

## House Prices and Time-till-sale in Windsor<sup>1</sup>

### Introduction

Advice and anecdotes surrounding house marketing proliferate. While vendors desire to sell quickly and for a high price, few people trade enough houses to really offer informed advice. Thus, selling a house is filled with stress and doubt. Using three years (1997 to early 2000) of Windsor and Essex County Real Estate Board data, covering over 20,000 houses, researchers from the University of Windsor and from Canada Mortgage and Housing Corporation were able to study this problem. On average, houses that sold took 10 weeks to sell but houses whose listings expired before sale, more than 40 percent of the sample, were on the market for 19 weeks before they left.

In general, vendors have two ways to influence the selling process. First, they can provide an enticing, while accurate, description of the house. Since prospective buyers first see this description and the list price, this information must prompt a buyer to think that the house might fulfill their requirements. Even so, some types of houses are simply hard to sell. Second, a vendor helps set the price at which the home is listed; usually a few percentage points above the minimum price that a vendor is willing to accept. While setting a lower list price tends to lead to a quicker sale, too low a list price may prompt a sale below the house's market value. Our study focused on this price/time trade-off. Table 1 summarizes some of our findings.

**Table 1:** Summary of Findings

Variables which:	Increased Time-till-sale	Decreased Time-till-sale
Description of House	5 or more bedrooms, Condominium, Ranch style, "Rental" Property	"Beautiful" House, 1 or 1.5 Bathrooms, "Starter" House, Landscaping, "Handyman Special"
Seller's Actions	Higher List Price, "Motivated" Seller	

The key variable is the "Degree of Over Pricing" (DOP) which measures the difference between the list price chosen by the seller and the average list price for a that type of house, based on its observable features. We found that the DOP of unsold houses was roughly 4.5 per cent higher than those which sold. A higher DOP increased the expected time-till-sale (TTS). Further, increasing DOP prompted a more-than-proportionate increase in TTS. For example, we estimate

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<sup>1</sup> This research is based on data from one place and at one time. While I believe that the results apply more broadly, readers should consult a qualified professional before taking any action. None of the organizations mentioned in this paper are responsible for any costs derived from the use of this information.

that a DOP of 10 percent increased average MT by about 7 percent, but a 20 per cent DOP prompted more than a 15 per cent increase in average MT. Using a repeat sales data set, which controlled for renovations and other changes to the house over time, we found that, *if* a house sold, an increase in DOP increased the selling price.<sup>2</sup>

Our research is the first of its kind in Canada and one of only a few such studies anywhere. It is innovative in two ways. Because of the data that was made available to us by the Windsor and Essex County Real Estate Board, we were able to examine the experience of on all listings, not just those which are sold, and thereby remove censoring bias. Censoring introduces a distinction between the marketing time (MT) and the time-till-sale (TTS). It shortens the apparent expected time-till-sale by reducing the likelihood that a long time would be observed in the data set. Since the severity of this effect varies by the type of house, censoring can produce misleading conclusions about which types of houses are hardest to sell. Second, our analysis uses a more precise methodology, known by various names such as survival, duration or hazard rate analysis. Such methods have been used in the past to study the duration unemployment and the survival of patients after certain types of medical procedures but they are become more common to study certain types of questions in real estate.

*Explanation of Time-till-sale: House features*

Our study examined a variety of potential influences on time-till-sale. As a benchmark, we compared the TTS of different types of houses to a three bedroom/two bathroom bungalow.

During 1997 to mid 2000, smaller houses (measured in terms of the number of bedrooms or the number of bathrooms) had shorter times. The expected TTS for a split level house was indistinguishable from the benchmark; ranch houses took 10 per cent longer and two or more storey houses took over 20 per cent longer.

**Table 2:** Estimated Effect of Bedrooms and Bathrooms on Time-till-sale

These estimates use historical data and estimate the change relative to the benchmark. Percentages within this table should **not** be combined with each other.

2 Bedrooms or less	-9%
4 Bedrooms	12%
5 Bedrooms or more	30%
1 Bathroom	-13%
1.5 Bathrooms	-20%
2.5 Bathrooms	35%
3 Bathrooms	50%

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<sup>2</sup> This sentence was changed from the original document following debates concerning the magnitude of the effect.

A listing’s “Remarks” section can both describe a house and signal its intended market, with significant TTS effects. Listings which included the words “Beautiful” or “Gorgeous” were found to have reduced TTS by 15 per cent. “Landscape” reduced TTS by 20 per cent and “Move-in” condition by 12 per cent. On the other hand, a “Must See” remark had no statistically significant effect.

Houses identified in the remarks section as being intended for the “Starter” market sold in 9 per cent less time than the benchmark. “Handyman Specials” in about 50 per cent less time (but we were careful to exclude listings with only the word “handyman” which tended to represent a work area for a hobbyist.) “Rental”, or income-generating, properties took 60 per cent longer. “Vacant” houses did not have significantly different expected TTS than other houses. For all of these results, it is important to realize that our methodology distinguished between the effect of these variables on TTS and their effect on prices. Thus, for example, we found that vacant houses sold for a lower price *and* that TTS did not differ significantly from the benchmark. Or, as another example, “Beautiful” houses sold in less time *and* for a higher price.

**Table 3:** Estimated Effect of Remarks and Market Segment on Time-till-sale

These estimates use historical data and estimate the change relative to the benchmark. If an effect is reported as “Insig” then, for reasons discussed in the Appendix, the estimated effect is too imprecise to be reported reliably.

“Beautiful” House	-15%
Landscaping	-20%
“Good Value”	-5%
“Must See”	Insig.
“Move-In” Condition	-12%
“Starter”	-9%
“Rental”	about +60%
“Vacant”	Insig.
“Handyman Special”	about - 50%

While our methodology was not able to identify market segments that were “hot” for a short period of time, we found that the average time-till-sale over the three years of data differed significantly by location within the city of Windsor. Listings outside the city experienced a longer expected time.

*Explanation of Time-till-sale: Seller’s Actions*

The single most important message that a seller can send to a buyer is their choice of list price. A high list price encourages potential buyers to inspect similar lower-priced houses, both those that are available currently and those which will become available. This bias toward low list price will be reinforced by new technology like Canada’s leading Internet real estate portal,

MLS.ca, which displays houses in ascending price order.

Our data confirms the obvious: as the list price for a dwelling with specific attributes rises, an increasing number of competing homes are listed for a lower price.

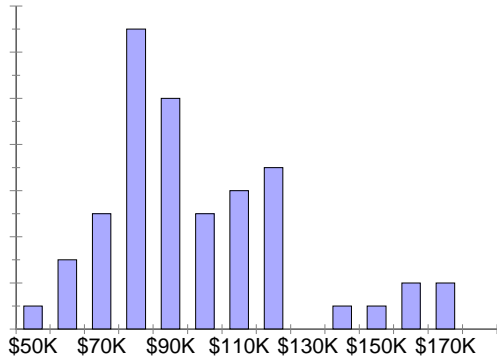


Figure 1: Sample Distribution of List Prices

The histogram in Figure 1 shows the distribution of list prices for the 56 three-bedroom, one bathroom houses listed in the area near the University of Windsor on July 1, 1999. Each bar shows the number of units having a list price in each \$10,000 price range.

Of course, prices also reflect legitimate house quality differences. Thus, a high-priced house is not “over-priced” if its list price is about the same as the list prices of similar types of houses. Our estimates of a “Degree of Over-Pricing,” also known as DOP, statistically controlled for house features using Multiple Listing Service (MLS®) data. After setting DOP for the average house listed between 1997 and early 2000 at 0.0, we found that the

average DOP for houses which sold was -2 per cent and +2.5 per cent for houses which expired. This difference is statistically significant but its importance can be exaggerated, since the ranges of DOP values for houses which sold and for those which expired overlapped.

We also found that, while a small amount of over pricing does not prevent a sale, an increase in DOP appears to increase the expected time at an increasing rate. As shown in Figure 2, a seller with DOP of +10 % hiked their average marketing time by +7 %, while a seller with a DOP of +20 % could face more than 15 % longer TTS.

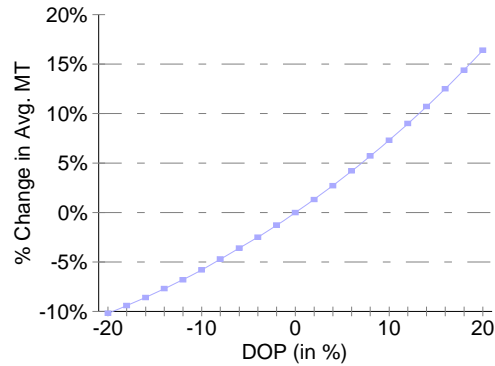


Figure 2: Effect of DOP on Time-till-sale

Sellers also signal their motivation through MLS Remarks. A comment that a seller was “Moving” had no statistically significant effect on TTS, while, perversely, comments indicating that a seller was “Motivated” or “Must Sell” were associated with about a 30 percent increase in the average TTS.

While macroeconomic variables like unemployment rates, interest rates, the ratio of listings to sales and seasonal influences also probably affect sellers, we were unable to discern stable relationships. Work on this issue continues.

#### Explanation of Selling Price and List Price

Notwithstanding a seller’s or buyer’s bargaining abilities, a house’s type and features determine most of its market value. Since MLS data excludes information on some valuable house

attributes, we cannot perfectly predict each house’s selling price; this probably explains some of the variation in the estimates of DOP. Location, lot size and the number of bedrooms dominate in explaining house price differences. Table 4 compares the prices for varying bedroom/bathroom combinations. Our benchmark is a three bedroom, two bathroom house. The following table includes the effect of interaction between the number of bedrooms and the number of bathrooms; clearly a 5 bedroom house with 1 bathroom has a different value as a 5 bedroom house with 3 bathrooms. So, the estimated effect of an additional bathroom in a 2 bedroom house starts from the average number of bathrooms for all 2 bedroom houses.

**Table 4:** Estimated Effect of Bedrooms and Bathrooms on Prices

These estimates use historical data and estimate the change relative to the benchmark. Percentages within this table should **not** be combined with each other.

Effect on:	List Price	Selling Price
2 Bedrooms or less	-9%	-10%
4 Bedrooms	6%	6%
5 Bedrooms or more	6%	4%
1 Bathroom	-17%	-16%
1.5 Bathrooms	-10%	-8%
2.5 Bathrooms	20%	20%
3 Bathrooms	30%	20%
More than 3 Bathrooms	40%	40%

The relationship between DOP and selling price is interesting and complicated. Selling prices averaged about 4.5 percent less than list prices, but exceeded list prices for about 8 percent of sales. Statistically, DOP was nearly uncorrelated with the discount, which suggests that DOP and the discount reveal different dimensions of the house selling process. Expired listings, with their higher average DOP, may represent costly and unsuccessful attempts by a seller to exert bargaining power although we could not test this hypothesis due to this data shortfall.

Other features contribute to a house’s price in smaller ways, as shown in Tables 5 and 6. These percentages can be added to estimate the combined effect of more than one change. Our estimates explain less than 70 percent of the variation in the list and selling prices. The selling price depends on features of the house in nearly, but not exactly, the same way as the list price. The discount depends to a small degree on the type of basement, the key word “Repair” and indications of the seller’s motivation.

**Table 5:** Estimated Change in Prices due to Features of the House

These estimates use historical data and estimate the change relative to the benchmark.

Effect on:	List Price	Selling Price
Pool	+ 6 %	+ 7 %
Landscaping	+ 5 %	+ 6 %
Full Basement	+ 11 %	+ 12 %
Ranch Style	+ 10 %	+ 10 %
Split-Level Style	- 1 %	- 3 %
Two or more Storeys	+ 5 %	+ 3 %

Table 6 considers the effects on prices of descriptive comments in the Remarks section. We have already shown that a “Good Value” listings remark was associated with a lower average TTS. Such houses indeed represented good value because they tended to have a lower selling price, given their other features. Table 6 also shows that “Beautiful” houses sold for a higher price in addition to our earlier finding that they tended to sell quicker. Table 3 above reports that houses which were described as a “Good Value” sold in less time. This table shows that, on average, such claims were accurate.

**Table 6:** Estimated Change in Prices due to Remarks

These estimates use historical data and estimate the change relative to the benchmark. If an effect is reported as “Insig.” then the estimated effect is too imprecise to be reported reliably.

Effect on:	List Price	Selling Price
“Beautiful”	+ 5 %	+ 5 %
“Move In” Condition	Insig.	Insig.
“Good Value”	- 6%	- 5 %
“Must see”	+ 4 %	Insig.
“Starter”	-10 %	- 10 %
“Vacant”	- 5 %	- 8 %
“Rental” Property	- 7 %	- 9 %
“Handyman Special”	- 30 %	- 30 %

A seller can send other signals about whether they are serious about their intent to sell and thus

affect pricing. Table 7 reports on our findings about the effects of these variables.

**Table 7:** Estimated Change in Prices due to Seller’s Information

These estimates use historical data and estimate the change relative to the benchmark.

Effect on:	List Price	Selling Price
“Moving”	- 1 %	- 1 %
“Motivated”	- 6 %	- 8 %

*Some Listings which Expired Reappeared*

Attempting to measure how long it takes to sell a house requires us to account for the fact that some attempts to sell were unsuccessful and the listings expired before sale. Many of the sellers who let a listing expire reappeared in our data with a different listing number. By matching addresses, we were able to identify 21647 separate sellers.<sup>3</sup> Of these, about 15000 sellers sold on their first attempt, 5900 listings expired and 700 listings were still active on the day that the data was collected. Of the listings which expired on the first attempt, over 3700 addresses reappeared; about 2400 of them sold on the second attempt, 1200 expired and about 175 were active. More than half of these sellers listed again within one week although the average time between end of one listing and the beginning of the second listing was 16 weeks. A few sellers reappeared for a third or fourth attempt. With each attempt, the ratio of sales to expired listings fell.

*Summary*

Some of our findings attach numbers to ideas that are well-known: that there is a trade-off between the selling price and the time it takes to sell a house, and that the vendor influences that trade-off by choosing whether to “over-price” or “under-price” when setting their list price. Other findings may be less obvious: big houses took longer to sell and beautiful houses sold in less time and at a higher price.

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<sup>3</sup> Our discussion of properties that were relisted ignores condominium listings because the data on condominiums excluded the suite number. Thus, we could not distinguish between two listings of different suites at the same address and the same suite being relisted.

Our data also does not yet allow us to track houses that were offered for sale through a Realtor® and then offered for sale by owner (FSBO) or the reverse. Other work by one of the authors suggests that about 10 percent of sales follow one of these sequences.

## A Technical Note explaining how to construct a Kaplan-Meier Estimate

Most people would know how to calculate the average marketing time if they were given a list of houses and the number of days it took each to sell. This note describes a procedure used to calculate the Kaplan-Meier (KM) estimate of survival using the same data plus an indication of whether a listing was sold or expired. These estimates provide clearer information on the process of sale than a single number showing the average time-till-sale. Figure 3 clearly shows

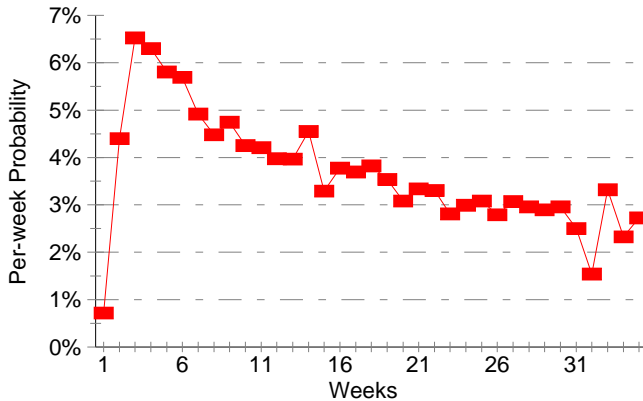


Figure 3: Probability of sale per week, if not yet sold

the risks involved in trying to sell a house and this figure does not illustrate the probability of a listing expiring before sale. The KM estimate should be regarded as a rough estimate since it may ignore important differences. Restricting the set of houses to those of the same type, such as the same number of bedrooms or the same neighbourhood, would reduce these problems.

Consider a collection of listings which have gone off the market.<sup>4</sup> Call it  $R_0$ . Each listing,  $i$ , in  $R_0$ , includes data on the marketing time,  $t_i$ , and why it went off the market, sold or expired. The key to the calculation is to identify a series of “risk sets”,  $R_1, R_2, R_3, \dots$ . Suppose that you want to calculate weekly risk sets. (A similar procedure would be used to calculate daily or monthly risk sets.) If  $R_0$  includes all listings offered for sale, then  $R_1$  includes only listings which survived week 1 and were still available at the beginning of week 2.  $R_2$  includes only the listings which survived week 2 and were available for sale at the beginning of week 3. And so on for later weeks.

The difference between risk sets is caused by listings which either sell or expire during that time. Let  $S_0$  be the number of listings which sell during the first week of listing and let  $E_0$  be the number of listings which expire during the first week.  $S_1$  and  $E_1$  are similarly defined for listings which leave the market during the second week. And so on for later weeks. At the beginning of each week, all members of that week’s risk set are “at risk” in the sense that they could be sold during that week. By the end of the week, some fraction of the listings have sold or expired. Thus, by definition,

<sup>4</sup> Diagnosing problems with active listings is more difficult. Simple arithmetic shows that active listings tend to include more than their fair share of “hard-to-sell” listings and simple bad luck. The first fact creates a selection effect in Figure 3 which creates a tendency for the probability of sale per week to fall with duration. The second fact explains a tendency in the data: given a fixed date, such as the end of a month and considering only houses which were for sale on that date, the average elapsed time between the listing date and that fixed date was about the same as the average marketing time for the entire sample. As a result, the marketing time of these listings, from beginning to end, was about twice that of the entire sample.

$$\#R0 - \#R1 = S0 + E0$$

where #R0 is the number of listings in the first risk set and #R1 is the number in the second risk set.

The KM estimate of the probability of sale during week 1, i.e. the hazard rate, is

$$S0/\#R0$$

and the KM estimate of the probability of expiry during week 1 is

$$E0/\#R0.$$

The probability that a listing leaves the market for any reason is  $(S0 + E0)/\#R0$ . For the second week, the KM estimates of the probability of sale, of expiry and of leaving the market are  $S1/\#R1$ ,  $E1/\#R1$  and  $(S1 + E1)/\#R1$ . And so on for later weeks. Notice that listings which eventually expired are included in the calculations only until they expire: such listings no longer provide any evidence concerning the sale process and should not belong to later risk sets.

These weekly probabilities can be combined to estimate the probability of sale on or before a particular date. The calculation uses two elementary steps. First, it is true that

$$\text{Probability of sale} = 1 - (\text{Probability of not selling})$$

Second, it is true that the probability of *not* selling during weeks 1 and 2 equals

$$(\text{Probability of not selling during week 1}) * (\text{Probability of not selling during week 2}).$$

Since the probability of *not* selling during week 1 is  $1 - S0/\#R0$ , these steps shows that

$$\text{Probability of sale during or before the end of week T} =$$

$$(1 - S0/\#R0)(1 - S1/\#R1)(\dots)(1 - ST/\#RT).$$

The following work sheet gives an example of these calculations where, even though all houses have left the market by the end of week 4, the estimated probability of sale is less than 100 %.

**Work sheet**

Week T=	1: #RT (start of week)	2: ST	3: ET	4: Hazard Rate of Sales	5: 1- Col 4	6: KM Estimate: Prob(Sale by end of week T)
0	100	20	5	20 %	80 %	20 %
1	75	20	5	26.6 %	73.4 %	41.3 %
2	50	15	10	30 %	70 %	58.9 %
3	25	10	15	40 %	60 %	75.3 %
4	0					
Avg. MT		2.2 weeks				

(Col. 4; Row T) is calculated as (Col. 2; Row T)/(Col. 1; Row T). (Col. 6; Row T) is calculated as  $1 - [1 - (\text{Col 6; Row T-1})]$  (Col. 5; Row T).

When calculating the average MT, all sales take place on the last day of the week to avoid dealing with fractions of weeks.