

Loss Aversion And Seller Behavior:

Evidence From The Housing Market

By David Genesove and Christopher Mayer



SOME TERMS YOU SHOULD KNOW

The 3 types of price

**List price /
Asking price**

The price a seller states he or she will accept for a property.
The starting price for negotiation.

**Selling price /
Transaction
price**

The price that a property is traded.
The price agreed by both seller and buyer.

**Reservation
price**

The smallest price at which a seller is willing to sell a property.

IMAGINE YOU ARE SELLING STOCKS...

When you purchased

You purchased 100 shares of one company at 1,000 bath per share.

Total:

100,000 baht



Later...



Now

The price drops to **700 baht per share** and credible analysts say that it will continue to drop and won't bounce back in the near future.

Question:

How will you set the price?

HOW WILL YOU SET THE PRICE FOR STOCKS

Purchased at
1,000 baht per share

Later...

Current market price at
700 baht per share



1

Sell right away at 700 baht per share

2

Wait and sell at around 700-1,000 baht per share

3

Wait until it bounces above 1,000 baht per share

NOW, IMAGINE YOU ARE SELLING YOUR HOUSE...

When you purchased



Later...

Now

10 million baht



7 million baht

and economy seems to sour for a long while.

Question:

How will you set the asking price?

HOW WILL YOU SET THE ASKING PRICE FOR YOUR HOUSE

Purchased at
10 million baht



Later...

Expected selling price at
7 million baht



1

Set at 7 million baht or even lower

2

Set around 8-10 million baht

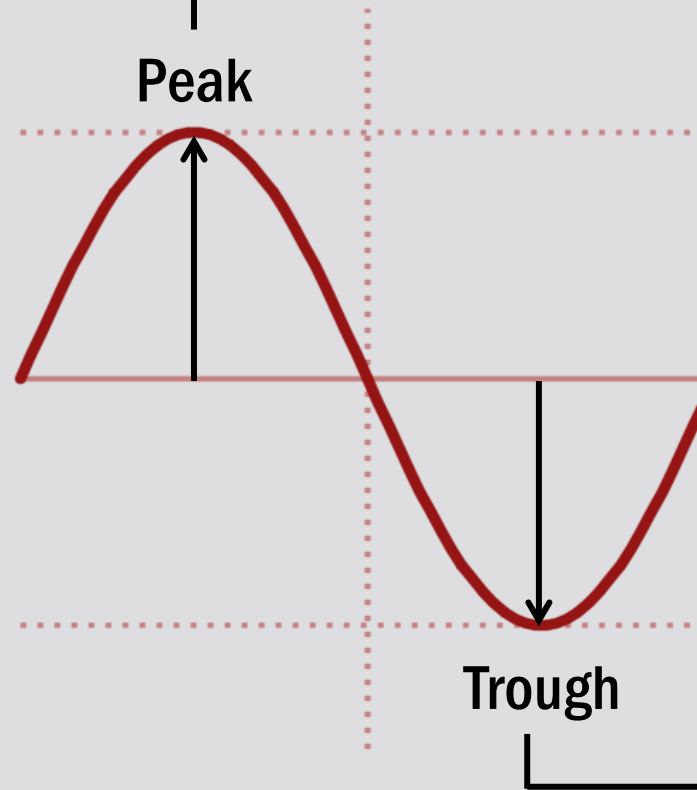
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Set more than 10 million baht

REAL ESTATE CYCLE

BOOM

- Houses sell quickly
- Houses sell at prices close to, and many times above, the sellers' asking prices.
- Many sellers successfully sell their properties

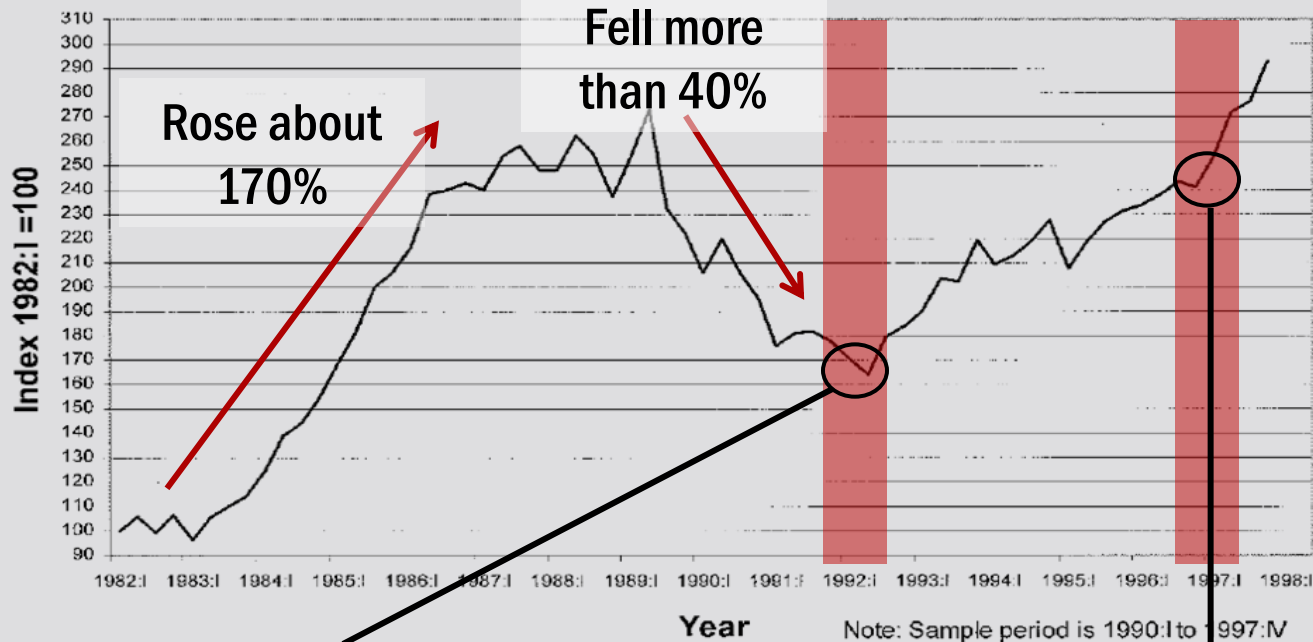


- Houses sit on the market for long periods of time
- Asking prices well above expected selling prices
- Many sellers withdraw properties without sale eventually

BUST

EVIDENCE FROM THE BOSTON CONDOMINIUM MARKET

Boston Condominium Price Index



- The average asking price for new listings exceeded the expected selling price by 35%
- Fewer than 30% of listed units were sold within 180 days

- New properties for sale had listing prices that were only 12% above their expected selling prices
- More than 60% of these new listings sold within 180 days

HOW TO EXPLAIN THIS PHENOMENON

**LOSS
AVERSION**

During a **BUST...**

Many houses have a market value below what the current owners paid for them



Owners who are averse to losses are unable to accept the market prices



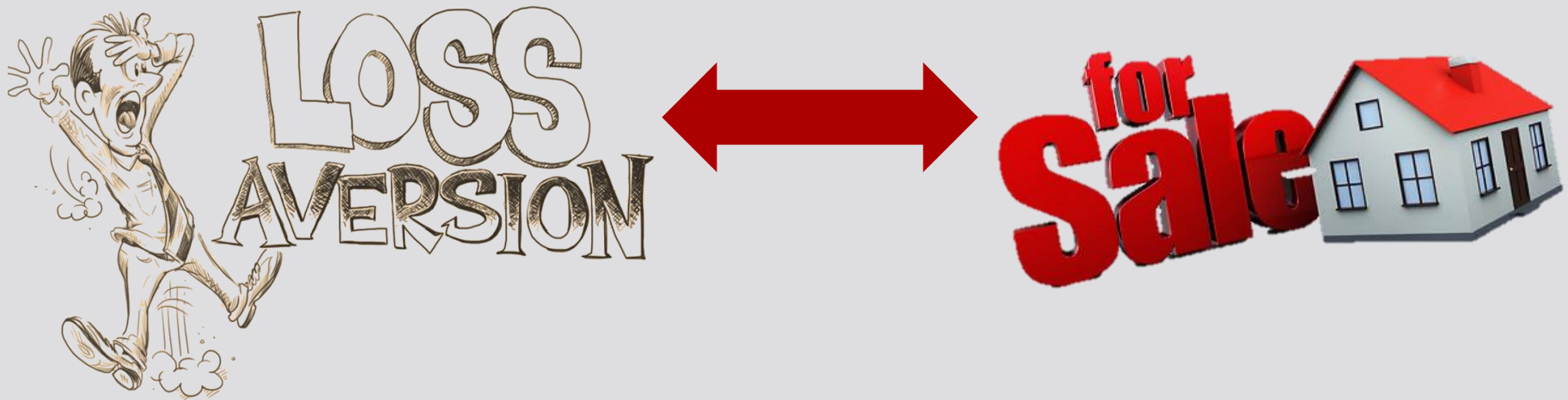
They tend to reduce the loss by setting a higher asking price



Because the asking price exceeds the market value, they spend a longer time on the market

PURPOSE OF THE PAPER

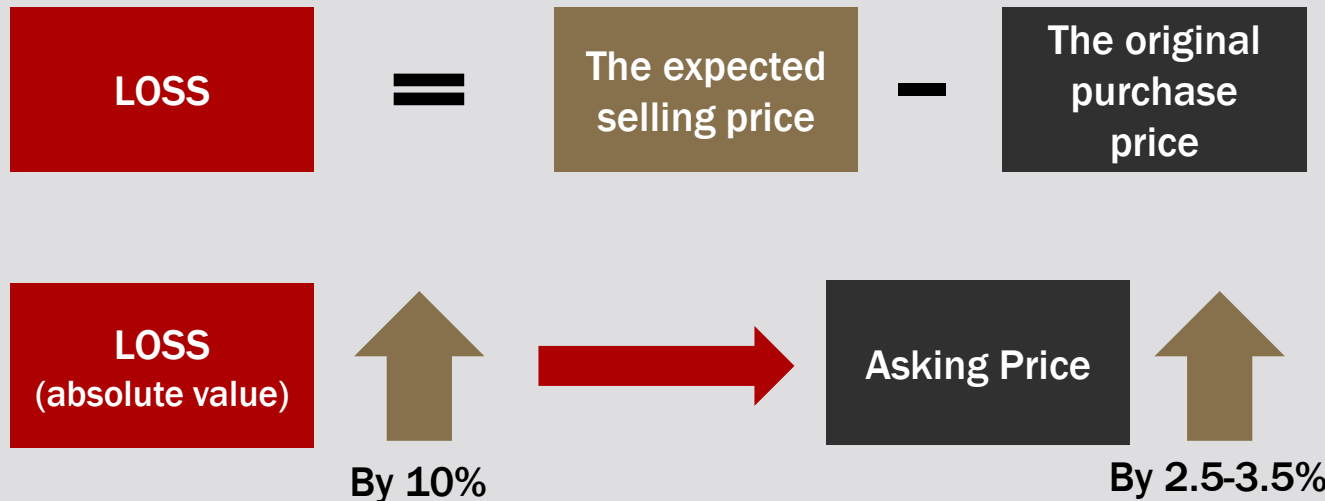
Analyze how loss aversion affects the seller behavior in the residential real estate market



KEY FINDINGS (1)

Sellers subject to losses...

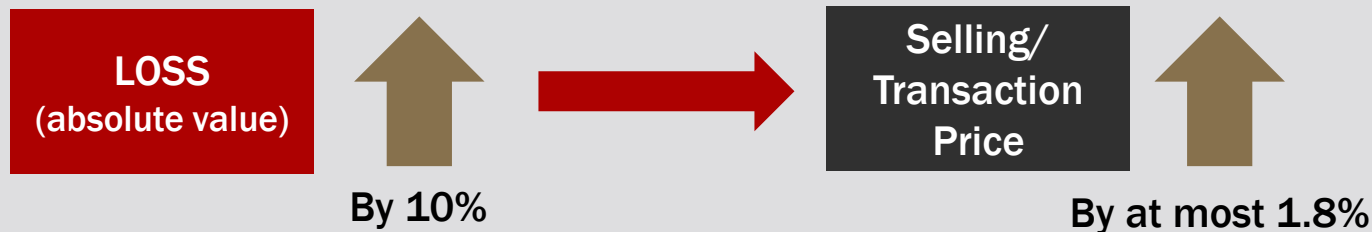
1. Set higher asking prices of 25-35% of the difference between the expected selling price of a property and their original purchase price.



KEY FINDINGS (2)

Sellers subject to losses...

2. Attain higher selling price of at most 1.8% of the loss



3. Face longer time on the market. In other words, they are exposed to a lower hazard rate of sale.



KEY FINDINGS (3)

4. Investors are also loss averse but only half of the degree of loss averse of owner-occupants.

Degree of loss aversion:

Owner-occupants

Investors

5. Successful sellers' degree of loss aversion is about half of unsuccessful sellers, or those who eventually withdraw properties from the market.

Degree of loss aversion:

Unsuccessful sellers

Successful Sellers



AGENDA

1. **Prospect Theory**
2. **Methodology:** An Empirical Model of Prices and Loss Aversion
 - 2.1) Ideal Model
 - 2.2) Feasible Models (I&II)
 - 2.3) Data Sources
3. **Results:** Estimates from List Price and Selling Price Regressions
 - 3.1) Loss Aversion and List Prices
 - 3.2) Owner-Occupants Versus Investors
 - 3.3) Sold Versus Unsold Properties
 - 3.4) Loss Aversion and Transaction Prices
 - 3.5) Loss Aversion and Hazard Rate of Sale
4. **Concluding Remarks**

PROSPECT THEORY

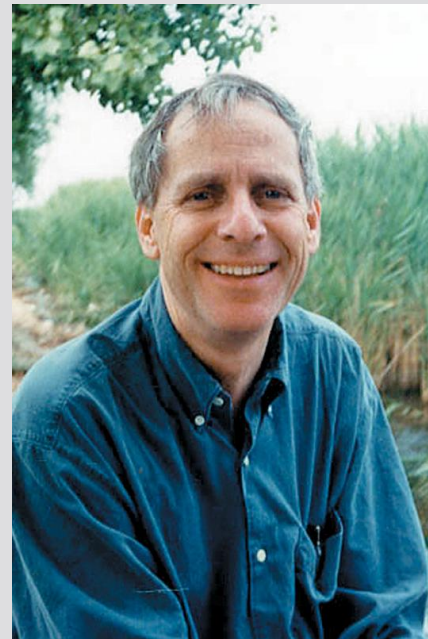
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PROSPECT THEORY

A behavioral economic theory that describes how individuals make choices under uncertainty. It is developed by two psychologists, Daniel Kahnman and Amos Tversky. Daniel Kahnman received the 2002 Nobel Prize in Economics from this prospect theory.

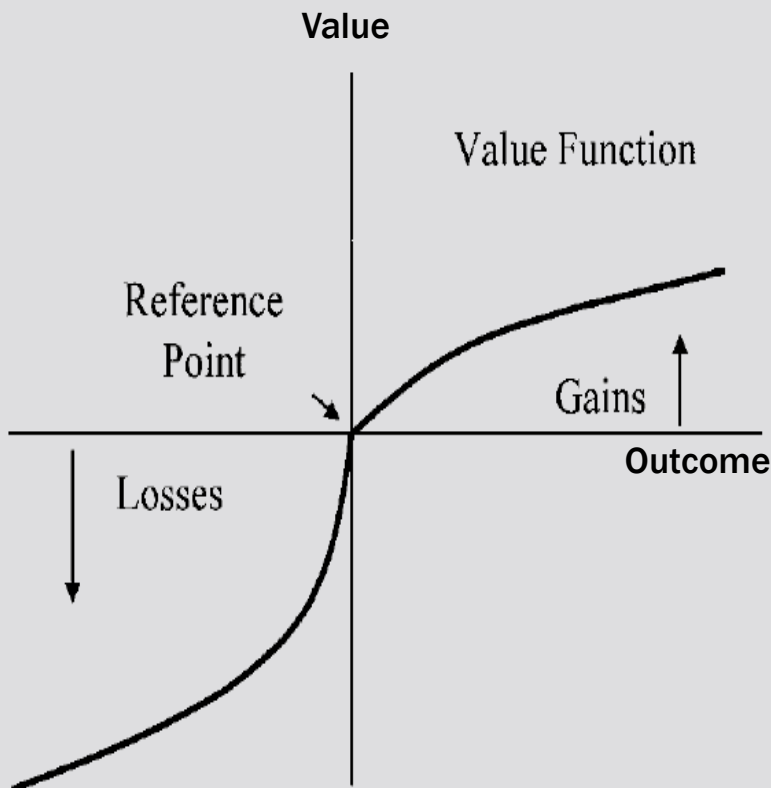


Daniel Kahneman



Amos Tversky

3 ESSENTIAL COMPONENTS



1

Gains and losses are examined relative to a **reference point**, which is **previous nominal purchase price** in this case

2

Value function is **steeper for losses than gains** although they have equal sizes.


3

The **marginal value** of gains and losses **diminishes** with the size


TO EXPLAIN LOSS AVERSION WITH PROSPECT THEORY

Under prospect theory,

Many sellers are reluctant to realize a loss on their houses.



A seller with a potential loss would be expected to set a higher reservation price than a seller who has prospective gain.



They subsequently set a high asking price.



They need to trade off with a longer expected time on the market.

METHODOLOGY:
AN EMPIRICAL MODEL OF
PRICES AND LOSS AVERSION

2

IDEAL MODEL(1)

Econometric formulation for the relationship between list price and potential loss

This is a true relationship (but infeasible)

i: the unit s: the quarter of previous sale t: the quarter of original listing

$$L_{ist} = \alpha_0 + \alpha_1 \mu_{it} + m \text{LOSS}_{ist}^* + \varepsilon_{it} \quad (1)$$

L: log asking price μ : expected log selling price LOSS: an indicator of potential loss

Assume that μ is a linear function of observable attributes, the quarter of listing and an unobservable component

δ : time effect that shifts expected price proportionally v : unobserved quality

$$\mu_{it} = X_i \beta + \delta_t + v_i \quad (2)$$

X : vector of observable attributes

IDEAL MODEL(2)

LOSS is the difference between the previous log selling price P^0 and the expected log selling price μ , cut from below at zero

$$LOSS_{ist}^* = (P_{is}^0 - \mu_{it})^+ \quad (3)$$

Where $X^+ = \max(0, X)$

P^0 : previous log selling price
 μ : expected log selling price

not the loss actually incurred but the percentage loss the potential seller would incur, if he were to sell at the current average price in the market

We can write the previous selling price as

$$P_{is}^0 = \mu_{is} + \omega_{is} = X_i\beta + \delta_s + v_i + \omega_{is} \quad (4)$$

μ : expected log selling price
 substitute μ_{is} from (2): $\mu_{it} = X_i\beta + \delta_t + v_i$
 P^0 : previous log selling price
 ω : the difference between the previous selling price and its expected value, conditional on quality attributes

IDEAL MODEL(3)

Substitute (4) into (3), we obtain the TRUE LOSS TERM

ω : the overpayment or underpayment by the current owner when he originally bought the house

$$LOSS_{ist}^* = (\mu_{is} + \omega_{is} - \mu_{it})^+ = \underbrace{((\delta_s - \delta_t) + \omega_{is})^+}_{\text{The change in the market price index between the quarter of original purchase and the quarter of listing}} \quad (5)$$

The change in the market price index between the quarter of original purchase and the quarter of listing

Combine all previous equations, we have

$$L_{ist} = \alpha_0 + \alpha_1 \mu_{it} + m LOSS_{ist}^* + \varepsilon_{it} \quad (1)$$

$$L_{ist} = \alpha_0 + \alpha_1 X_i \beta + \alpha_1 \delta_t + m(\delta_s - \delta_t + \omega_{is})^+ + \alpha_1 v_i + \varepsilon_{it} \quad (6)$$

The equation cannot be estimated because v and ω , and so $LOSS^*$, are not observed.

FEASIBLE MODEL I (FOR UPPER BOUND)

Substitute a noisy measure of loss for TRUE LOSS

we cut ν out of the equation since it is unobservable

$$L_{ist} = \alpha_0 + \alpha_1(X_i\beta + \delta_t) + mLOSS_{ist} + \eta_{it}$$

$$LOSS_{ist} = (P_{is}^0 - X_i\beta - \delta_t)^+ = (\delta_s - \delta_t + \underbrace{\nu_i}_{\text{Noisy measure of loss}} + \omega_{is})^+$$

Noisy measure of loss adds ν into the loss equation

The error η_{it} contains two terms

$$\eta_{it} = \alpha_1(\nu_i) + m((\delta_s - \delta_t + \omega_{is})^+ - (\delta_s - \delta_t + \nu_i + \omega_{is})^+) + \varepsilon_{it}$$

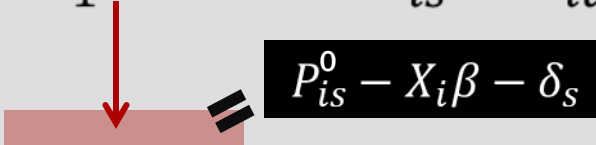
Since ν occurs in both the error term and the observed loss term, η is positively correlated with LOSS and will tend to bias upward the estimate of the coefficient of LOSS, m .

Hence, this model provides the upper bound for the coefficient of LOSS.

FEASIBLE MODEL II (FOR LOWER BOUND)

Add the residual of the previous selling price from the price regression, $v + \omega$, as a noisy proxy for unobserved quality, v .

$$L_{ist} = \alpha_0 + \alpha_1 X_i \beta + \alpha_1 \delta_t + \alpha_1 v + mLOSS_{is} + u_{it}$$

$$L_{ist} = \alpha_0 + \alpha_1 X_i \beta + \alpha_1 \delta_t + \alpha_1 (v_i + \omega_{is}) + mLOSS_{is} + u_{it}$$


Residual of the previous selling price

The error u_{it} contains two terms

$$u_{it} = -\alpha_1 \omega_{is} + m((\delta_s - \delta_t + \omega_{is})^+ - (\delta_s - \delta_t + v_i + \omega_{is})^+) + \varepsilon_{it}$$

This term is **negatively correlated with LOSS**, so it tends to **bias the coefficient of LOSS downward**.

Hence, this model provides the lower bound for the coefficient of LOSS.

DATA SOURCES

Property listing record in the Boston condominium market at weekly intervals between 1990 – 1997.

Examples of data sets:

- Data of entry and exit of properties
- The listing price on the day of entry
- The type of exit: Sold or Withdrawn
- The sale price (if happens)
- Etc.

Sources are

- **LINK** – a privately owned listing service
- **The City of Boston Assessor's Office**
- **Banker and Tradesman**

RESULTS:
**ESTIMATES FROM LIST PRICE
AND SELLING PRICE
REGRESSIONS**

3

LOSS AVERSION AND LIST PRICE(1)

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS	0.35 (0.06)	0.25 (0.06)	0.63 (0.04)	0.53 (0.04)
LOSS-squared			-0.26 (0.04)	-0.26 (0.04)
LTV	0.06 (0.01)	0.05 (0.01)	0.03 (0.01)	0.03 (0.01)
Estimated value in 1990	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)
Estimated price index at quarter of entry	0.86 (0.04)	0.80 (0.04)	0.91 (0.03)	0.85 (0.03)
Residual from last sale price		0.11 (0.02)		0.11 (0.02)
Months since last sale	-0.0002 (0.0001)	-0.0003 (0.0001)	-0.0002 (0.0001)	-0.0003 (0.0001)
Dummy variables for quarter of entry	No	No	No	No
Constant	-0.77 (0.14)	-0.70 (0.14)	-0.84 (0.13)	-0.77 (0.14)

Feasible Model I: Upper bound

$$L_{ist} = \alpha_0 + \alpha_1(X_i\beta + \delta_t) + mLOSS_{ist} + \eta_{it}$$

A 10% increase in a prospective loss leads a seller to set a list price higher by no more than 3.5%.

Feasible Model II: Lower bound

$$L_{ist} = \alpha_0 + \alpha_1 X_i \beta + \alpha_1 \delta_t + \alpha_1 (v_i + \omega_{is}) + mLOSS_{is} + u_{it}$$

A 10% increase in a prospective loss leads a seller to set a list price higher by at least 2.5%.

LTV ratio > 0.8

When LTV ratio increases by 10%, the list price increases by 0.6%. It is positive and significant. Thus, the impact of equity constraint on list price is significant but **less important than loss aversion.**

LOSS AVERSION AND LIST PRICE(2)

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS	0.35 (0.06)	0.25 (0.06)	0.63 (0.04)	0.53 (0.04)
LOSS-squared			-0.26 (0.04)	-0.26 (0.04)
LTV	0.06 (0.01)	0.05 (0.01)	0.03 (0.01)	0.03 (0.01)
Estimated value in 1990	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)
Estimated price index at quarter of entry	0.86 (0.04)	0.80 (0.04)	0.91 (0.03)	0.85 (0.03)
Residual from last sale price		0.11 (0.02)		0.11 (0.02)
Months since last sale	-0.0002 (0.0001)	-0.0003 (0.0001)	-0.0002 (0.0001)	-0.0003 (0.0001)
Dummy variables for quarter of entry	No	No	No	No
Constant	-0.77 (0.14)	-0.70 (0.14)	-0.84 (0.13)	-0.77 (0.14)

The coefficient on the Estimated Value in 1990 is 1.09, which is greater than 1, across all columns. With higher quality, list prices are set more than proportionately higher to allow greater room for bargaining.

The coefficient on the market index is significantly less than one. This suggests that list prices do not immediately adjust to changes in market prices.

Column 3 and 4 add a quadratic loss term. The coefficients are significant and negative in both model I and model II. This implies that, at large losses, marginal effect of loss aversion diminishes. This makes sense since sellers cannot raise the list price indefinitely.

OWNER-OCCUPANTS VERSUS INVESTORS(1)

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS × owner-occupant	0.50 (0.09)	0.42 (0.09)	0.66 (0.08)	0.58 (0.09)
LOSS × investor	0.24 (0.12)	0.16 (0.12)	0.58 (0.06)	0.49 (0.06)
LOSS-squared × owner-occupant			-0.16 (0.14)	-0.17 (0.15)
LOSS-squared × investor			-0.30 (0.02)	-0.29 (0.02)
LTV × owner-occupant	0.03 (0.02)	0.03 (0.02)	0.01 (0.01)	0.01 (0.01)
LTV × investor	0.053 (0.027)	0.053 (0.027)	0.02 (0.02)	0.02 (0.02)
Dummy for investor	-0.02 (0.014)	-0.02 (0.01)	-0.03 (0.01)	-0.03 (0.01)
Estimated value in 1990	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)
Estimated price index at quarter of entry	0.84 (0.05)	0.80 (0.04)	0.86 (0.04)	0.82 (0.04)
Residual from last sale price		0.08 (0.02)		0.08 (0.02)

The coefficient on LOSS for owner-occupants

Upper bound: 0.50

Lower bound: 0.42

The coefficient on LOSS for investors

Upper bound: 0.24

Lower bound: 0.16

The coefficient on the dummy for investor is negative

Among those who neither are equity constrained nor face a potential loss, **investors also set 2-3% lower asking/list price.**

Investors exhibit less loss aversion than owner-occupants by half.

OWNER-OCCUPANTS VERSUS INVESTORS(2)

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS × owner-occupant	0.50 (0.09)	0.42 (0.09)	0.66 (0.08)	0.58 (0.09)
LOSS × investor	0.24 (0.12)	0.16 (0.12)	0.58 (0.06)	0.49 (0.06)
LOSS-squared × owner-occupant			-0.16 (0.14)	-0.17 (0.15)
LOSS-squared × investor			-0.30 (0.02)	-0.29 (0.02)
LTV × owner-occupant	0.03 (0.02)	0.03 (0.02)	0.01 (0.01)	0.01 (0.01)
LTV × investor	0.053 (0.027)	0.053 (0.027)	0.02 (0.02)	0.02 (0.02)
Dummy for investor	-0.02 (0.014)	-0.02 (0.01)	-0.03 (0.01)	-0.03 (0.01)
Estimated value in 1990	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)
Estimated price index at quarter of entry	0.84 (0.05)	0.80 (0.04)	0.86 (0.04)	0.82 (0.04)
Residual from last sale price		0.08 (0.02)		0.08 (0.02)

The joint test on the quadratic loss terms is also statistically significant not only for owner-occupants but also for investors

The coefficients of investors are larger than those of owner-occupants in absolute term.

This implies that

For large losses, marginal effect of loss aversion on list price of investors diminishes much faster with the size of the loss than owner-occupants do.

SOLD VERSUS UNSOLD (1)

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS × unsold	0.45 (0.06)	0.34 (0.06)	0.61 (0.06)	0.50 (0.06)
LOSS × sold	0.27 (0.08)	0.16 (0.08)	0.60 (0.04)	0.49 (0.04)
LOSS-squared × unsold			-0.16 (0.09)	-0.16 (0.09)
LOSS-squared × sold			-0.29 (0.02)	-0.29 (0.02)
LTV × unsold	0.04 (0.02)	0.04 (0.02)	0.03 (0.01)	0.03 (0.01)
LTV × sold	0.06 (0.02)	0.06 (0.02)	0.03 (0.01)	0.02 (0.01)
Dummy for sold	-0.03 (0.01)	-0.03 (0.01)	-0.03 (0.01)	-0.04 (0.01)
Estimated value in 1990	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.10 (0.01)
Estimated price index at quarter of entry	0.88 (0.04)	0.81 (0.03)	0.93 (0.03)	0.86 (0.03)
Residual from last sale price		0.11 (0.02)		0.11 (0.02)

The coefficient on LOSS for sellers whose properties are unsold

Upper bound: 0.45

Lower bound: 0.34

The coefficient on LOSS for sellers whose properties are sold

Upper bound: 0.27

Lower bound: 0.16

The coefficient of the dummy for a sold property is negative

Among those who neither are equity constrained nor face a potential loss, **properties that eventually sell had been listed at a 3-4% lower list price.**

Sellers exhibit less loss aversion than withdrawers by about half.

SOLD VERSUS UNSOLD (2)

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS × unsold	0.45 (0.06)	0.34 (0.06)	0.61 (0.06)	0.50 (0.06)
LOSS × sold	0.27 (0.08)	0.16 (0.08)	0.60 (0.04)	0.49 (0.04)
LOSS-squared × unsold			-0.16 (0.09)	-0.16 (0.09)
LOSS-squared × sold			-0.29 (0.02)	-0.29 (0.02)
LTV × unsold	0.04 (0.02)	0.04 (0.02)	0.03 (0.01)	0.03 (0.01)
LTV × sold	0.06 (0.02)	0.06 (0.02)	0.03 (0.01)	0.02 (0.01)
Dummy for sold	-0.03 (0.01)	-0.03 (0.01)	-0.03 (0.01)	-0.04 (0.01)
Estimated value in 1990	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.10 (0.01)
Estimated price index at quarter of entry	0.88 (0.04)	0.81 (0.03)	0.93 (0.03)	0.86 (0.03)
Residual from last sale price		0.11 (0.02)		0.11 (0.02)

The joint test on the quadratic loss terms is also statistically significant for both sellers and withdrawers.

The coefficients of sellers are larger than those of withdrawers in absolute term.

This implies that

For large losses, marginal effect of loss aversion on list price of sellers diminishes much faster with the size of the loss than withdrawers do.

LOSS AVERSION AND TRANSACTION PRICES

Variable	(1) All listings	(2) All listings
LOSS	0.18 (0.03)	0.03 (0.08)
LTV	0.07 (0.02)	0.06 (0.01)
Residual from last sale price		0.16 (0.02)
Months since last sale	-0.0001 (0.0001)	-0.0004 (0.0001)
Dummy variables for quarter of entry	Yes	Yes
Number of observations	3413	3413

Variable	(1) All listings	(2) All listings
LOSS	0.35	0.25

X 2

Loss Aversion and Asking Price

Only the coefficient on prospective LOSS of model I, or the upper bound, is statistically significant. The lower bound is not.

The coefficient in this case is 0.18, which is about half of what we found in asking prices. There are two factors that make the impacts of loss aversion on asking price doubles the impacts on transaction price.

1. Owners who withdraw from the market are more sensitive to loss than those who eventually sell.
2. Some sellers initially set the asking price too high and quickly corrected it once they entered the market.

LOSS AVERSION AND HAZARD RATE OF SALE

Terminology

Hazard Rate of Sale

A probability that a property sells in any given week given that an owner has listed the property for sale.

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS	-0.33 (0.13)	-0.63 (0.15)	-0.59 (0.16)	-0.90 (0.18)
LOSS-squared			0.27 (0.07)	0.28 (0.07)
LTV	-0.08 (0.04)	-0.09 (0.04)	-0.06 (0.04)	-0.06 (0.04)
Estimated value in 1990	0.27 (0.04)	0.27 (0.04)	0.27 (0.04)	0.27 (0.04)
Residual from last sale		0.29 (0.07)		0.29 (0.07)

The coefficients on the Estimated Value in 1990 are positive and significant.

Interpretation

High-quality properties have a higher hazard rate of sale. In other words, they are sold more quickly.

The coefficients on LOSS are negative and statistically significant.

Interpretation

Sellers facing a higher potential loss face a lower hazard rate of sale. They have to stay longer on the market.

The coefficients on the quadratic terms of LOSS are positive and significant.

Interpretation

Larger losses have a positive, but diminishing effect on the hazard rate of sale. This is consistent with previous findings that marginal effect on the list price diminishes with the size of the loss.

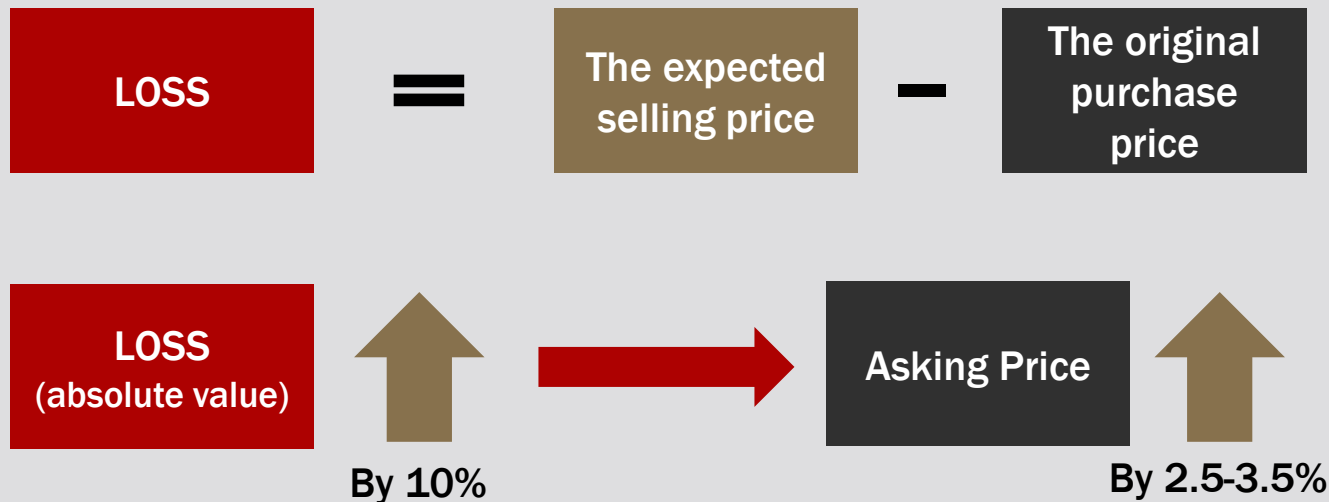
CONCLUDING REMARKS

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CONCLUDING REMARKS (1)

Sellers subject to losses...

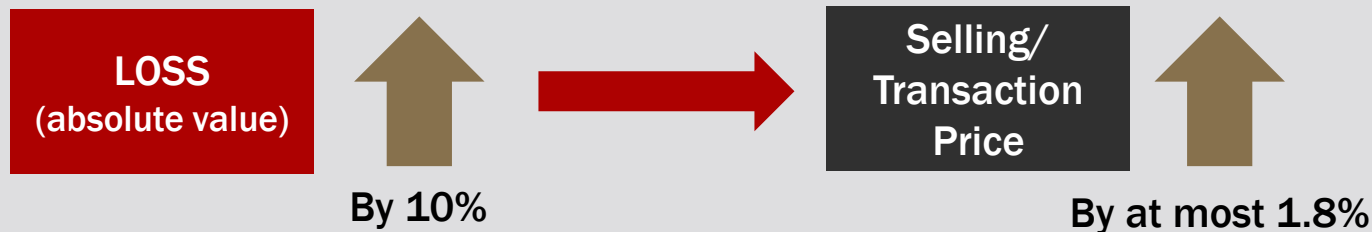
1. Set higher asking prices of 25-35% of the difference between the expected selling price of a property and their original purchase price.



CONCLUDING REMARKS (2)

Sellers subject to losses...

2. Attain higher selling price of at most 1.8% of the loss



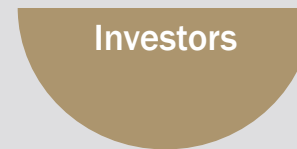
3. Face longer time on the market. In other words, they are exposed to a lower hazard rate of sale.



CONCLUDING REMARKS (3)

4. Investors are also loss averse but only half of the degree of loss averse of owner-occupants.

Degree of loss aversion:



5. Successful sellers' degree of loss aversion is about half of unsuccessful sellers, or those who eventually withdraw properties from the market.

Degree of loss aversion:



CONCLUDING REMARKS (4)

- These findings suggest that **sellers in the real estate market are averse to realizing (nominal) losses.**
- **Real estate markets are far from being perfect asset markets** since transaction prices are determined by seller characteristics, such as their loss aversion and equity constraints, in addition to the qualities of properties.
- This also explains the major finding in the previous research that **volume falls when prices decline**, which cannot be explained by perfect asset models. However, **loss aversion and equity constraints can explain it.**

Q&A