

# Measurement of Owner Occupied Housing in the U.S. Consumer Price Index

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Treatment of owner-occupied housing (OOH) in consumer price indexes is... **the most difficult issue** faced by CPI compilers.

The dual use of CPIs as both (1) a macroeconomic indicator and (2) an indexation tool can lead to **clear tensions** in designing an appropriate treatment for (OOH).

- *Consumer Price Index Manual: Theory and Practice*  
ILO, IMF, OECD, Eurostat, UN, World Bank, © 2004  
§§10.4-10.5, page 179.



# Conceptual approaches to OOH

1. Acquisition    2. Payment    3. Use

## ■ Acquisition

- ▶ **Objective:** Change in the cost of acquiring a housing unit
- ▶ **Weight:** Net purchase price + maintenance\repair + property taxes + insurance
- ▶ **Price change:** Change in replacement cost of dwellings (sample of home sales)
- ▶ **Challenges:**
  - Separating investment element from consumption element
  - Quality adjustment of homes sold month by month

# Conceptual approaches to OOH

1. Acquisition    2. Payment    3. Use

## ■ Payment

- ▶ **Objective:** Change in outlay required to gain access to shelter service
- ▶ **Weight:** Mortgage interest + maintenance\repair + property taxes + insurance
- ▶ **Price change:** Aggregate of price change of weight components
- ▶ **Challenges:**
  - Measurement of price change for mortgage interest cost is problematic
  - Classification of mortgage principal as investment or consumption

# Conceptual approaches to OOH

1. Acquisition    2. Payment    3. Use

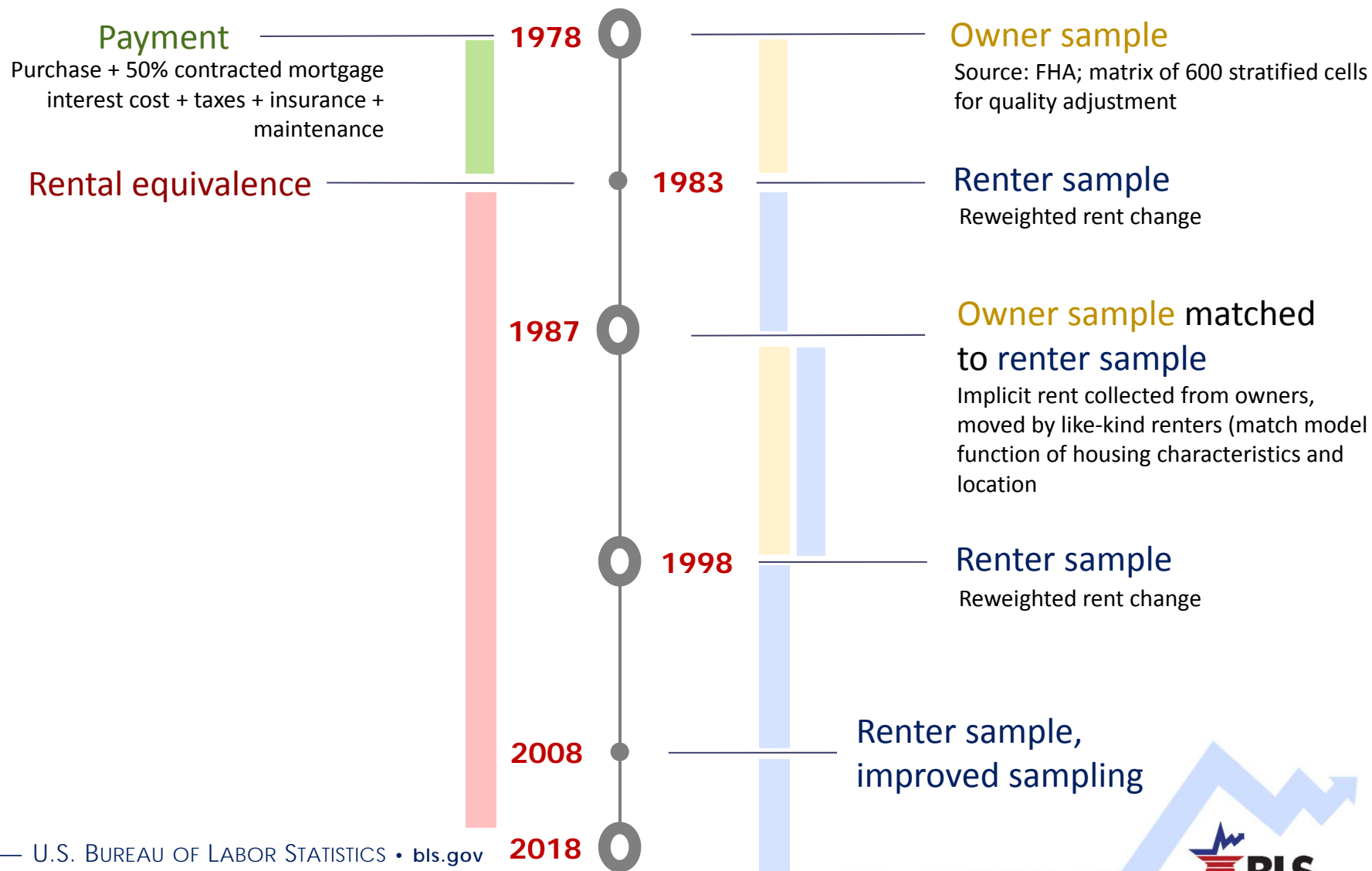
## ■ Use

- ▶ **Objective:** Change in the value of the flow of shelter service
- ▶ **Weight:** User cost or rental equivalence
  - **User Cost** = recurring costs + opportunity cost of holding the asset
  - **Rental equivalence** = estimated amount owner would pay to rent home
- ▶ **Price change:** Imputed from the change in rent of like-kind rental dwellings
- ▶ **Challenges:**
  - Full user cost difficult to measure
  - Are owner estimates of rental value reliable (for weighting)?\*
  - Is rental housing stock homogeneous\representative of owned housing stock (for pricing)?

# History of OOH treatment in CPI-U

## Weight

## Price Change



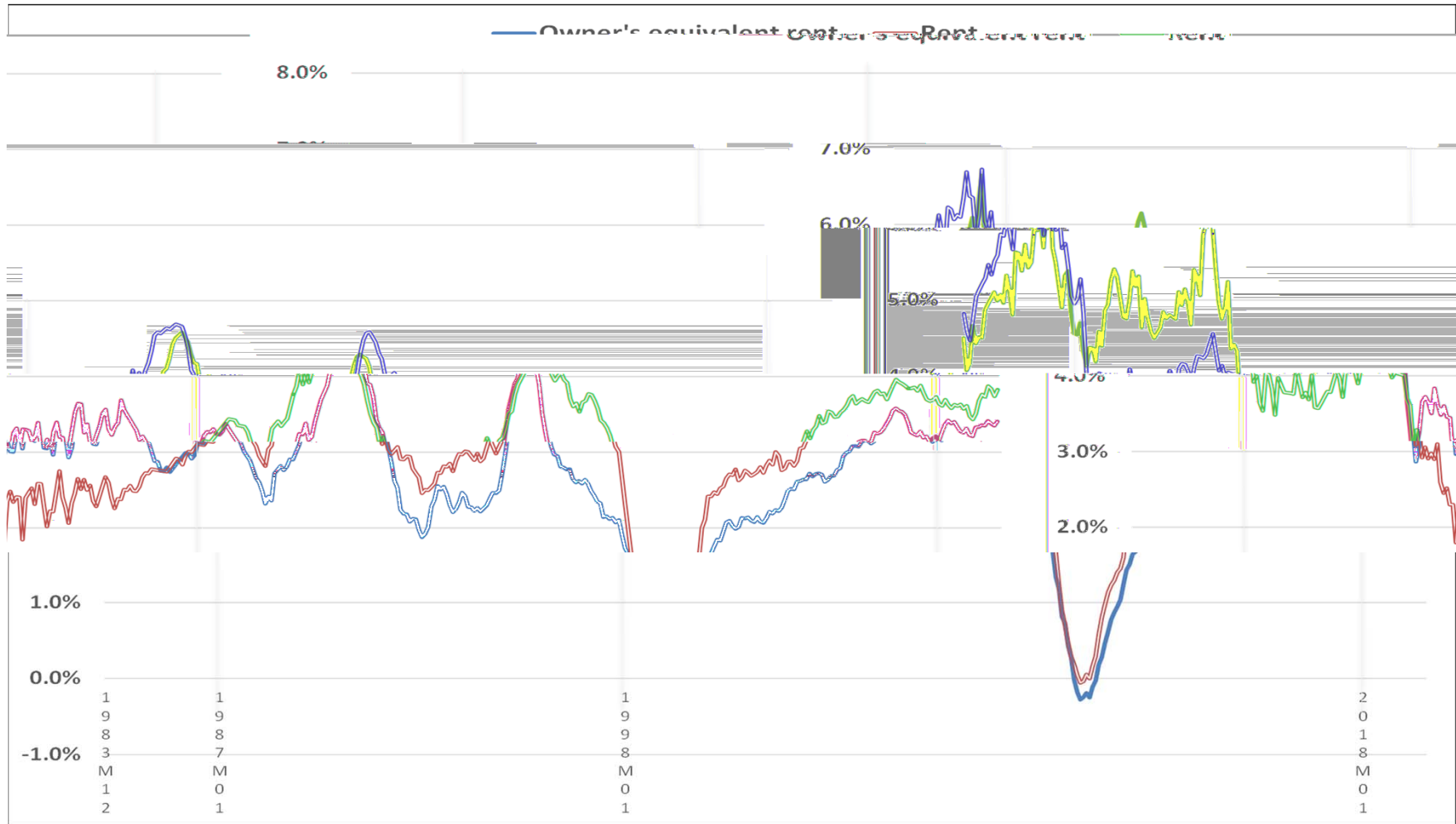
# Model to estimate segment OOH rental value

$$\begin{aligned} \text{Ln(Rental equivalence)Owner Rent)} = & \text{Intercept} \\ & + \text{Average number of bedrooms} \\ & + \text{Ln(Average property value)} \\ & + \text{Ln(Median owner income)} \\ & + \% \text{ mobile home units} \\ & + \% \text{ other structure units} \\ & + \% \text{ apartment building} \\ & + \% \text{ high rise} \end{aligned}$$

- Source: CE Interview Survey data; units mapped into Census blocks (segments)
- 1998: Systematic segment sampling, controlling for inner city and suburb location
- 2008: Systematic segment sampling, controlling for segment housing stock value



# 12-month percent change, 1983 to 2019





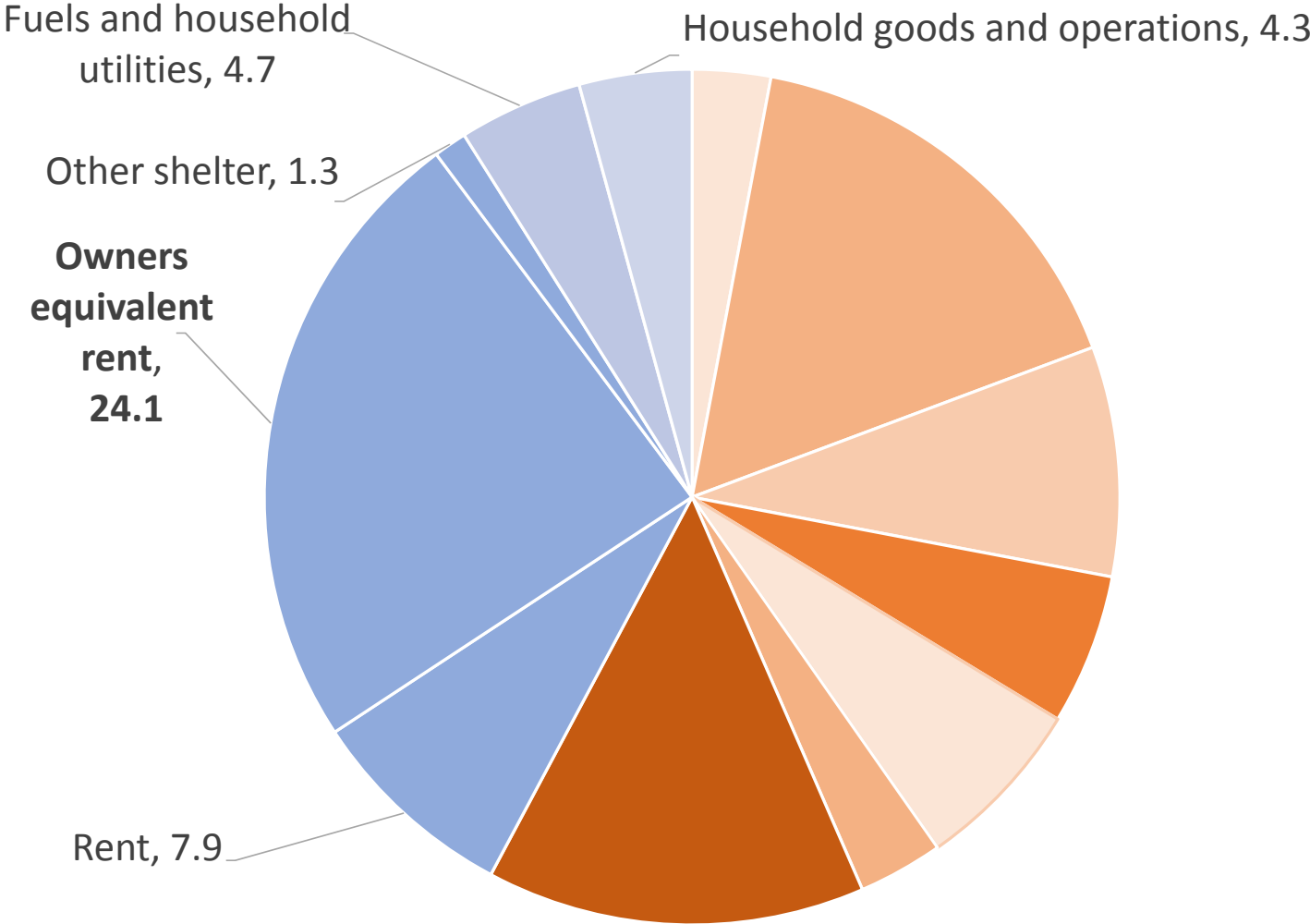
# CPI Housing Survey example unit data

	Month T-6	Month T	Change in month T
<b>Collected rent</b>	\$ 500	\$ 600	Landlord increased biweekly payment by \$100
Payment frequency	biweekly	biweekly	
Normalized monthly rent	\$ 1,000	\$1,200	
Utility adjustment	<del>                    </del>	\$ 50	Electricity no longer included in rent
Facility adjustment	<del>                    </del>	\$ (75)	Garage parking space now included
Structural change adjustment	<del>                    </del>		
Analyst adjustment	<del>                    </del>		
Age-bias adjustment	\$ (5)		
<b>Economic rent (HA01)</b>	<b>\$ 995</b>	<b>\$1,175</b>	18.1% 6-month change, 2.8% one month change
Normalized monthly rent	\$ 1,000	\$1,200	
Utility removal	\$ (50)		
Facility adjustment	<del>                    </del>	\$ (75)	
Structural change adjustment	<del>                    </del>		
Analyst adjustment	<del>                    </del>		
Age-bias adjustment	\$ (5)		
<b>Pure rent (HC01)</b>	<b>\$ 945</b>	<b>\$1,125</b>	19.0% 6-month change, 2.9% one month change

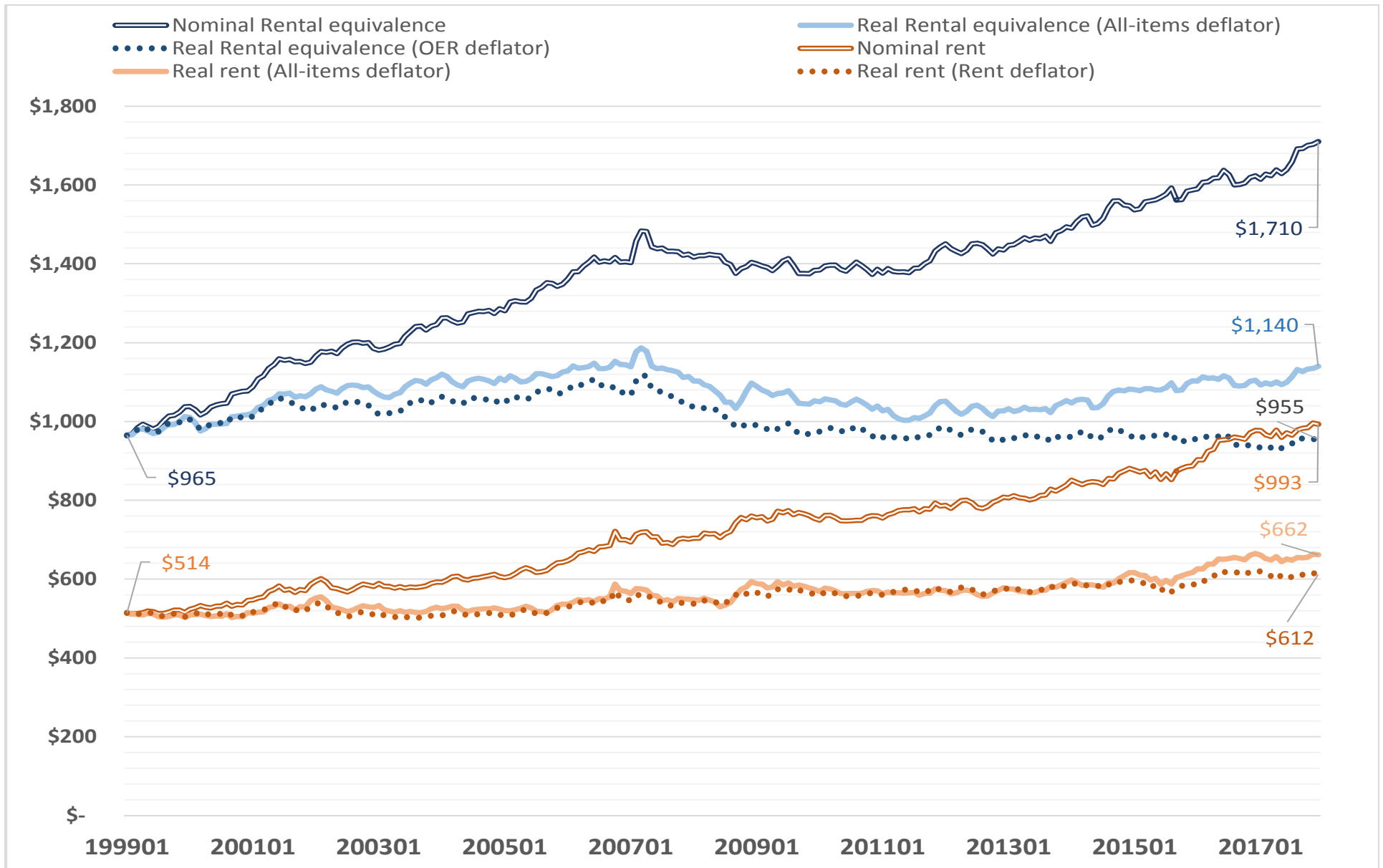
Units used for RENT but not OOH include rent-controlled units and units in 100% renter occupied segments.

# Relative importance of Housing in CPI-U, December 2018

Housing = 42%

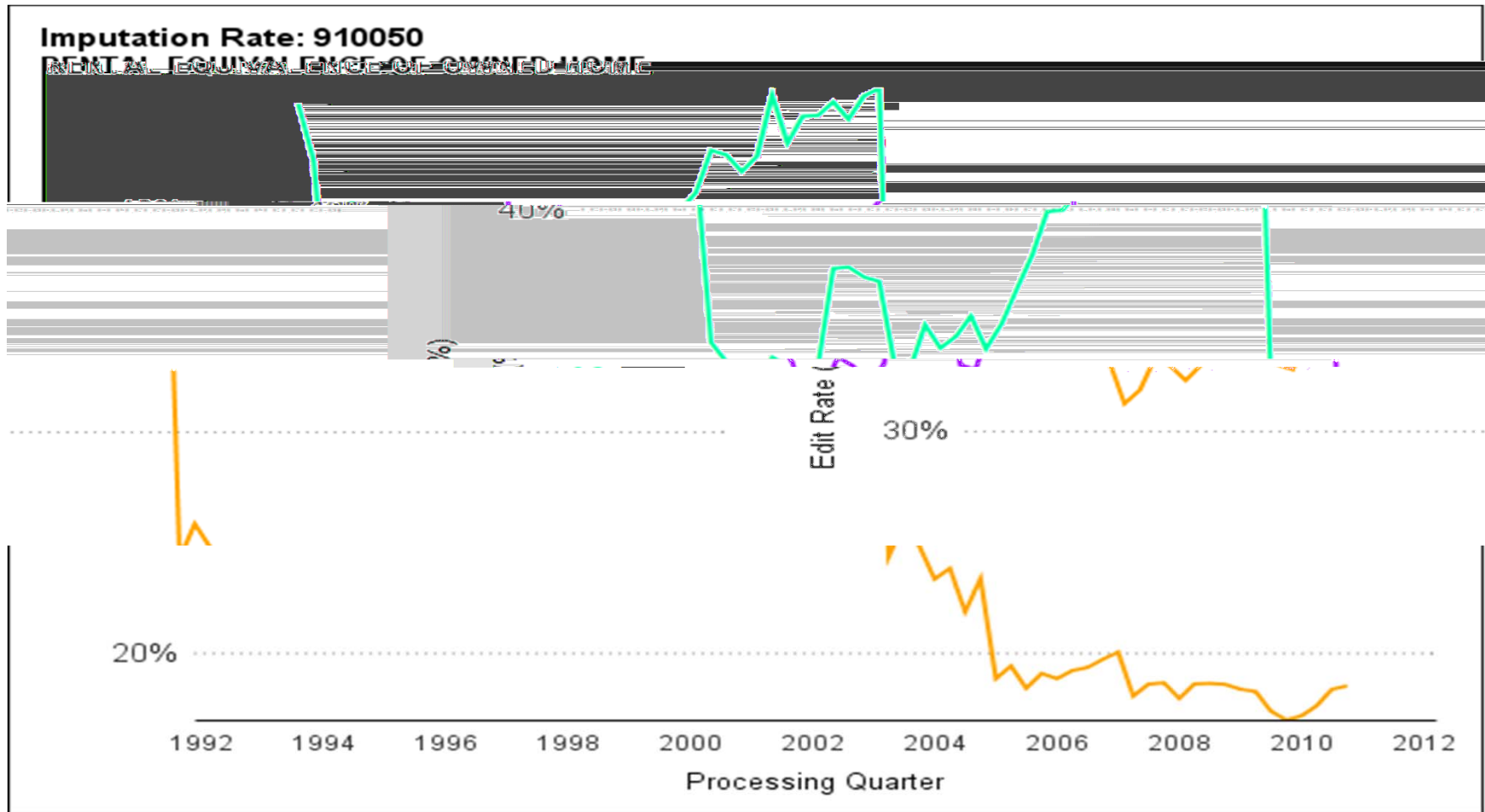


# Average monthly rental equivalence, 1999 to 2017



# Reliability of owner estimates of rental value

Distribution of Q1 to Q4 rent value change, 4-quarter households, CE-Interview Survey, 2018



# Rented dwellings vs. owned dwellings

Unique addresses sampled, CE-Interview Survey, 2017 and 2018

Structure type	Owners	Renters	CPI Housing Survey
<b>Single family units</b>	<b>92.0%</b>	<b>47.6%</b>	<b>41.5%</b>
Single family detached	85.6%	31.3%	26.0%
Single family attached	6.4%	16.3%	15.5%
<b>Multi-family units</b>	<b>2.9%</b>	<b>46.9%</b>	<b>56.1%</b>
Garden-style	0.4%	2.4%	
High-rise	0.7%	4.3%	
Type not specified	1.8%	40.3%	
<b>Mobile homes and other units</b>	<b>5.1%</b>	<b>4.1%</b>	<b>2.4%</b>
<b>College dorms</b>	<b>0.0%</b>	<b>1.4%</b>	

**NOTES:**

- 1, Single family attached units include townhomes, rowhomes, and duplexes.
2. Mobile homes and other units include house boats, campers, and recreational vehicles garaged on owned or leased land with an address.
3. CE-Interview sample size per PSU (CBSA) in 2018: @ 250 total, 160 owner, 90 renter (64% owner, 36% renter)
4. CPI Housing Survey data from Aug 2018 to January 2019.
5. CPI Housing Survey sample size per PSU (CBSA), roughly 100 per panel, 20 segments per PSU, 5 units per segment.



## Concluding remarks

- Reliability of owner estimate of rental equivalence in CE-Interview has improved over time
- CPI Housing Survey rent sample under-represents single family detached houses for use in OOH estimator
- Future BLS research:
  - ▶ Evaluate stratification of renter sample by housing type (*2004 ILO CPI Manual* recommendation)
  - ▶ Evaluate use of Payment approach for OOH in subpopulation indexes such as CPI-W and CPI-E (*2002 CNSTAT At What Price?* recommendation)



## Comments on Aten\Rassier proposal

- Should owner premium  $\beta$  be calculated at the core-based-statistical area (CBSA) level instead of STATE level?
- Does the lag in ACS availability present practical challenges to implementing this methodology?
- Should 100% of vacant owned dwellings be treated as occupied (re: owners 'rent' to themselves)?

# Contact Information

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# Reference Slides



# Conceptual approaches to OOH

	Measurement Objective	Weight	Price Change	Practical Issue
1. Use	Change over time in the value of the flow of shelter service			
	User cost	$rM + iE + D + RC - K$ where M=mortgage debt, E=equity in the home, r= mortgage interest rates, i= rate of return available on alternative assets, D=depreciation, RC= recurring costs, and K=capital gains.	Derive from rent sample, excluding rent-controlled and rent subsidized units	Are rental dwellings representative of owned dwellings?
	➔ Rental equivalence	1. Estimate of rental value by owner; or 2. Match owner dwelling to rental dwelling, and use rented dwelling rental value		
2. Payment				
	Change in actual outlay required to gain access to shelter service	Downpayments on new purchases + purchase transaction costs + repayments of mortgage principal + mortgage interest + alterations and additions + insurance + maintenance and repair + property taxes	Aggregate of separate component indexes for mortgage interest, maintenance and repair, and property taxes	Measurement of mortgage interest cost change difficult
3. Acquisition				
	Change in the cost of acquiring the dwelling	Net purchases of used dwelling + purchases of new dwellings + alterations and additions + purchase transaction costs + maintenance and repair + insurance + property taxes minus portion considered investment (e.g. cost of land=investment element and cost of structure=consumption element).	Change in replacement cost of existing dwellings and newly constructed dwellings (owner sample)	Separating investment element from consumption element

**NOTES:**

1. Summarized from ILO Consumer Price Index Manual, §§10.7-10.10.50.
2. Rental equivalence approach formally recommended in the System of National Accounts adopted by the UN Statistical Commission, 1993.



YEAR	CONCEPT	WEIGHT	PRICE CHANGE
1978	Payment	Net purchase price (1968-1973) + mortgage interest cost (first half of amortization term) + property tax + maintenance and repairs + insurance	Quality adjusted average price of a monthly, lagged rotating sample of homes purchased. <a href="#">SOURCE: house sales from Federal Housing Administration</a> + Indexes for mortgage interest cost change + Indexes for maintenance & repairs, insurance, and property taxes (standard CPI goods\services approach)
1983	Use (Rental equivalence)	Rental value of owned dwelling, unfurnished and without utilities; Directly estimated in CE-Interview Survey	Renter sample; reweighted to represent owner units
1987			Owner sample; implicit rent moved forward by matched rented dwellign unit
1998			Renter sample; reweighted to represent owner units; sample stratified by geography to control for inner city and suburb representation
2018			Renter sample; reweighted to represent owner units; CBSA's partioned into segments (Census block groups); systematic sampling of segments, controlling for total housing stock value

