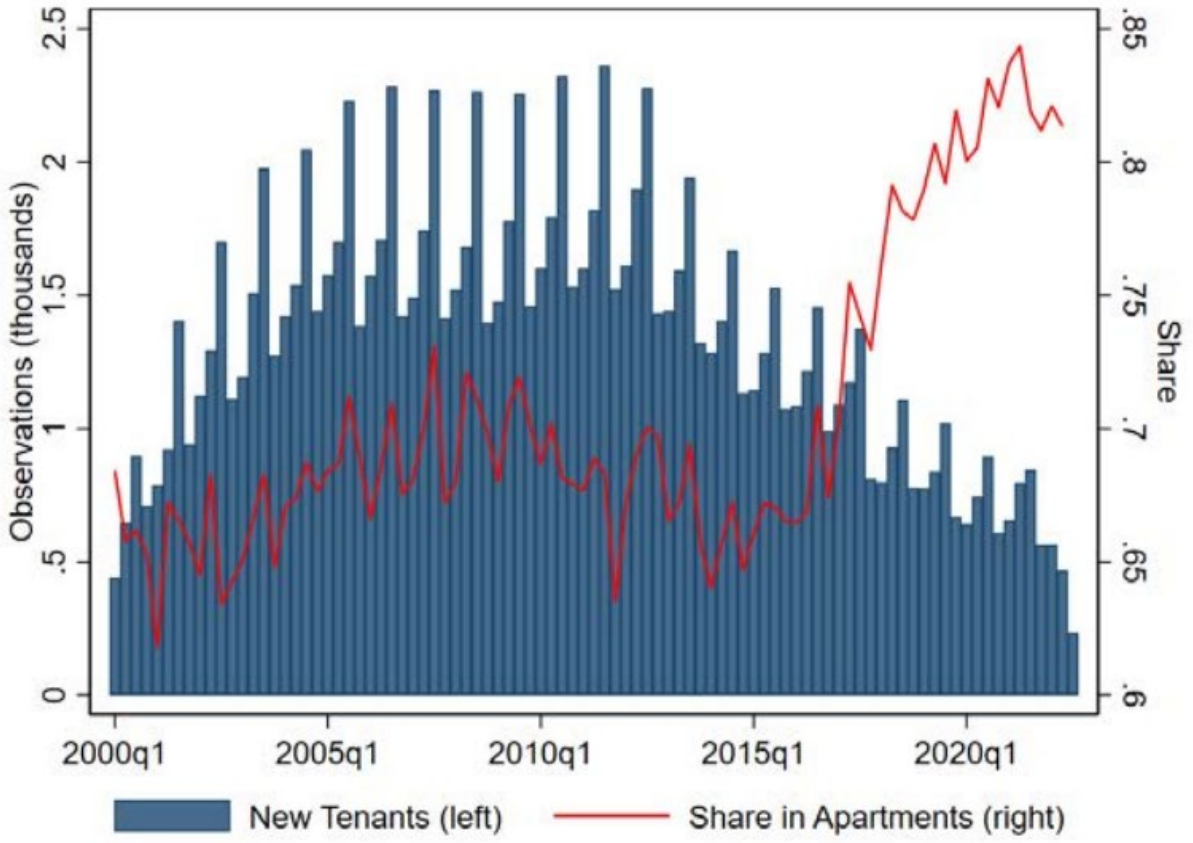
Structure type matters!



New Tenants' Share of Observations



Observations used in NTRR



Formula, and timing issues

- 6-month movement in average rent converted to monthly change using 1/6 root.

$$I^R(t) = \left(\frac{\Sigma_i w_i rent_i^*(t)}{\Sigma_i w_i rent_i^*(t-6)} \right)^{1/6} I^R(t-1)$$

- This smooths out measured rent dynamics.
- Tracks average rents, not marginal.
- Also, lag in "detecting" when rent changed on unit *k*.

ACY "Marginal Rent Index" (MRI)

- Data: RCA Commercial Property Price Indices (RCA CPPI), formerly known as Moody's/RCA CPPI.
- Large (>$2.5 million, avg. = $15 million) apartment complexes that sold this period.
  Only 20 states, 34 metro areas.
  Use national price index (repeat-sale index) and expected average cap rate (income yield).

MRI = P * E(Cap rate).

- This is a net rent index. If costs change cyclically, this will introduce time-varying bias.
- ="Expected Average Net Rent Index."
- ACY scale it to match the (short) ACY RRI.
- Huge outlier in GFC. If we rescale the index, it becomes an outlier in Covid Collapse.