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The user cost of owner-occupied housing: Implications for the measurement of inflation and housing market equilibrium

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Starting at 12.30 PM

ESCoE ECONOMIC MEASUREMENT WEBINARS

The user cost of owner-occupied housing: Implications for the measurement of inflation and housing market equilibrium

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ESCoE Economic Measurement Webinar

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Overview

This talk combines material from two recent papers of mine.

Hill, R. J., M. Steurer and S. Waltl (2020), "Owner-Occupied Housing, Inflation, and Monetary Policy," Graz Economics Papers 2020-18.

Chen, J. Y. Chen, R. J. Hill, and P. Hu (2021), The User Cost of Housing and the Price-Rent Ratio in Shanghai, *Regional Science and Urban Economics*, forthcoming.

The Treatment of Owner-Occupied Housing (OOH) in the Measurement of Inflation

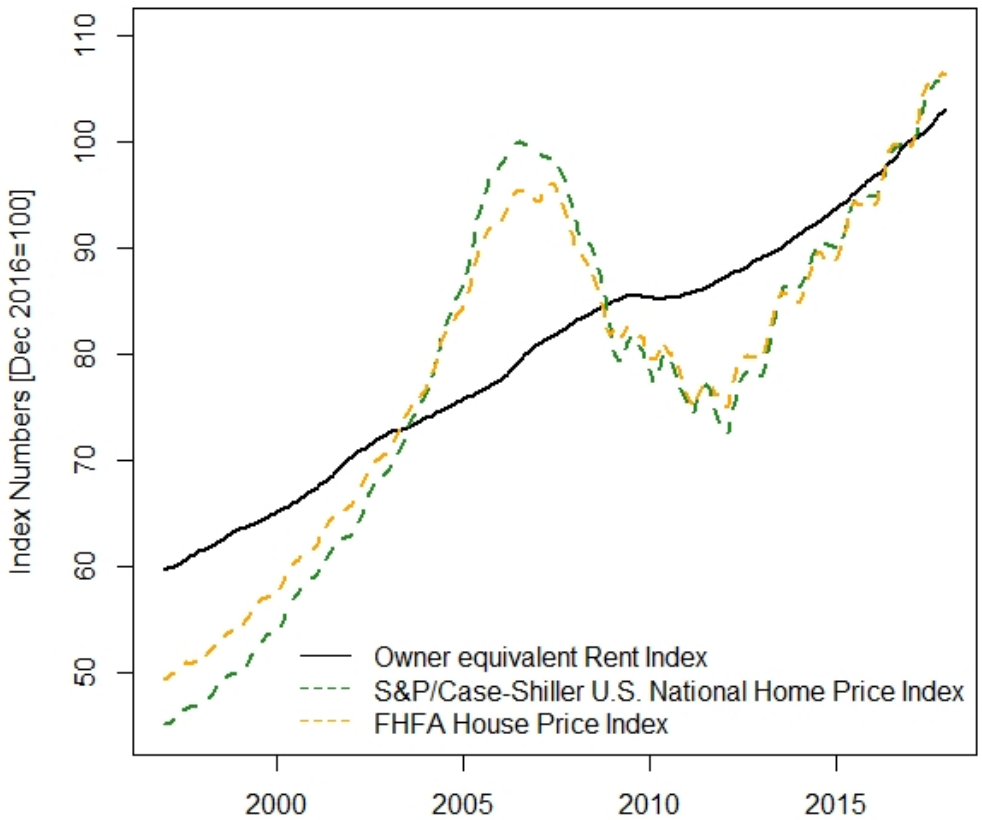
There are three main methods for including OOH in a Consumer Price Index (CPI) (see Diewert 2009).

- **Rental equivalence**:
OOH Expenditure: Estimate how much owner-occupied properties rent for.
OOH price index: Use a rent index.

- **Net acquisitions**:
OOH Expenditure: Mainly expenditure on new builds (excluding land component).
OOH price index: A price index for new builds.

- **A user cost method**:
OOH Expenditure: The user cost of OOH.
OOH price index: The change in the user cost.

Figure 1: The Owner Equivalent Rent and Commonly Used National House Price Indices in the US



Source: Hill, Steurer and Waltl (2020). Note: The figure shows the Owner equivalent Rent Index together with the S&P/Case-Shiller U.S. National Home Price Index and the FHFA House Price Index for the U.S. The monthly indices are nominal and not seasonally adjusted.

A European Dilemma

The Harmonized Index of Consumer Prices (HICP) in Europe excludes OOH.

Why?

Many EU countries claim their rental markets are too small to do rental equivalence.

Eurostat has been trying to implement the net acquisitions method for 20 years.

Problem: Many EU countries cannot provide the price data within 15 days of the end of the month (as required by the HICP).

There are other problems with the net acquisitions method.

(i) The main cost of housing is land. But the acquisitions approach excludes the cost of land from OOH expenditure.

(ii) Smaller countries may not have enough transactions to construct a reliable price index for new builds.

(iii) A new builds price index lags a secondary market index. Hill, Pfeifer, Steurer and Trojanek (2021) find that the lag is two years in Poland.

Is a user cost method a viable alternative?

$$\text{OOH Expenditure} = P_t u_t, \quad \text{OOH price index} = \frac{P_t u_t}{P_{t-1} u_{t-1}}.$$

where $u_t = r_t + \delta_t + \omega_t + \gamma_t - g_t$ denotes the per Euro user cost.

r=real interest rate
δ=depreciation rate
ω=taxes, running costs and average transaction costs
γ=risk premium
g=expected real capital gain

Problem: Changes in g can cause huge volatility in both the OOH price index and expenditure shares, to the point that OOH's inclusion can seriously destabilize a CPI.

See for example Verbrugge (2008), Garner and Verbrugge (2009) and Hill, Steurer and Waltl (2020).

u can even turn negative, in which case the OOH price index is not defined and OOH expenditure is negative.

How to compute expected real capital gains?

(i) Extrapolation from past performance

One approach is to set g equal to the average annual real return on housing over the previous 2, 5, 10, 20 or 30 years. The longer the time horizon the more stable the index.

But Hill, Steurer and Waltl (2020) find that a CPI for Sydney is destabilized even by a 30 year horizon.

(ii) Fix the expected capital gain when comparing adjacent periods

Hill, Steurer and Waltl (2020) suggest fixing g when comparing periods $t-1$ and t. The value of g can then be updated when periods t and $t+1$ are compared.

Fixing u when comparing adjacent periods

Hill, Steurer and Waltl (2020) show that changes in r can destabilize the CPI.

Also, it is problematic for central banks if the immediate impact of a contractionary monetary policy is to increase measured inflation. A rise in r in period t increases u_t and hence $P_t u_t$.

δ=depreciation rate, ω=taxes, running and average transaction costs, γ=risk premium are all generally assumed to be constant.

Hence, if both g and r are held fixed when comparing adjacent periods, so is u.

When u is constant it follows that:

$$\text{User cost price index} = \frac{P_t u}{P_{t-1} u} = \frac{P_t}{P_{t-1}}.$$

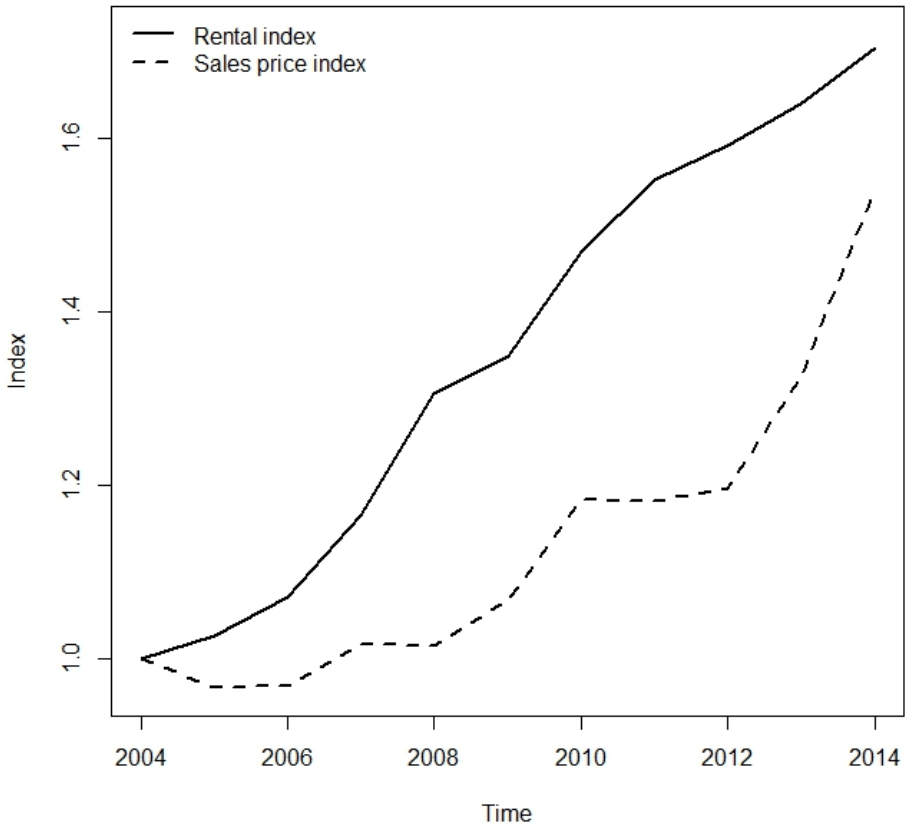
The OOH price index reduces to a house price index (HPI).

This method is related to one of the CPIs computed by Statistics Sweden.

Regarding the HICP, there is still the problem of computing monthly HPIs and obtaining the price data within 15 days of the end of the month.

An empirical application to the CPI for Sydney

Figure 2: Rental and Sales Price Indexes for Sydney



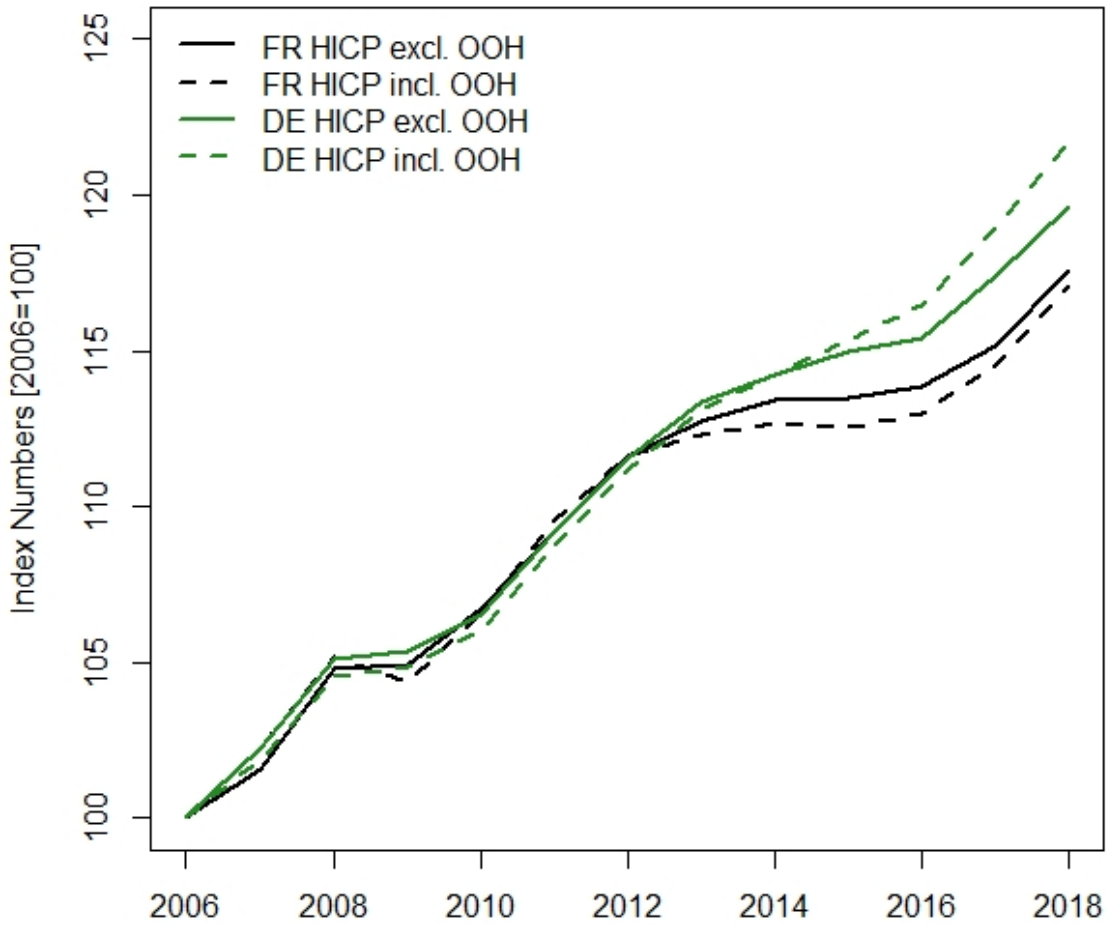
Source: Hill, Steurer and Waltl (2020). Note: Results are based on the chained Törnqvist price index formula. We use imputed prices and rents from conditional quantile models.

Table 1: CPI Annual Inflation for Sydney

	u(0)	u(10)	u(30)	u(f)	Rent Equiv	Acq(AUS)	Acq(EUR)	OOH Excl.
04-05	-2.293%	2.215%	-1.823%	1.304%	2.298%	2.463%	1.820%	2.215%
05-06	6.189%	3.961%	8.528%	3.449%	4.179%	3.846%	3.791%	4.146%
06-07	5.398%	11.739%	4.405%	2.296%	3.166%	1.736%	2.078%	1.744%
07-08	4.748%	12.828%	5.217%	3.491%	6.331%	4.323%	3.869%	4.269%
08-09	-2.067%	4.892%	-0.717%	1.956%	1.300%	1.309%	1.600%	1.041%
09-10	4.234%	-0.189%	3.436%	4.389%	4.060%	2.906%	3.609%	2.845%
10-11	2.269%	2.153%	4.310%	3.380%	4.398%	3.766%	3.604%	3.800%
11-12	-6.652%	-0.542%	-2.748%	1.297%	1.671%	1.310%	1.313%	1.266%
12-13	8.496%	38.796%	4.571%	3.854%	2.585%	2.587%	3.149%	2.396%
13-14	7.412%	7.387%	1.536%	5.128%	2.831%	2.813%	3.761%	2.538%
Mean	2.773%	8.324%	2.672%	3.054%	3.282%	2.706%	2.859%	2.630%
CV	1.771	1.398	1.326	0.424	0.432	0.370	0.361	0.413

Source: Hill, Steurer and Waltl (2020).
Note: Depreciation: $\delta = 0.011$,
Running and average transaction costs: $\omega = 0.019$.
Risk premium: $\gamma = 0$.
When setting the real interest and capital gain terms in $u(f)$ we set them to 0.02.

Figure 3: The HICP with and without OOH for France and Germany



Source: Hill, Steurer and Waltl (2020). Note: The figure compares the annual HICP for France (FR) and Germany (DE) including and excluding an OOH component calculated using the user cost method.

User Cost and Housing Market Equilibrium

In equilibrium, the user cost of owner occupying should equal the cost of renting.

$$P_t u_t = R_t \quad \Rightarrow \frac{P_t}{R_t} = \frac{1}{u_t}$$

Hence we can check whether the housing market is in equilibrium by comparing the actual price-rent ratio with the equilibrium price-rent: $(1/u_t)$.

But attempts to apply this approach run into problems.

Problem 1: The equilibrium condition assumes owner-occupied and rental properties of equal quality are being compared. Hence the actual price-rent ratio needs to be quality adjusted.

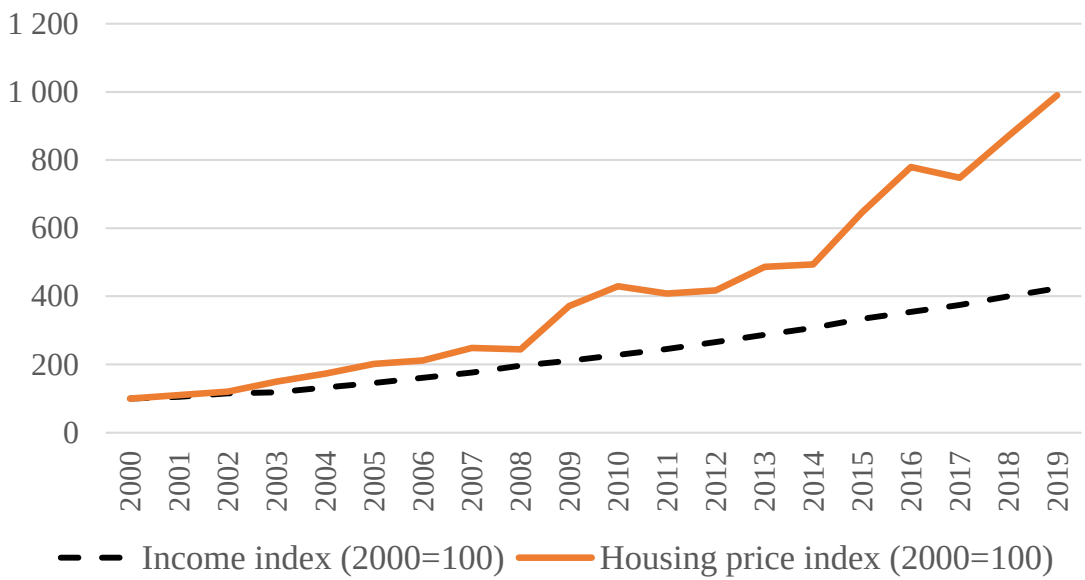
Problem 2: Small changes in the parameter estimates for δ=depreciation rate, ω=taxes, running and average transaction costs, γ=risk premium can have big impacts on the estimated equilibrium price-rent ratio $(1/u)$.

Chen, Chen, Hill and Hu (2021) construct quality-adjusted price-rent ratios and then try computing u Shanghai in 2017.

The average annual increase in real house prices in Shanghai was 22.8% from 2006 to 2017 (see Joseph Gyourko's website).
https://real-faculty.wharton.upenn.edu/gyourko/chinese-residential-land-price-indexes/

Problem 3: Unless households expect the future to be very different from the past, g in Shanghai is so large that u will be negative.

Figure 4: The Income and Housing Price Trend in Shanghai (2000-2019)



Source: Chen, Chen, Hill and Pu (2021).

Data source: Statistics Bureau of Shanghai Note: "Income" in the figure refers to the per capita disposable income of each year, "Housing Price" refers to the mean sale price of newly-built commodity residential housing per sqm.

The hedonic quality-adjusted price-rent ratio in Shanghai in 2017 is about 68 (i.e., price equals 68 times annual rent). This is extremely high by international standards.

By comparison, Bourassa, Hoesli and Oikarinen (2019) obtain quality-unadjusted price-rent ratios for Helsinki, Geneva, Zurich, Chicago, Miami, San Francisco that range between 16.1 (Chicago) and 37.0 (Geneva).

Bracke (2015) obtains a quality-adjusted price-rent ratio of about 25 in London over the period 2006-2012, and Halket, Nesheim and Oswald (2021) a quality-adjusted price-rent ratio of about 20 for 2011-2014.

Has the price-rent ratio reached an unsustainable level in Shanghai?

A negative u implies that the equilibrium price-rent ratio is infinite!

How to make sense of this?

$P_t/R_t = 1/u_t$ implicitly assumes an interior equilibrium.

Suppose instead that we have a corner solution in which $P_t u_t < R_t$, and hence everyone wants to own (and participate in the high rate of expected capital gains).

But then why would anyone rent?

Who rents when the user cost of owning is negative?

(i) In China a 30% deposit is typically needed to buy.

(ii) Household's have to complete two years of residency before they are eligible to buy.

(iii) It is extremely difficult for foreign residents to buy.

(iv) Short-term residents such as students may not want to buy.

Also, the vacancy rate in Shanghai is rising.

Hence a corner solution where (almost) everyone wants to buy is possible in Shanghai.

Implications of the corner solution

In the corner solution equilibrium we have that:

$$P_t u_t < R_t \Rightarrow \frac{P_t}{R_t} < \frac{1}{u_t}.$$

When u is negative, all we get is an upper bound. In this case we obtain that the equilibrium price-rent is less than infinity, which is not very helpful!

What else can we do with this equilibrium condition?

An alternative approach is to calculate the value of g_t at which $1/u_t$ equals the observed price-rent ratio:

$$\text{Assume} \quad u_t = \frac{\hat{R}_t}{\hat{P}_t}.$$

Rearranging, we have that

$$\hat{g}_t = r_t - \pi^e + \omega_t + \delta_t + \gamma_t - \frac{\hat{R}_t}{\hat{P}_t}.$$

The implied expected real annual capital gain in Shanghai that would make households indifferent between owning and renting in 2017 was about 5.8%.

While high by international standards, 5.8% would represent a big slowdown in Shanghai.

Gyourko, Mayer and Sinai (2013) compute the average annual real capital gain for 50 US cities over the period 1950 to 2000.

They find that the average is 1.7%, with the highest result of 3.5% being observed for San Francisco.

Conclusions

(i) The user cost approach can destabilize a CPI if not used carefully.

(ii) Used carefully, a user cost method is a viable alternative to the rental equivalence and net acquisitions methods. It may be the best option for the HICP.

(iii) The user cost approach can help us interpret price-rent ratios.

(iv) This approach becomes problematic when u is small or negative such as in cities with very high expected capital gains.

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