Reference Price Updating in the Housing Market

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Introduction

- This paper is the first to examine the dynamics of reference points in the housing markets.
- The convention is to use the original purchase price as the reference point, which explains sellers' listing behavior by loss aversion (Genesove and Mayer 2001).
- I build a **model of seller listing behavior** that includes:
  1. reference points;
  2. down-payment constraints (Stein 1995);
  3. mortgage default option (Head, Sun, and Zhou 2023).
- **Main Result:** an observed "historical peak", measured by the appraisal price from a refinance mortgage, serves as an updated reference point.
- To achieve this, I construct a novel dataset that tracks the transaction, financing, and listing history of over 97,000 U.S. residential properties.

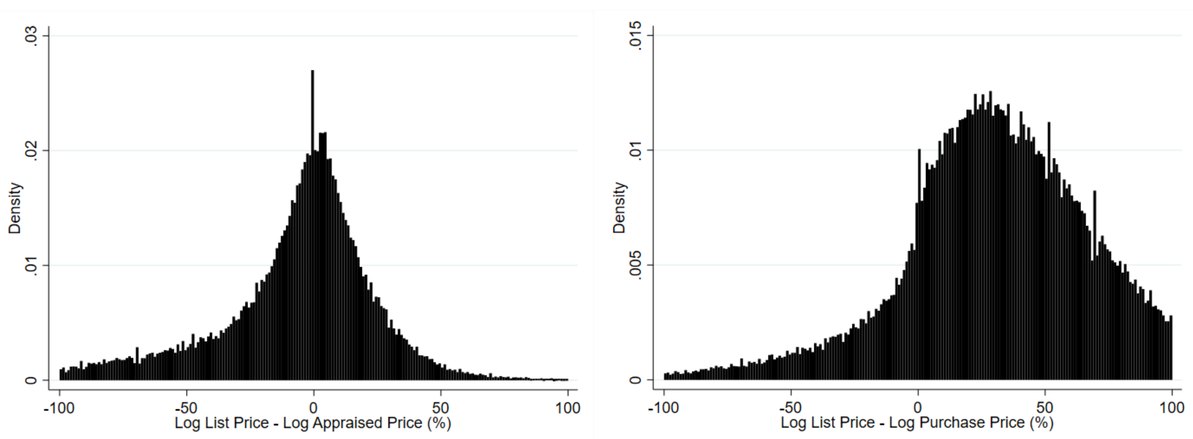

Figure 1. Listing Price Density

Data and Reduced-Form Model

- **Data: CoreLogic** and **Moody's BlackBox Logic** datasets.
- **Final Sample:** property listings between 2007 and 2015, initial home purchases between 1998 and 2007, and refinances between 2004 and 2007.
- **Reduced-Form Model:** List price for property i in census tract n, purchased at month s, refinanced at month m, and listed at month t (s < m < t) is modeled as:

$$\log(Y_{insmt}) = \Lambda_1 Loss\_PurchasePrice_{inst} + \Lambda_2 Loss\_AppraisedPrice_{inmt} + \delta LTV_{int} + \tau_1 Log\widehat{Price}_{int} + \tau_0 + \varepsilon_{insmt}$$

- Loss: the greater value between the difference of the log of the reference price and the hedonic predicted price, and zero.
- LTV: the greater value between the difference of the Loan-to-Value ratio and 0.8, and zero.
- $Log\widehat{Price}_{int}$: hedonic predicted price.

Reduced-Form Evidence

- A 10% increase in expected nominal loss to the refinancing appraised price leads a seller to set a 4.4% higher listing price.
- In contrast, a 10% increase in expected nominal loss to the purchase price results in a 0-1% higher listing price.
- **Main Takeaway:** The observed "historical peak" during sellers' homeownership period serves as an updated reference point influencing their pricing strategy.

VARIABLES	(1)	(2)	(3)	(4)
	Log (Original Listing Price)			
Loss: Appraised Price	0.444***	0.435***	0.565***	0.525***
	(0.006)	(0.006)	(0.013)	(0.014)
Loss-squared: Appraised Price			-0.124***	-0.088***
			(0.015)	(0.015)
Loss: Purchase Price	0.095***	-0.007	0.150***	0.009
	(0.008)	(0.010)	(0.015)	(0.015)
Loss-squared: Purchase Price			-0.011	0.012
			(0.010)	(0.012)
LTV if ≥ 80%	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Estimated Value	1.046***	1.053***	1.045***	1.052***
	(0.003)	(0.003)	(0.003)	(0.003)
Estimated Price Index	1.025***	1.008***	1.025***	1.008***
	(0.002)	(0.002)	(0.002)	(0.002)
Residuals		0.276***		0.269***
		(0.006)		(0.005)
Months since last refinance	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Months since last purchase	-0.000***	-0.000***	-0.000**	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.505***	-0.561***	-0.511***	-0.567***
	(0.037)	(0.039)	(0.039)	(0.039)
Observations	97,635	97,635	97,635	97,635
R-squared	0.860	0.867	0.861	0.867

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1. Loss Aversion and Reference Point Updating

Model and Estimation Results

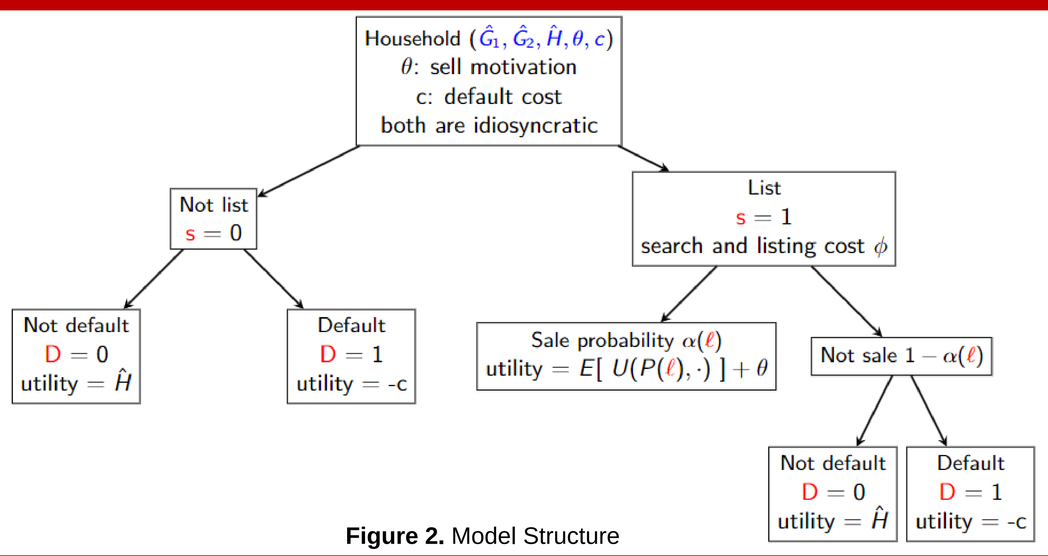

Figure 2. Model Structure

- Each household is characterized by:
  1. nominal gains to reference price ($\widehat{G}_i$), i = 1 or 2 (i.e., original purchase price and refinancing appraised price, respectively);
  2. home equity position ($\widehat{H}$);
  3. random values capture seller motivation (θ) and default cost (c).
- Households make three decisions: (1) listing decision (s), (2) listing premium (ℓ), (3) default decision (D).
- The utility upon sale: $U(p(\ell),\cdot)$ = P(ℓ) + $\lambda_1\eta_1 G_1(\ell)$ + $\lambda_2\eta_2 G_2(\ell)$ - κ(P(ℓ)).
  1. η_i: the degree of reference dependent;
  2. λ_i: the degree of loss aversion;
  3. κ(P(ℓ)): the down-payment penalty function.
- **Trade-off:** a higher listing premium (ℓ) increases utility upon sale but decreases the probability of a sale ($\alpha(\ell)$).
- **Main Takeaway:** sellers exhibit 2.5 higher degree of loss aversion to an observed "historical peak", compared to the original purchase price. (Table 2)

	Reference Dependence η_1	Reference Dependence η_2	Loss Aversion λ_1	Loss Aversion λ_2	Financial Constraints μ	Average Motivation Shock θ_m	St. dev. of Motivation Shock σ_m	Average Default Cost θ_c	St. dev. of Default Cost σ_c	Search and Listing Cost ϕ
Parameter Estimates	0.012	0.344	1.450	3.660	1.230	3.825	1.182	0.124	0.389	1.025

Table 2. Structural Parameter Estimates

Conclusions

- This paper provides both empirical and quantitative evidence that an observed "historical peak", measured by the appraisal price from a refinance mortgage, serves as an updated reference point.
- I extend Genesove and Mayer 2001 and find sellers are also loss averse in a housing boom period because reference price is adaptive.
- Model decomposition shows that loss aversion with reference price updating helps explain the price-volume correlation to a greater extent.

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