Ottawa Group 2007

Utilities Adjustment for Owners' Equivalent Rent

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US Bureau of Labor Statistics

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Main Points

1. The US uses a rental equivalence approach to measuring inflation in shelter costs for homeowners.
   The BLS produces two shelter indexes, Rent and Owners' Equivalent Rent (OER). Both are based upon inflation in market rents.
2. OER is a rent-of-shelter concept which does not include utilities.
3. Rent contracts sometimes include utilities;
   these need to be removed before these rents are used to compute OER.
   Thus, a utilities adjustment is necessary; the only issue is, how best to do it.
4. Between 1999 and 2006, rent inflation and OER inflation diverged several times, which caused some to wonder if the BLS was doing something wrong with the utilities adjustment.
5. There are several potential explanations for such divergence.
   When we investigated the issue, we found that the utilities adjustment was not the main story.
6. In the process of investigating the adjustment, we found a way to improve it.

Terminology for This Talk

Rent = amount paid to landlord (Rent index simply tracks these)

Shelter = “roof over your head” (this concept is the goal for OER)

A rental contract always has a shelter component, and sometimes also has a utilities component.

Background

In the CPI, shelter expenditures account for about 1/3 of the total weight of the index. OER is most of this.

How to measure homeowner shelter costs? A well-studied problem.

SNA, and US CPI, use **rental equivalence**.

Conceptually: rental equivalence says that:

Homeowner shelter inflation = *change* in what the house would rent for.

However, market rents on owned homes aren't observable.

But “location-location-location” and our research concur that rent-changes are very similar in nearby areas,

whereas other seemingly-good candidate predictors, such as level of rent or shelter type, are only weakly/vaguely related to rent changes.

Thus, OER index, I, is moved based upon inflation in market rents, as follows.

$$I_t = I_{t-1} * R_t$$

$$R_t = \left(\frac{\Sigma w_i rent_{i,t}}{\Sigma w_i rent_{i,t-6}} \right)^{\frac{1}{6}}$$

We make sure that there is plenty of sample data **in** (or, failing that, **near**) heavily owner-occupied regions. (The weights w_i differ across the Rent and OER indexes).

Key detail in constructing OER: treatment of **utilities**.

Utilities Adjustment

Many rental contracts include utilities; that is, the tenant has no separate utility bill, and the rent includes compensation to landlord for utilities.

In BLS data, **31%** of (weighted) units have energy utilities included in the rent (mostly apartment buildings; by region (weighted): NE 59%, MW 36%, S 18%, W 17%).

But homeowners always pay their own utilities.
Utilities expenditures for homeowners show up elsewhere in the CPI.

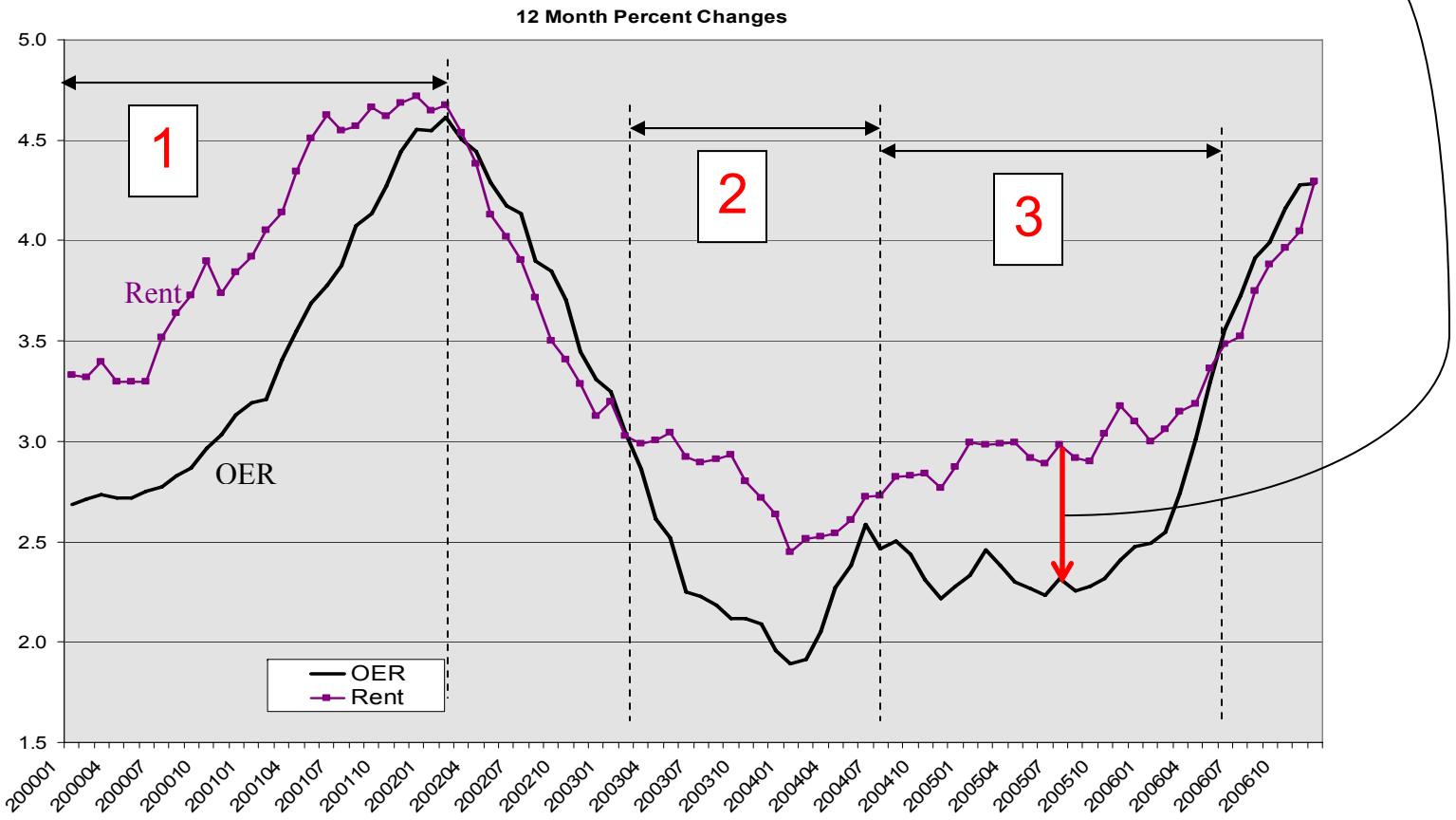
So if rents used in OER included utilities, this would be a double-counting of utilities. (OER = **pure shelter** rent)

BLS **must** remove the utilities portion of rent ("utilities adjustment"), prior to using these rents in the OER computation.

The only question is, are we doing the adjustment properly?

The Rent-OER Inflation Divergence Issue

Depicted is 12-month changes in both indexes, 2000-2006. There are three distinct periods during which Rent inflation was significantly higher than OER inflation. … Due to U.A.??



What caused these divergences?

These divergences caused some people concern.

One key difference between Rent and OER: the **utilities adjustment**.
(but there are others, e.g. rent control units, and aggregation weights)

Prior to this study, most analysts believed that this adjustment was the story,
i.e. **the** factor responsible for the divergence.

But we show in this research that this is not the case.

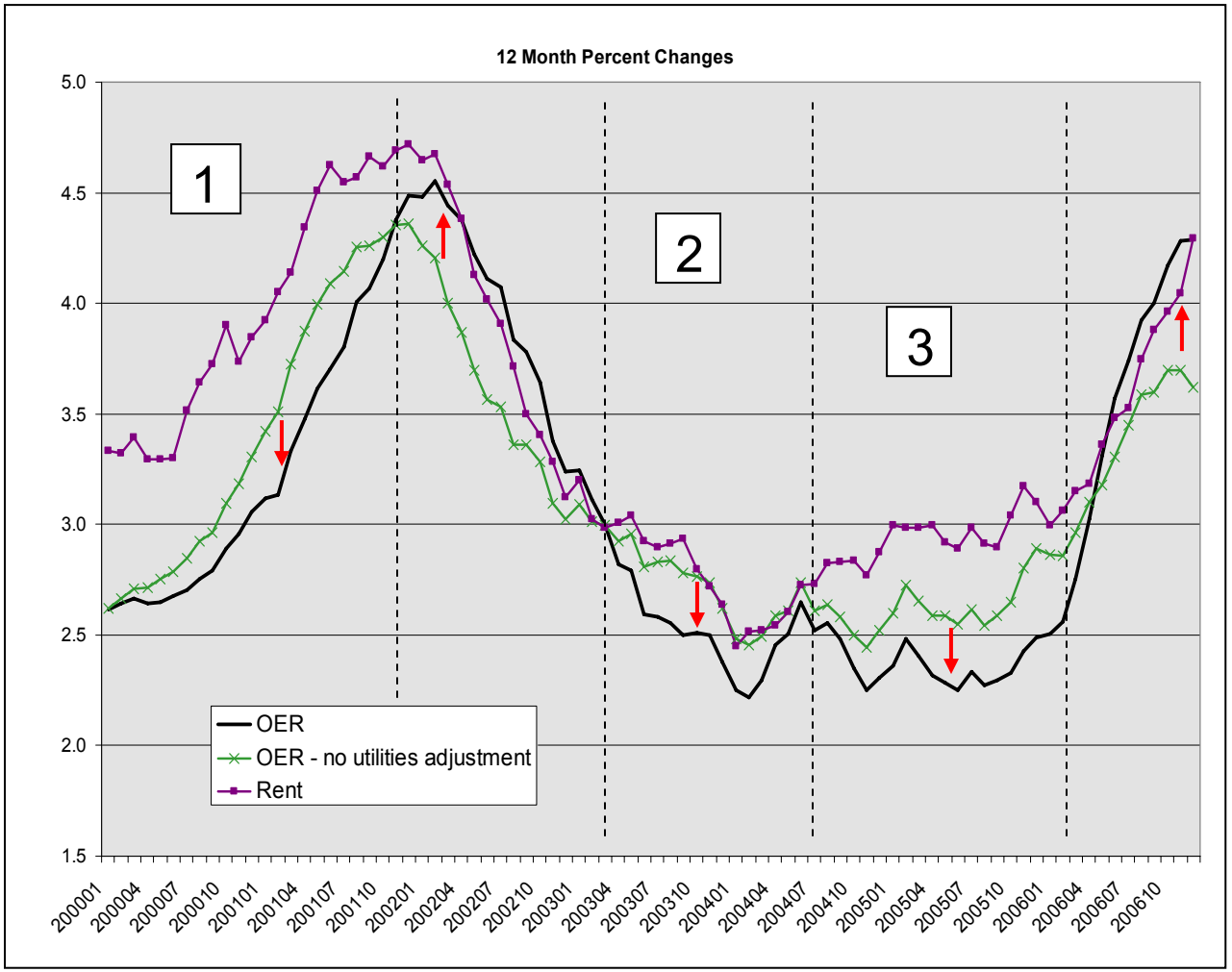
(David Johnson and John Layng prompted this work;
Rob Poole and Frank Ptacek each wrote CPI shelter index simulators
which replicate CPI production output to high degree of accuracy.)

More precisely, while the utilities adjustment **can** be quantitatively significant
during periods where utilities prices are changing **rapidly**,

Utilities adjustment is **rarely** the **main** determinant of the OER and Rent divergence.

What Did Utilities Adjustment Contribute to Difference?

Research series (green): OER w/ no utilities adjustment (Rob Poole)
(↓ denotes impact of utilities adjustment)



1 (Pre-2002) utilities not main part of gap (of ~1%), U.A.: 0→0.4%→0

2002 no divergence (but there would have been …)

2 (2003-2004:II) small gap (~0.3%), only period where U.A. is the main story (not pictured: water/sewer improvement blip).

3 (2004:III-2006:I) gap rises to 0.7%, U.A.: 0.05%→0.35%→ 0 "maybe half."

2006:II-IV no divergence

Remember, Rent is not a shelter index;
it is a shelter **plus utilities** index.

Thus, OER should not equal Rent,
unless utilities remain unchanged.

But, Utilities Adjustment Can Be Improved

The research **has** identified a conceptual deficiency in the utilities adjustment.

In particular, current methods impart additional **variance** to the OER index;
i.e., in the **short run**, OER diverges from its theoretical ideal.

(Ultimately because most rents change only annually, implicitly ignored by our current method.)

The conclusion:

It would be better to smooth out utilities inflation, in order to mimic the implicit smoothing in rents … otherwise we add volatility to the index.
With current methods, CPI inflation will diverge from measurement goal for **12 months** following a utilities price innovation.

Improving the CPI Utilities Adjustment

OER a shelter concept, OER inflation based upon inflation in the shelter component.

For a contract which includes utilities,

rent = (shelter rent) + (utilities cost)

Each unit: collect rent every 6 months, estimate utilities expenditure every month.

BLS procedure: subtract this month's utilities from every rent,
and use those utilities-adjusted rents for OER.

But: Most rents are fixed for 1 year (hence only collect data every 6 months!).
Leases (Census data):

- 44% of all units had annual leases
- 4% had leases longer than one year
- 36% had leases shorter than one year
- 16% had no lease.

Regardless, most rent adjustments occur at roughly annual intervals.

Key: if utilities prices go up in the middle of the year, rent does not change.

Thus to the consumer, shelter rent is fixed **and** utilities charge is fixed.

Until my lease changes, the shelter part of my rent is fixed.

If utilities prices go up, landlord profits fall, but my shelter rent doesn't change.

Suppose landlord set a rent of $1200, of which $1000 was for rent-of-shelter, and $200 was for utilities.
My contract expires in August.

If utilities prices rise from $200 to $400 in April, *this doesn't change my rent*, and in particular,
my shelter rent doesn't suddenly fall to $800 = $1200 - $400.

Instead, landlord profits fall. But we only worry about prices facing the consumer.

However, current BLS procedures implicitly say that my shelter rent did immediately fall.

Example to illustrate current method, and suggested new method

(Note: this example counterfactually assumes that the BLS calculates average rents, not a rent index; but the intuition is identical, and it is simpler to maintain this assumption.)

Complex with 12 identical units.
Unit 1's lease is a January lease; unit 2's lease is a February lease; etc.

Ideal rent index: average **rent** over time.
Ideal OER index: average **rent-of-shelter** over time.

For simplicity, assume shelter part of rent is fixed at $**1000** (stable and expected to remain stable).
(say apartment complex next door has individually metered apartments, lease = $1000)

Each unit's rent equals $1000 *plus* expected utilities cost over the next year.

Suppose that up until April, utilities have been fixed at $**200**.

All rents thus equal $**1200** = $1000 + $200.
But in April, utilities costs rise to $400.

This month (April), utilities prices double to $**400**, expected to stay there.
But only the April unit lease changes to $1400; all other leases are still fixed at $1200.
So Rent index (in April) given by:

shelter + avg. utilities in rents

Avg. Rent = (1/12)[11(1200) + 1400] = 1000 + (1/12)[11(200) + 400] = $1216.67

(…rises because utilities rose.)

The correct measure of **OER** should still be **$1000**.

But BLS procedure would subtract $400 from each rent, yielding

BLS I: Avg. OER = (1/12)[11(1200 - 400) + (1400-400)] = $817

Over the next 12 months, *as rents adjusted* to the new higher utilities price, the BLS-type measure would converge to theoretical ideal.

Suppose instead of subtracting the current utilities price from current average rent, we instead subtracted a **12-month moving average** of utilities prices from each rent:

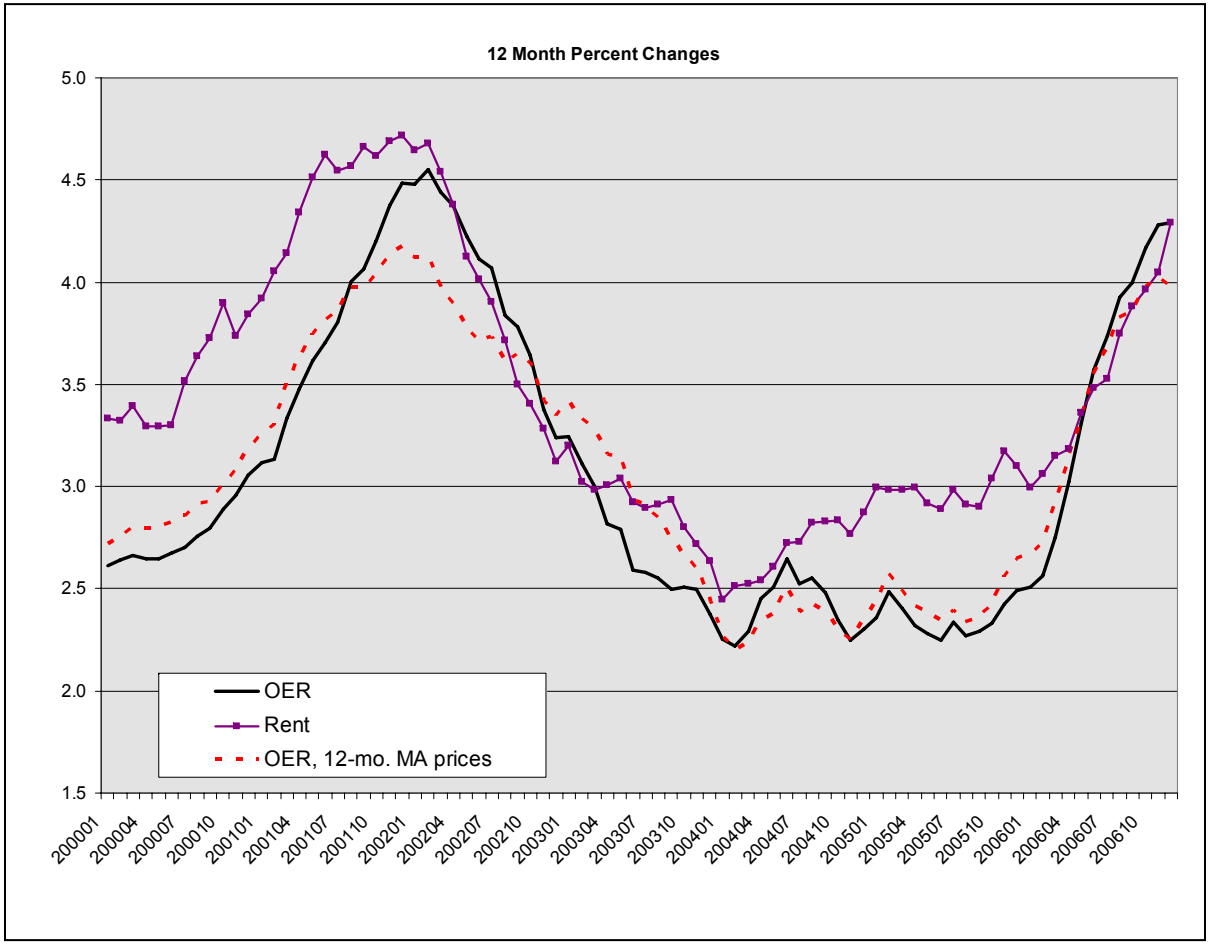
BLS II: Avg. OER = (1/12)[11(1200) + 1400] – (1/12)[11(200) + 400)]
= $1216.67- 216.67 = $1000

- Table follows.
- That is the basic insight. The paper deals with the messy details (i.e., let's skip the math).

	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Jan	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1400	1400	1400	1400
Feb	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1400	1400	1400
Mar	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1400	1400
Apr	1200	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
May	1200	1200	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Jun	1200	1200	1200	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Jul	1200	1200	1200	1200	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
Aug	1200	1200	1200	1200	1200	1400	1400	1400	1400	1400	1400	1400	1400	1400
Sep	1200	1200	1200	1200	1200	1200	1400	1400	1400	1400	1400	1400	1400	1400
Oct	1200	1200	1200	1200	1200	1200	1200	1400	1400	1400	1400	1400	1400	1400
Nov	1200	1200	1200	1200	1200	1200	1200	1200	1400	1400	1400	1400	1400	1400
Dec	1200	1200	1200	1200	1200	1200	1200	1200	1200	1400	1400	1400	1400	1400
Utilities	200	400	400	400	400	400	400	400	400	400	400	400	400	400
MA(12)	200	217	233	250	267	283	300	317	333	350	367	383	400	400
Avg. Rent	1200	1217	1233	1250	1267	1283	1300	1317	1333	1350	1367	1383	1400	1400
BLS I (U(t))	1000	817	833	850	867	883	900	917	933	950	967	983	1000	1000
BLS II (MA)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

= avg. of: 10(1200 – 400) + 2(1400 – 400)

What difference would new procedure make?



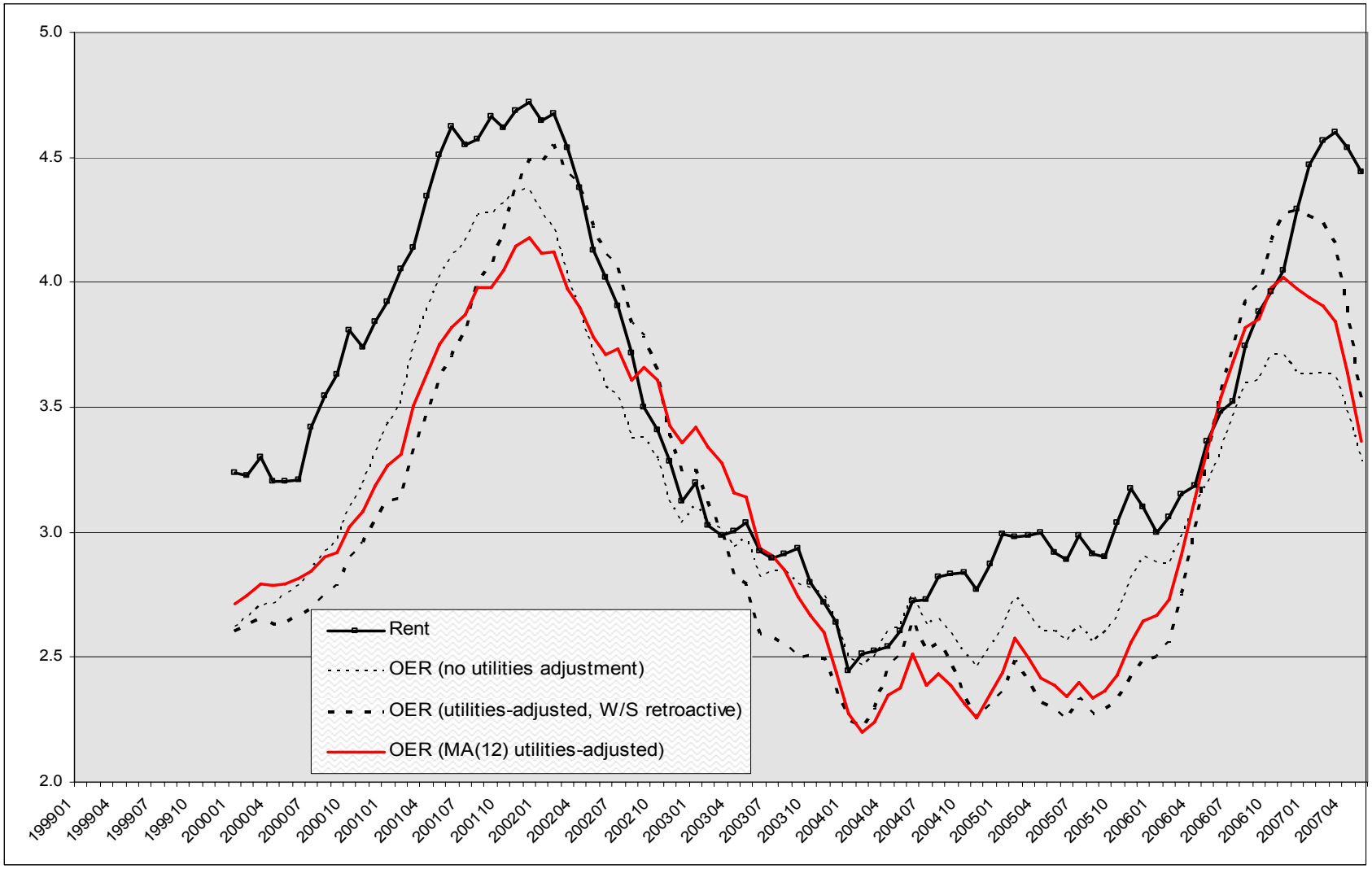
Will agree with official measures except when utilities inflation is changing a lot;
Will agree with official measures over longer horizons (no bias).

New OER series is less volatile (std. deviation 17% smaller);

Response to sharp changes in utilities inflation more subdued.

Biggest impact in 2001:III,IV: monthly OER inflation reduced by 0.7% (annual rates), reducing overall CPI inflation by 0.2% (annual rates).

Implement? Need to compare gain relative to cost of implementation.



The latest (through May): OER and Rent inflation divergence (Poole/Verb.: weights)

Conclusion

Periods of divergence between OER inflation and Rent inflation led to questions about BLS utilities adjustment procedure.

A utilities adjustment procedure is necessary; the only issue is whether we are doing it properly.

Findings:

- While utilities adjustment is sometimes fairly significant, it is **not** the major determinant of the divergence.
- However, current procedures could be improved by smoothing out utilities price inflation prior to making the utilities adjustment.
- Units with high OER weight have recently experienced much less inflation than units with high Rent weight. (An interesting fact)