Equity and Time to Sale in the Real Estate Market

by David Genesove
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Abstract

Estimates from the Boston condominium market show that owners with high loan-to-value ratios take longer to sell their properties than owners with low loan-to-value ratios. When sold, properties with high loan-to-value ratios receive a higher price than units with less debt. Both of these results are consistent with a search model in which owners "constrained" by large amounts of debt set a higher reservation price than "unconstrained" owners, accepting a lower probability of sale in exchange for a higher final sales price, and thus lend credibility to theoretical models that establish a link between sales volume and prices through changes in the equity of existing homeowners.

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Equity and Time to Sale in the Real Estate Market

I. Introduction

One of the distinctive and puzzling features of the housing market cycle is the dramatic variation in sales volume over time. In Massachusetts, for example, total sales of existing homes increased from 42,500 in 1982 to over 100,000 in 1987, and then fell below 60,000 by 1992 (National Association of Realtors 1993). Over that same time period, real prices rose by over 130 percent, and then declined by almost one-third. These changes are much more dramatic than the movements of economic fundamentals such as unemployment and gross state product over the same time period.

Some have argued that this positive price-volume correlation in real estate is due to sellers who do not accept market conditions when prices fall, refusing to sell their house for a nominal loss or below some other value that is above the current market price.[1] Others have suggested that the volume decline in a down market may be a rational response by sellers who recognize that at current prices real estate investments have positive expected future returns.[2] Finally, the uniqueness of individual properties may prevent sellers from recognizing market-wide price changes, and thus sellers may be

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[1]Case and Shiller (1988) conducted a survey of recent home buyers and found that 57 percent of the Boston respondents agreed with the following proposition: "Since housing prices are unlikely to drop very much, the best strategy in a slow market is to hold on until you get what you want for a property." Almost 20 percent of the respondents who had previously sold a home noted that they set their reservation price based on what they previously paid.

[2]See Case and Shiller (1989) and Meese and Wallace (1993) for evidence of forecastable long-run returns.

slow to adjust their reservation prices in a changing market, at least in the short term.

Recently Stein (1993) has proposed an alternative explanation, arguing that down payments and other borrowing constraints can add a self-reinforcing mechanism to demand shocks. When housing prices fall, equity losses on current homes may prevent potential buyers who rely on the proceeds from the sale of their existing home for a down payment on the next from purchasing a home of equal value. Instead, they will either buy a smaller home or forgo moving altogether. The first course leads to a decrease in demand and hence an even lower price; the second, to a diminution of sales of existing homes. Together, they explain the positive correlation between volume and price. Also, in this way, initial contractions in demand are magnified. Note that the mechanism works through the asymmetric treatment of housing purchasers, who are required to contribute some equity, and incumbent owners, whose equity position may deteriorate without their being forced out of the dwelling.

Using a sample of condominiums listed for sale in Boston in the early 1990s, this paper presents evidence consistent with the first predicate of the Stein model. The results indicate that housing equity does matter in owners' decisions to sell and in the list and final transaction prices. A unit with a loan-to-value ratio of 100 percent is one-third less likely to sell within any given amount of time than a unit with no mortgage; if sold, however, the first unit obtains a price 10 percent higher than the second. The data suggest that the predictions of the Stein model, which is a model about people trading homes, is borne out as strongly for investors as for owner-occupants. We suggest an explanation for investor behavior as well.

The remainder of the paper is organized as follows. Section II reviews the pertinent theoretical and empirical literature. Section III reformulates the equity hypothesis in a search framework. Section IV describes the data. Section V presents estimates of a proportional hazards model of sale, and Section VI, estimates of the regression of price on the ratio of loan to value. Section VII, which concludes the paper, discusses aggregate implications.

II. Previous Literature

We are aware of only one other theoretical model that generates a positive price-volume correlation in the market for existing homes. Wheaton (1991) shows in a search model that small movements in vacancy rates (due to shocks in demand, or changes in the search technology) can be associated with large movements in prices. The extent of trading volume in that model comes from the efficiency with which mismatched households are able to buy a new house that is well matched with their preferences. Better matching technology leads to higher prices and increased trading volume. Thus the Wheaton and Stein papers are alternative, although not mutually exclusive, explanations for the price-volume correlation.

On the empirical side, several papers provide evidence that is consistent with the equity hypothesis. One implication of the Stein model is that owners of existing homes should behave differently as buyers than do consumers who are looking to purchase their first home. Thus the trade-up market (homes purchased by existing owners) should be more responsive to the housing cycle than the first-time buyer's market. Consistent with this theory, Mayer (1993) shows that high-priced homes seem to increase faster in upturns and decrease

faster in downturns than low-priced homes. Smith and Tesarek (1991) get a similar result comparing price changes of high- and low-quality homes in Houston during the 1970s and early 1980s.

Several studies show that down payment constraints do alter household behavior. Englehardt (1992), for example, shows that households reduce their consumption in anticipation of the purchase of a new home. Linneman and Wachter (1989), Jones (1989), and Zorn (1989) also find evidence that down payment requirements affect the housing tenure decision.

None of these papers provide a direct test of the equity hypothesis. For example, the cyclical behavior of trade-up home prices might be due to changes in the relative supply of various types of homes rather than differences in demand. Previous studies of mortgage constraints and household behavior look at tenure choice--the decision whether to own or rent--rather than the mobility of existing homeowners.

III. Search

We find it more natural to test the equity hypothesis within a search framework. This has the added advantage of yielding predictions about cross-sectional variations in prices. In a search model, owners do not decide whether or not to sell at some single price. Rather, facing a distribution of offered prices, they choose a reservation price. A high reservation price brings the benefit of a higher expected transaction price, but at the cost of a longer wait until sale.

The equity hypothesis is to be reinterpreted, then, as the claim that owners with insufficient equity in their house will choose a higher reservation price. Consequently, the hazard rate of sale (the probability

that a property will sell in period t given that it has survived on the market t-1 periods) will be smaller. Furthermore, transaction prices will be higher. To the extent that asking prices reflect reservation prices, they, too will be higher.

The argument is most simply stated in a world in which all houses are equally valued by the market. Then the level of the down payment constraint together with the extent of equity in the existing home will put a floor on the set of offers that the seller could accept and still move to a comparable house. If that floor exceeds what would otherwise be the reservation price, it will serve as the reservation price.

An inherent nonlinearity exists in the relationship between equity and reservation price. Those owners whose equity stake in their present home is sufficiently high that they are unconstrained will be insensitive to small changes in their equity shares. But for those who are constrained--but not so encumbered by debt that moving is out of the question--every dollar more of equity is a dollar more that can be applied to the new home. We examine that nonlinearity in our empirical work.

Our sample is restricted to the population of units that are listed for sale. Thus we condition on the owner exhibiting some interest in selling the property. Although this might introduce a selection bias, its direction is clear: If low equity deters listing as well, among "constrained" owners only the most eager to sell will list, and the equity effect on the sale hazard and price will be more difficult to detect. Under the null hypothesis of no equity effect in any aspect of selling, including listing, there will be no self-selection of interest. An alternative approach would have been to model the hazard of sale among the entire population of householders. But we lack

information on demographic and other factors that have been shown to predict mobility in cross sections. (We would be especially worried about our inability to observe age. Young owners have less equity because they have yet to accumulate non-human capital, but they are also more mobile.)

IV. Data

This paper uses data from the Boston condominium market between May 1, 1990 and December 31, 1992, a period of substantial decline in the market (Figure 1). In May 1990, prices were nearly triple those of eight years previous but had just started to decline. Sales had already declined by over one-third from two years previous. Subsequently, prices would fall by almost 20 percent in 1990 alone, to be followed by a 10 percent drop over the next two years. Sales would rise slightly between 1990 and 1992. These years form an appropriate time period for testing the equity hypothesis, which presupposes an unanticipated price decline.

Listing data were obtained from LINK, a privately owned listing service not associated with broker groups like the National Association of Realtors. Over this time period, LINK claims to have had a 90 to 95 percent market share in its coverage area, which includes Central Boston (Back Bay and Beacon Hill), Charlestown, and South Boston.[3] LINK has weekly records of all properties listed, including the asking price, the realtor's name and the property's street address. (Although LINK allows properties to be listed concurrently by up to three brokers, listings were combined to a single record for each property in a week, regardless of the number of brokers involved.)

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[3]LINK lists some condominiums in East Cambridge as well as some one- to four-family properties in the city of Boston, but that information was eliminated to maintain a well-defined market.

To supplement LINK, information on property characteristics and assessed tax valuations was obtained from the City of Boston Assessor's Office for all units in the three neighborhoods. The Assessor's data indicate for each year whether the owner applied for a residential tax exemption.[4] We classify all units that an exemption was applied for as owner-occupied, though clearly there is room for misclassification. Finally, Banker & Tradesman, a private firm, supplied sales prices and mortgage amounts for all property transactions between 1982 and 1992, including sales and refinancings, but not foreclosures.

LINK properties were included in the sample if they could be matched into the Assessor's data.[5] Some listings correspond to the same property being listed more than once (multiple spells). Because of the possibility of an address mismatch in a given week, or brokers gaming to get a property designated as a "new listing," a listing was considered new only if there was at least a four-week window since it last appeared in LINK.

When a property exited from LINK, its destination was labeled either "sale" or "off-market," according to whether a sale transaction record was found in Banker & Tradesman in a window of two months prior to four months after the date of exit. Because of matching difficulties, some sales will be misclassified as "off-market." Also, any initial agreements that led to a unit exiting from LINK but later fell through will be classified as "off-market."

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[4]In Boston, owners can obtain a tax exemption equal to 10 percent of the city's average property tax bill by certifying that the owner lived in his/her unit on January 1st of a given tax year.

[5]A listing that failed to match had an address that was too vague for exact matching or was different from the property's legal address. The initial matching by computer was followed by a round of matching by hand.

The mortgage balance was calculated for all properties that sold or refinanced at least once after 1982, using the latest transaction available in Banker & Tradesman, and under the assumption that the owner used a 30-year fixed mortgage at the prevailing mortgage interest rate. Some transactions could not be matched with the Assessor's data and were discarded.

We normalized the mortgage balance by dividing through by an estimate of the market value of the home to obtain the loan-to-value ratio. Two different estimated values were used--the property's official assessed value and the previous sale price, adjusted by a resale price index. The Boston Assessor's Office computes a value based on both a hedonic method and the median price[6] of five comparable units from recent sales. Where the two methods differ significantly, the property's valuation is investigated further by the Assessor's Office. Only sales that occur prior to the assessment date are used to determine the official value. The resale price index is calculated on a quarterly basis using the value-weighted arithmetic method as in Shiller (1991) on matched sale pairs in the LINK coverage area.

We chose to focus on assessed values. Although the previous sale price captures the idiosyncracies of individual properties, it also reflects the vagaries of the previous transaction itself, such as below-market transfers of properties and distressed sales. Also, because of the relatively small size, the resale price index is a very noisy estimate of the general market level of prices. As will be seen in the next section, however, it makes little qualitative difference which estimated value is used. Out of a total of 8,041 listings in LINK, 5,838 were successfully matched to the Assessor's Office

[6]There is some adjustment of prices for small differences in attributes in this method as well.

data. We dropped properties that lacked information on a previous sale, or that had an observed loan-to-value ratio greater than 2. This shrank the sample to 2,381 observations (if loan-to-value is calculated from the assessed value) or to 2,358 observations (if loan-to-value is calculated from the previous sale price).

Table 1 gives means of various property characteristics for the whole sample, as well as various subsamples. The sample is restricted to condominiums in the LINK coverage area, broadly defined. Because Boston does not delineate neighborhoods in the same way that LINK does, the whole sample includes some properties that are unlikely to have been listed in LINK even if they were for sale.

The average condominium had a tax assessment of almost $200,000, but contained less than 1,000 square feet of finished space. Over half of all owners did not claim the residential tax exemption, suggesting that a large number of units are owned by investors and rented as apartments. Investor units are on average smaller and more highly leveraged than condominiums possessed by owner-occupants. LINK units are slightly larger and more expensive than the average for their area, and contain a higher proportion of owner-occupants.

V. Hazard Rate of Sale

This section estimates the contribution of equity to the hazard rate of sale--the probability that a property sells in any given week, given that an

Table 1
Sample Means
(Standard Errors)

Variable	(1) All Units	(2) LINK Listings	(3) Owner-Occupants	(4) Investors
Number of Observations	21,446	2,381	1,320	1,061
1991 Assessed Value[a]	197,240 (140,540)	213,693 (134,323)	227,729 (126,520)	196,232 (141,569)
Computed Loan Balance as of 5/1/90	101,814 (152,085)	181,195 (122,153)	193,493 (119,154)	165,894 (124,149)
Loan/Value[b] Calculated Using Resale Price Index	.53 (.35)	.65 (.55)	.67 (.48)	.62 (.63)
Loan/Value[b] Using Assessed Value	.48 (.34)	.61 (.42)	.64 (.40)	.57 (.44)
Square Footage	908 (480)	973 (460)	1,002 (477)	856 (424)
Total Rooms	3.7 (1.3)	3.8 (1.3)	4.0 (1.3)	3.6 (1.3)
Bedrooms	1.5 (.7)	1.5 (.7)	1.6 (.7)	1.5 (.6)
Full Baths	1.2 (.5)	1.2 (.4)	1.2 (.5)	1.1 (.4)
Half Baths	.12 (.33)	.14 (.35)	.17 (.38)	.11 (.32)
Floor of Unit	4.0 (5.1)	3.5 (4.4)	3.4 (4.3)	3.5 (4.4)
Parking Spaces	.20 (.44)	.19 (.45)	.19 (.49)	.18 (.41)
Owner-Occupant	.43	.55	1	0
Year Built		1903	1898	1909

[a]Boston Assessor's Office prediction of January 1, 1990 value, using information prior to that date only.
[b]Calculated for all properties with a previous sale and an estimated Loan/Value < 2.

owner has listed the property for sale in LINK and that it has not yet sold. We specify the hazard rate as:

$$h(t) = \frac{\textit{probability of selling between week t and week t+1}}{\textit{probability of not exiting before week t}}$$

$$= h_0(t)\, e^{\beta x}$$

where x is a vector of attributes of the property and the owner, and ß is a conformable vector of parameters.

The assumption of a proportional hazard means that changes in the attributes affect the hazard by the same proportion each week a unit is on the market. Thus if unit A is half as likely to sell as unit B after one week on the market, A is also half as likely to sell as B after 10 weeks. The hazard ratio for the two properties is:

$$\textit{hazard ratio of A relative to B} = \frac{h_0(t)\, e^{\beta x_A}}{h_0(t)\, e^{\beta x_B}} = e^{\beta (x_A - x_B)}$$

and so is independent of the baseline hazard, $h_0(t)$.

We estimate the parameters by Cox's partial likelihood method. Units that remain listed but unsold at the end of our sample period, December 1992, are considered to be right censored. Units that are delisted without sale (go "off-market") are considered to be censored at their time of exit. Although some properties go "off market" because of exogeneous changes in the conditions of the household, others exit when the owners become discouraged. Under the null hypothesis of no equity effect on selling, the treatment of "off market" properties should have no effect on the estimated coefficients. Under the alternative that equity does matter, the likely bias is positive if,

precisely because they are less likely to sell, high loan-to-value properties are more likely to go off market. The presence of this bias will make the Stein model more difficult to establish.

Table 2 presents estimates of the proportional hazards model. The evidence strongly favors the conclusion that higher loan-to-value ratios decrease the sale hazard.

As column (1) indicates, the coefficient on the loan-to-value ratio is negative and highly significant, and suggests that a property with an outstanding mortgage balance equal to its assessed value would be about 75 percent ($e^{-.29}$) as likely to sell in a given week as an identical property with no mortgage. That conclusion continues to hold when a dummy variable for the absence of any mortgage is included, as in column (2). Columns (4) and (5) show that including property attributes and the inverse of the property's assessed value ($(\text{Value})^{-1}$) has little effect on the coefficient on loan-to-value coefficient.

All specifications include year-of-entry dummies. Because prices and assessed values declined substantially over the period, loan-to-value ratios are much higher in 1991 and 1992 than in 1990. The dummies are included to avoid confusing any aggregate time effects with the equity effect. We suspect that the much lower estimated hazard in 1990 than in the following years is due to the more rapid decline in prices in that year, and to the fact that owners are slow to adjust their reservation prices in the face of price shocks. Future work will examine this conjecture.

Years since last sale (at time of entry) is included in all columns since, by construction of the mortgage balance, it, too, is highly correlated with the loan-to-value ratio and, because of the dependence of mobility on

Table 2
Sale Hazard Equations
Value Is the Assessed Value in the Year of Entry into LINK
Duration Variable Is the Number of Weeks the Property Is Listed on the Market before Exiting
(Standard Errors)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Loan/Value (L/V)	-.29 (.10)	-.29 (.16)		-.26 (.11)	-.23 (.11)	
No Mortgage		-.01 (.16)				
Loan/Value (< .8)			-.26 (.15)			-.23 (.15)
Loan/Value (≥ .8)			-.37 (.36)			-.34 (.35)
$(VALUE)^{-1}$ (000s)					-202 (311)	
Years Since Last Sale	-.04 (.02)	-.04 (.02)	-.04 (.02)	-.04 (.02)	-.05 (.02)	-.04 (.02)
1991 Entry	.55 (.11)	.55 (.11)	.55 (.11)	.54 (.11)	.75 (.12)	.54 (.12)
1992 Entry	.62 (.13)	.62 (.13)	.63 (.13)	.61 (.13)	.95 (.14)	.62 (.13)
Include Property Attributes	NO	NO	NO	YES	YES	YES
Number of Observations	2,381	2,381	2,381	2,381	2,381	2,381
Log Likelihood	-3589.6	-3589.6	-3589.6	-3565.6	-3541.9	-3565.6
P-Value[a]		.02	.02			.06

[a]For the joint test of the hypothesis that all of the Loan/Value coefficients equal zero.

length of tenure, may have an independent effect on the hazard. The loan-to-value ratio is equal to the product of the (mortgage balance at the time of (re)financing)-to-value and a function that is declining in the elapsed time since (re)financing. Two sellers of identical units with the same length of residence will exhibit different loan-to-value ratios if at least one factor among the initial mortgage balance, the prevailing interest rate, and the time since last refinancing, differs between them.

Given the inherent nonlinearity in the hypothesized relationship between equity and time to sale, columns (3) and (6) introduce a spline function, so that the log-hazard is piecewise linear and continuous in the loan-to-value.[7] This allows the sensitivity of the hazard to loan-to-value to differ on either side of 0.8, which corresponds to a 20 percent cash outlay for the down payment and closing costs,[8] and so is consistent with the theoretical prediction that only high loan-to-value units--those of "constrained" households--are sensitive to equity. Consistent with theory, the hazard rate is more sensitive to loan to value above than below the knot; however, the difference is not significant.

Table 3 repeats Table 2 with the indexed previous sale price replacing the official assessed value. The coefficients are remarkably similar to those in Table 2, although they are slightly larger. For example, increasing the loan-to-value ratio from 0 to 1 decreases the sale hazard by 31 percent using the Table 3 estimates (column (1)) rather than the 25 percent of Table 2.

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[7]The additional variable is defined as the product of loan-to-value and a dummy variable that equals 1 when loan-to-value is above the cutoff and 0 otherwise.

[8]A grid search over the knot yielded likelihood functions that asymptoted to infinity near zero or exhibited global maxima at 1.51, which is exceeded by only one percent of the sample.

Table 3
Sale Hazard Equations
Value Computed Using Resale Price Index
Duration Variable Is the Number of Weeks the Property Is Listed on the Market before Exiting
(Standard Errors)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Loan/Value (L/V)	-.38 (.10)	-.49 (.17)		-.34 (.11)	-.38 (.11)	
No Mortgage		-.15 (.17)				
Loan/Value (< .8)			-.27 (.16)			-.27 (.16)
Loan/Value (≥ .8)			-.73 (.43)			-.56 (.42)
$(VALUE)^{-1}$ (000s)					-718 (182)	
Years Since Last Sale	-.05 (.02)	-.06 (.02)	-.05 (.02)	-.05 (.02)	-.07 (.02)	-.05 (.02)
1991 Entry	.54 (.11)	.55 (.11)	.55 (.12)	.53 (.11)	.59 (.12)	.54 (.12)
1992 Entry	.64 (.13)	.66 (.13)	.67 (.13)	.63 (.13)	.74 (.13)	.65 (.13)
Include Property Attributes	NO	NO	NO	YES	YES	YES
Number of Observations	2,354	2,354	2,354	2,354	2,354	2,354
Log Likelihood	-3542.5	-3542.1	-3542.1	-3520.0	-3510.8	-3519.8
P-Value[a]		.001	.001			.007

[a]For the joint test of the hypothesis that all of the Loan/Value coefficients equal zero.

Table 4 compares the hazard rates for owner-occupants and investors. When the two groups are forced to share the same baseline hazard, whether with property attributes (column (2)) or without (column (1)), it is impossible to reject the null that the loan-to-value coefficients are the same. When the baseline hazards are allowed to differ, the magnitude of the coefficient for investors (column (4)) exceeds that for owner-occupants (column (3)), though not significantly so.

From the narrow perspective of the equity hypothesis, this result is surprising. The hypothesis is a story about trading homes; there is no obvious reason why it should also apply to investors. We offer a simple explanation of why investors are also sensitive to equity.

When the value of a property falls below the difference between the remaining loan balance and any other assets, the owner will default on the loan if the unit is sold. Thus, so long as rent is sufficient to cover the scheduled mortgage payments, the owner is better off continuing to hold the property and waiting for it to appreciate.[9] In essence, he holds a put option. The value of the option is positive if prices follow a random walk (as in an asset model), and greater still if there long-run returns to holding real estate in a down market are positive, as suggested by Case and Shiller (1989) and Meese and Wallace (1993). For this reason, we expect investors who own units with high loan to values, like owner-occupants, to set high

[9]If the rent falls below the mortgage payments, holding the property remains the optimal policy so long as the option value exceeds the cash outflow.

Table 4
Sale Hazard Equations by Owner-Occupant Status
Value Computed Using Assessed Value
Duration Variable Is the Number of Weeks the Property Is Listed on the Market before Exiting
(Standard Errors)

Variable	(1) Full Sample	(2) Full Sample	(3) Owner-Occupied	(4) Not Owner-Occupied
Loan/Value (L/V)			-.15	-.37
			(.15)	(.16)
L/V* (OWNOCC = 1)	-.29	-.22		
	(.14)	(.15)		
L/V* (OWNOCC = 0)	-.39	-.37		
	(.16)	(.16)		
Owner-Occupied	.31	.18		
	(.15)	(.15)		
Years Since Last Sale	-.05	-.04	.01	.14
	(.02)	(.02)	(.03)	(.04)
1991 Entry	.54	.54	.48	.58
	(.11)	(.11)	(.15)	(.18)
1992 Entry	.62	.61	.41	.89
	(.13)	(.13)	(.17)	(.20)
Include Property Attributes	NO	YES	NO	NO
Number of Observations	2,381	2,381	1,320	1,061
Log Likelihood	-3581.5	-3561.5	-2022.4	-1210.7
P-Value[a]	.007			

[a]For the joint test of the hypothesis that all of the Loan/Value coefficients equal zero.

reservation prices, and thus that such units will take longer to sell and obtain higher prices.[10]

The failure to discriminate between the hazard function of owner-occupants and investors is not entirely due to the possibility of misclassification. The coefficients in Column (1) also indicate that, all else equal, owner-occupants are one-third more likely to sell than investors. This is not surprising. Owner-occupants have higher search costs: it is *their* homes that potential buyers will traipse through. And without a new home to live in and bridge financing, the opportunity to rent the property while waiting for a high price is limited. Also, investors face a lower cost of defaulting and are probably more likely to exercise this option than owner-occupants.

VI. Prices

Table 5 presents the regression of the (log) transaction price on the loan-to-value ratio. Property attributes, the (log) assessed value, and dummies for the quarter of sale are also included. The coefficient on the assessed value exceeds 0.9 in the first four columns, even after separately controlling for the hedonic attributes, providing evidence that the assessed value is a very good proxy for the current value.

Table 5 gives further evidence in favor of the search version of the equity hypothesis. At 0.14, the coefficient on loan-to-value in column (1) is

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[10]Although the argument applies to owner-occupants as well, because investors can more easily shield their assets (through incorporation or the "homestead" exemption) and face a lower cost of default, they are more likely to exercise this option. For this reason, banks generally require greater initial equity from investors.

Table 5
Regressions Using Sale Price and (Original) Asking Price
Value Calculated with Assessed Value
(Standard Errors)

Variable	(1) Sale Price[a]	(2) Sale Price[a]	(3) Sale Price[a]	(4) Asking Price[a]	(5) Sale Price[a]- Asking Price[a]
Loan/Value	.14 (.03)	.13 (.04)		.10 (.02)	.04 (.02)
No Mortgage		-.01 (.04)			
L/V (< .8)			.11 (.04)		
L/V (> = .8)			.21 (.09)		
Years Occupied	.006 (.005)	.01 (.01)	.01 (.005)	-.002 (.004)	.008 (.004)
Value[a]	.91 (.07)	.91 (.07)	1.06 (.08)	.98 (.06)	-.07 (.06)
Include Property Attributes	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES
R^2	.84	.84	.85	.89	.10
Number of Observations	496	496	496	496	496
P-Value[b]		.001	.001		

[a]Denotes variables measured in logs.
[b]For the joint test of the hypothesis that all of the Loan/Value coefficients equal zero.

positive, and significant at the 1 percent level, suggesting that owners with high loan-to-value levels hold out for a higher price. But as column (3), which allows for a spline, indicates, this positive partial correlation is driven by the high loan-to-value properties. This is further proof of the nonlinearity in the relationship, as predicted by the theory.[11]

Column (4) shows that the loan-to-value ratio has somewhat lesser effect on the asking price than on the transaction price. The estimates indicate that owners with a loan-to-value ratio of 1 set an asking price that is, on average, about 10 percent higher than the asking price set by owners who have no mortgage. Column (5) shows that the discount (the excess of the (log) asking price over the (log) sale price) is decreasing in loan-to-value.

VII. Conclusion

This paper shows that units with low equity take longer to sell and obtain a higher price when sold. These results lend credibility to the theory that initial decreases in property prices may lead to further declines in demand by reducing home equity. Each week that it is on the market, a unit with an outstanding mortgage balance equal to its market value is one-third less likely to sell than a unit with no mortgage at all. Consistent with a strategy of holding out for a high price, the first unit will obtain a price that is 10 percent higher than the second, if both sell.

Can the equity hypothesis alone explain the aggregate behavior of the market? Given that condominium prices in Boston decreased by almost one-third between 1990 and 1992 (and thus loan-to-value ratios increased by nearly 50 percent), our estimates would predict a decline in the hazard rate of about 15

[11]A grid search over the knot yielded a value of 0.67.

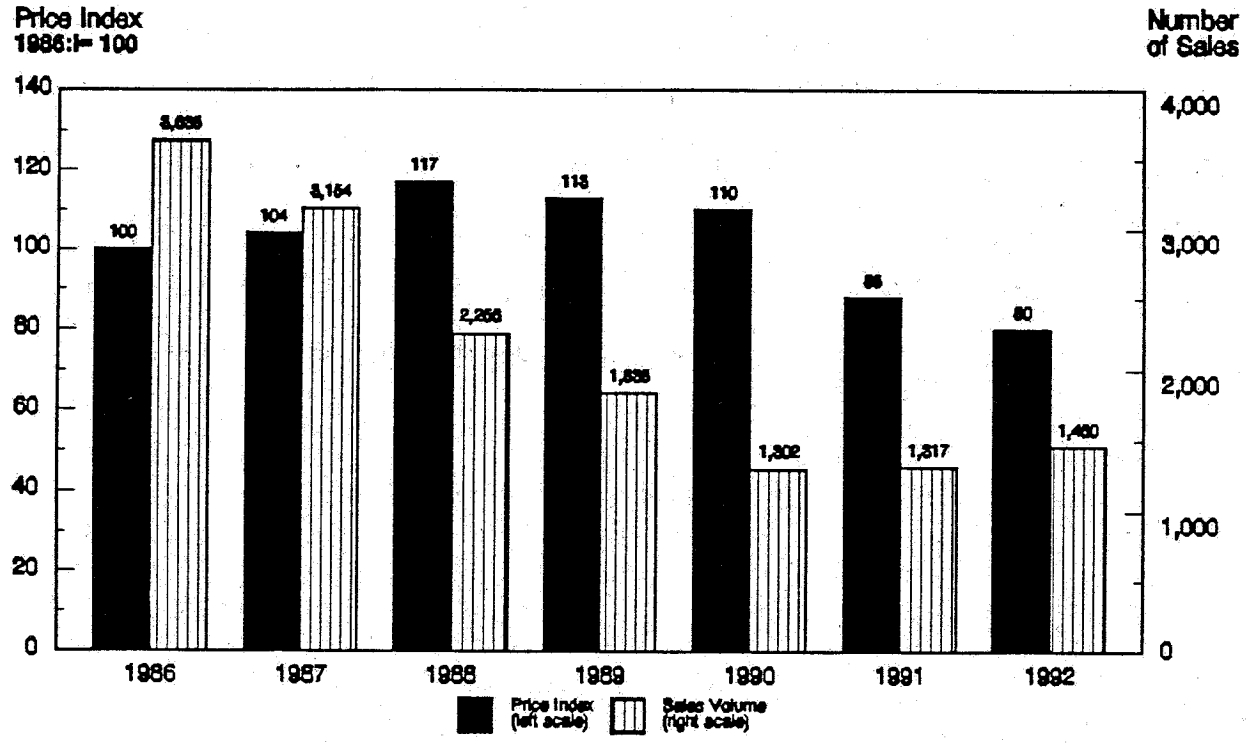
percent. To the extent that low equity units are less likely to be listed in the first place, we would expect a decrease in sales as well.

In fact, the opposite is true: both the hazard rate and sales increased over those years! Table 2 shows that properties entering the market at the end of the sample period sold twice as quickly as units entering in 1990. Figure 1 shows that 1990 marks the trough in sales as well. At most, the equity hypothesis can explain the concurrent fall in prices and sales in 1990, and the failure of sales to fully return to their previous level in the subsequent years. Although equity has some part to play, a complete explanation of aggregate behavior clearly requires an understanding of other factors (such as the slowness of owners to adjust to changing market conditions).

Figure 1

Price Index and Sales Volume

Boston Condominiums



Source: Banker & Tradesman and author's calculations.
The price index was calculated using an arithmetic resale price estimator and corresponds to the first quarter of each year
The price data include matched sales in the LINK coverage area: Central Boston, South Boston, and Charlestown.

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