# 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.



#### 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



#### 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



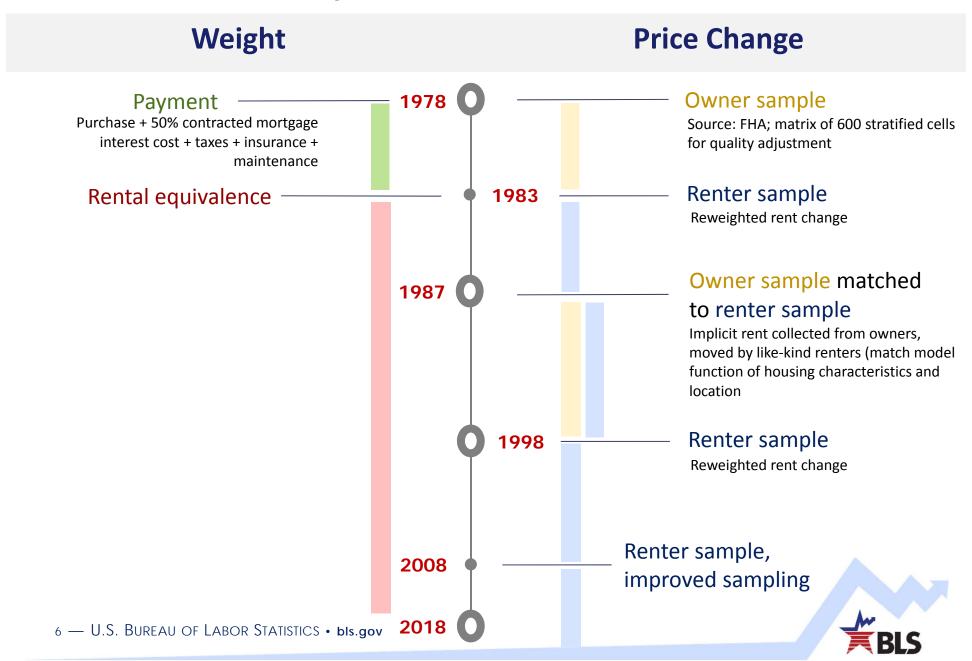
#### 1. Acquisition 2. Payment 3. Use

### 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**



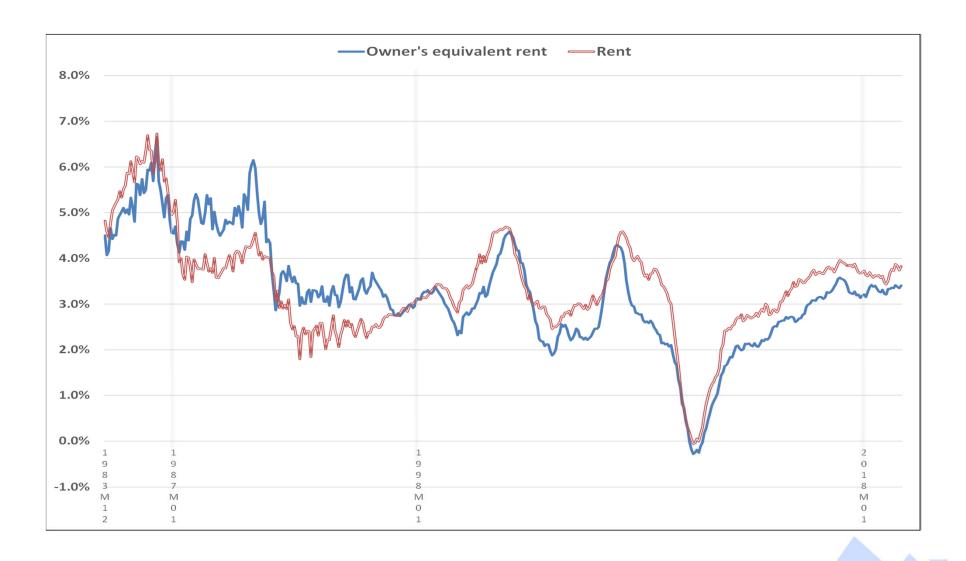
# Model to estimate segment OOH rental value

Ln(Rental equivalence)Owner Rent) = Intercept

- + Average number of bedrooms
- + In(Average property value)
- + In(Median owner income)
- + % mobile home units
- + % other structure units
- + % apartment building
- + % high rise
- 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**

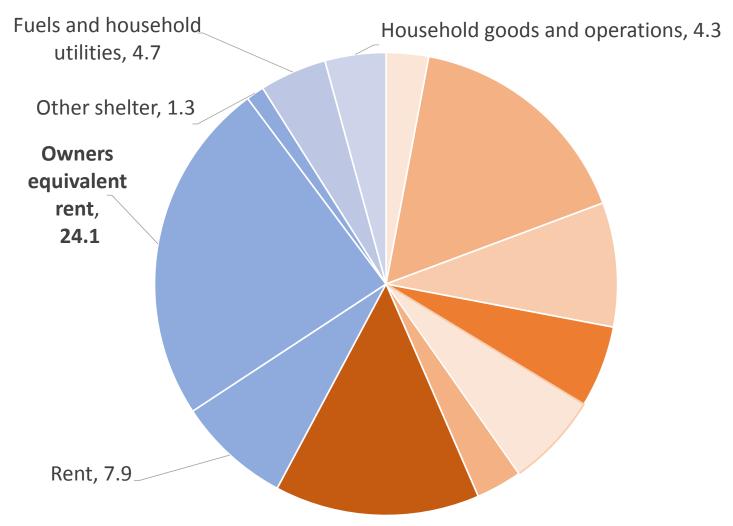
	Мо	nth T-6	Мо	nth T	Change in month T
Collected rent	\$	500	\$	600	Landlord increased biweekly payment by \$100
Payment frequency	b	weekly	biw	eekly	
Normalized monthly rent	\$	1,000	\$1	,200	
Utility adjustment	$/ \setminus$	$\times$	\$	50	Electricity no longer included in rent
Facility adjustment	//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



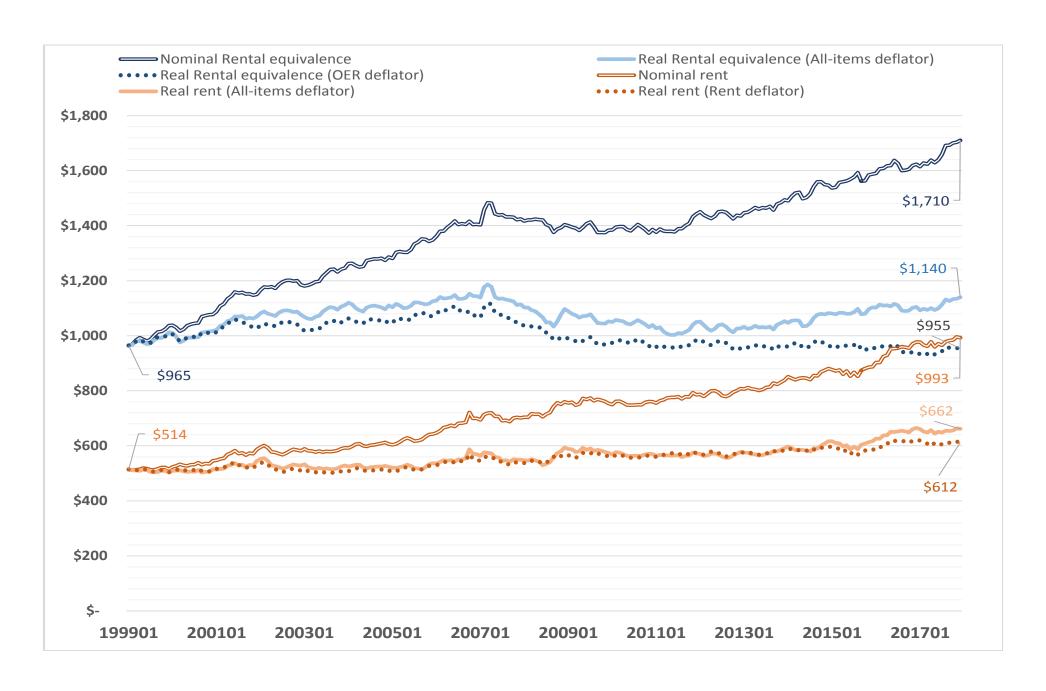
## Relative importance of Housing in CPI-U, December 2018

Housing = 42%



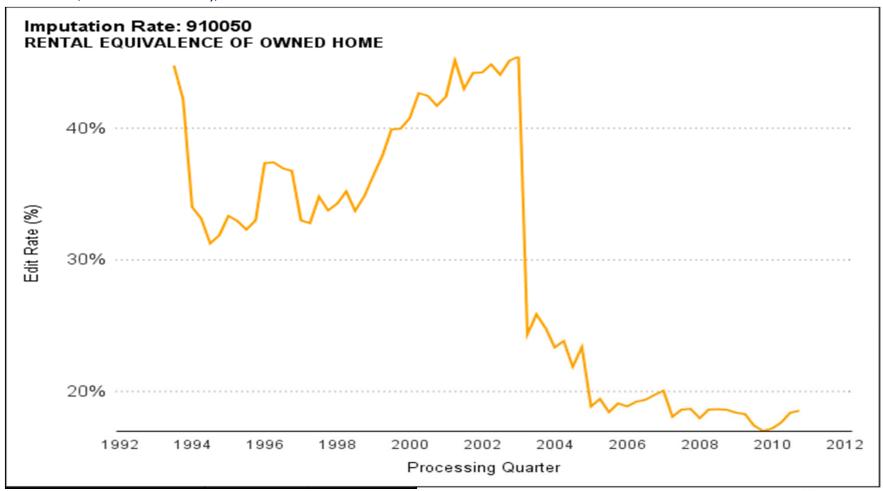


# Average monthly rental equivalence, 1999 to 2017



# 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
Single family units	92.0%	47.6%
Single family detached	85.6%	31.3%
Single family attached	6.4%	16.3%
Multi-family units	2.9%	46.9%
Garden-style	0.4%	2.4%
High-rise	0.7%	4.3%
Type not specified	1.8%	40.3%
Mobile homes and other units	5.1%	4.1%
College dorms	0.0%	1.4%

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- 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.



**CPI** 

Housing

Survey

41.5%

26.0%

15.5%

56.1%

2.4%

# **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**



		Measurement Objective	Weight	Price Change	Practical Issue
1.	Use	Change over time in the valu			
	User cost	Change in the cost of using the dwelling	r M + i E + 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	
	Rental equivalence	Change in the price of the housing service consumed	Estimate of rental value by owner; or     Match owner dwelling to rental dwelling,     and use rented dwelling rental value	units	
2.	Payment				
		Change in actual outlay required to gain access to shelter service	Downpayments on new purchases + purchase transaction costs + repayments of mortgage principal + mortgate interest + alterations and additions + insurance + maintenance and repair + property taxes	Aggregate of separate component indexes for <i>mortgage interest</i> , maintenance and repair, and property taxes	Meaurement of mortgage interest cost change difficult
3.	Acquistion				
		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.  SOURCE: house sales from Federal Housing Administration  + Indexes for mortgage interest cost change + Indexes for maintenance & repairs, insurance, and property taxes (standard CPI goods\services approach)	
1983			Renter sample; reweighted to represent owner units	
1987	1998 Use (Rental equivalence)		Owner sample; implicit rent moved forward by matched rented dwellign unit	
1998		Rental value of owned dwelling, unfurnished and without utilities; Directly estimated in CE-Interview Survey	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	

