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Brokers' list price setting in an auction context

Brokers' list
price setting

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Abstract

Purpose – The role of list price is often discussed in a narrative describing sellers' preferences or sellers' price expectations. This paper aims to investigate a set of list price strategies that real estate brokers have available to influence the outcome of the sale, which may be many times self-serving.

Design/methodology/approach – By analyzing real estate brokers' arguments on the choice of the list price level, a couple of hypotheses are formulated with regard to different expected outcomes that depend on the list price. This study empirically tests two hypotheses for the underlying incentives in the choice of list price from the real estate broker's perspective: lower list price compared to market value leads to the higher sales price, lower list price compared to market value leads to a quicker sale. To investigate the two hypotheses, this paper adopts different methodological frameworks: *H1* is tested by running a classical hedonic model, while *H2* is tested through a duration model. This study further tests the hypotheses by splitting the full sample into two different price segments: above and below the median list price.

Findings – The results show that *H1* is rejected for the full sample and for the two sub-samples. That is, contrary to the common narrative among brokers that underpricing leads to a higher sales price, underpricing lower sales price. *H2*, however, receives support for the full sample and for the two sub-samples. The latter result points to that brokers may be tempted to recommend a list price significantly below the expected selling price to minimize their effort while showing a high turnover of apartments.

Originality/value – Although there are a large number of previous studies analyzing list price strategies in the housing market, this paper is one of the few empirical studies that address the effect of list price choice level on auction outcomes of non-distressed housing sales.

Keywords Housing market, List price strategy, Degree of overpricing, Non-distressed real estate, Real estate auctions, Time-on-market

Paper type Research paper

1. Introduction

The sales mechanism for homes in Sweden is quite unique in that virtually all condominiums and single-family houses are sold through broker-assisted auctions [1] [2]. As homes are mainly sold through auctions, setting the list price becomes part of the strategy that the broker/seller may use to affect the outcome of the auction. In particular, brokers in Sweden argue that setting a low list price [3] (relative to expected selling price) entice more potential buyers to the showing of a home, which increases the probability of

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JEL classification – D12, D82, R31

many bidders in the following auction and, as a result, a high selling price (Hungria-Gunnelin and Lind, 2008).

The literature that study list price as a strategy is mainly focused on the trade-off between list price and time-on-market (TOM), probably due to homes mainly being sold through search and bargaining markets in most countries and where asking prices are usually set higher than selling prices (Haurin *et al.*, 2010; Haurin *et al.*, 2013). These studies typically report a positive relationship between list price (in relation to some reference price) and TOM.

Few papers have studied list price in the context of a market where the auction of non-distressed real estate is the dominant sales mechanism. The relationship between list price and a number of bidders in auctions is, for example, discussed in Bucchianeri and Minson (2013), Han and Strange (2016), Hungria-Gunnelin (2013), Pryce (2011), Stevenson *et al.* (2010) and Thanos and White (2014), who examine markets where the practice of underpricing is used by real estate brokers. While there seems to be a consensus that a low list price tends to increase the number of bidders in an auction, there are only a handful of studies that empirically test this correlation. Han and Strange (2016) and Hungria-Gunnelin (2018a, 2018b) are, to our knowledge, the only studies that have directly investigated this relationship in a real estate context. Conclusions regarding the resulting effect on transaction prices are ambiguous. The majority of studies examining the effect on the price of the list price conclude that the transaction price is positively correlated with the list price.

The role of list price is often discussed from a perspective of sellers' preferences or sellers' price expectations (Hayunga and Pace, 2018). In this paper, we argue that list price belongs to a set of strategies – and not only preferences or price expectations – that brokers have available to influence selling outcomes in a real estate auction context. By adopting a narrative of the broker, a couple of hypotheses are formulated with regard to different expected outcomes that depend on list price and in particular, the relationship between the estimated market value of the property and the list price is chosen. By analyzing 11,658 transactions of non-distressed condominium apartments in Gothenburg, Sweden, during the period August 2012–September 2016, we test two hypotheses for the underlying incentives in the choice of list price from the broker's perspective. The tests are performed for the full sample, as well as in two sub-samples, objects with above and below median list price. The first hypothesis is that a low list price (compared to the object's market value) leads to a higher selling price. The second hypothesis is that a low list price leads to a quicker sale. The results show that *H1* can be rejected, in the full sample and in the sub-samples. That is, a low list price leads to a low selling price. *H2* cannot, however, be rejected, which supports the argument that brokers may act in self-interest by recommending clients to set a low list price. This result holds both in the full sample and in the two sub-samples.

The remaining of the paper is structured as follows: Section 2 discusses the background and hypotheses in the present study. Section 3 presents the methodological framework, while Section 4 shows the data and discusses the results. Section 5 finalizes.

2. Background and hypotheses

One of the earliest empirical studies analyzing the role of list price in real estate markets was done by Case and Shiller (1988), who used a questionnaire survey to study the behavior of home buyers and sellers in different US markets in an attempt to identify the nature and causes of booms in housing markets, especially concerning the sudden and sustained price movements in these markets. From the sellers' perspective, the authors pose questions that embrace the rationale of list price levels in booming and in post-booming markets. The survey shows evidence that list price rigidity appears to be more significant in falling

markets than in rising ones. One possible explanation of the downward rigidity, according to Case and Shiller, comes from the prospect theory of [Kahneman and Tversky \(1979\)](#), where individuals make decisions based on the potential value of losses and gains which are determined by the frame of reference that attracts their attention. Another explanation could be based on sellers' expectations of the future (higher) prices. Moreover, sellers with high loan-to-value ratios have difficulty in cutting the asking price as they risk defaulting on their debt payments. In booming markets, on the other hand, list prices seem to present upward volatility that is largely driven by expectations (rather than fundamentals), which combined with the rigidity of prices downwards produces an entry barrier for non-owners at all income levels. A similar seller behavior has been observed in the Gothenburg housing market.

[Horowitz \(1992\)](#) develops both a theoretic and an econometric model of sellers' behavior to explain why there are list prices in housing markets and why they are never similar to sellers' reservation prices. Although the housing market in Horowitz's study is characterized by list prices that are almost exclusively higher than sales prices, he brings forth the discussion of why bids above list prices sometimes arrive. To the author, list price entices information on the upper bound of the seller's reservation price. However, there may be situations where sellers will not accept bids equal to the list price with certainty in the case that the seller receives two or more bids simultaneously, as this gives buyers with sufficiently high valuations an incentive to bid over competing buyers' bids. Similarly, [Knight et al. \(1994\)](#) find that the list price is a central indicator of the selling price.

List price as a selling strategy has been discussed in a number of theoretical and empirical studies (for reviews, see [Haurin et al., 2010](#); and [Haurin et al., 2013](#)). [Haurin et al. \(2013\)](#) discuss the importance of list price in a booming market, where search markets become more auction-like and where a low list price seems to entice more bids from potential buyers. This conclusion is in line with findings in the auction fever literature ([Adam et al., 2011](#); [Chen, 2011](#); [Ku et al., 2005](#)). [Stevenson et al. \(2010\)](#) also argue that real estate agents adjust asking prices downwards to attract a higher number of potential buyers. In empirical studies of residential real estate markets [Han and Strange \(2016\)](#) and [Hungria-Gunnellin \(2018a, 2018b\)](#), find that sellers attract more bidders by setting a low asking price. Han and Strange argue that similar to online auctions, auctions of homes may trigger emotional bidding and as a consequence that winning bidders may overpay. These findings lead us to our first testable hypothesis:

H1. A low list price compared to market value leads to higher sales prices.

The argument is as follows; a lower list price [4] will attract more potential buyers to the showing of the home and the following auction, as a larger number of potential buyers have a reservation price above the list price. In particular, if the list price is significantly lower than the estimated market value, this is argued to attract more potential buyers, who think that the dwelling may be a bargain. The second step of the argument is that attracting more potential buyers to the auction will result in more bidders which, in turn, results in a higher sales price. From the real estate broker's perspective (as well as the sellers'), this is of course a positive outcome. Brokers typically charge a fee that is calculated as a percentage of the sales price. A higher sales price will, thus, result in a larger gain for the broker. This narrative is developed by [Levitt and Syverson \(2008\)](#), who find that homes owned by brokers tend to sell at, on average, 3.7% higher prices than other houses. The argument is based on the existence of informational asymmetries between sellers and brokers but is also in line with a principal-agent problem. When a broker sells a house on part of a client, an increase in sales price has a fractional payoff of the increased price. When selling his or her

own house, the broker keeps the full increase. A similar result is found by Xie (2018), who investigates if brokers sell their clients' homes too cheaply and too quickly. Xie found that, on average, brokers sell their clients' homes for 4.6% less and 8.5 days sooner than their own homes. In his study, he classifies clients into four categories: individual clients, corporate clients, lender clients and government clients. The differences between brokers selling their own home and selling a client's home were found mainly driven by institutional clients whose motivations to sell are more divergent. Individual-owned homes, which are the focus of the present study, were found to be sold for just 1.5% less and stay the same length of time on the market as broker-owned homes.

The literature investigating the relationship between list price and TOM is vast. The majority of these studies, however, analyze US markets, where private negotiations are the common selling mechanism and where list prices are normally set higher than sales prices. In search markets, list prices have a role to signal sellers' ceiling price so they can attract buyers with similar valuations that a match is hopefully made and a sale occurs (Haurin, 1988; Horowitz, 1992; and Yavas and Yang, 1995) [5]. In an ascending-bid auction context, on the other hand, list prices may play a different role, as list prices rarely exceed selling prices (Stevenson and Young, 2015). Though the role of list price may differ between private negotiations and auctions, the early works of Belkin *et al.* (1976), Janssen and Jobson (1980) and Kang and Gardner (1989) found that TOM decreases as the ratio between selling price [6] and list price increases, which indicates that the higher the *degree of overpricing*, the lower the chance to sell the property faster, making a private treaty and auction list pricing similar in that respect. Later studies, also from traditional private negotiation markets, have similarly found that an increase in list price reduces bids' arrival and increases TOM (Anglin *et al.*, 2003; Genesove and Mayer, 1997; Haurin, 1988; Mayer, 1995; Merlo and Ortalo-Magne, 2004). Nevertheless, Yavas and Yang (1995) examine the effect of list price on TOM of residential real estate and find conflicting results. They divide houses into three different price categories and find that list price is positively correlated with TOM for mid-price houses, but for low-price and high-price houses list price and TOM are uncorrelated. Albeit these studies do not analyze price settings in an auction context, they all seem to support the views from Swedish real estate brokers that a low list price shortens, on average, the days on the market.

Almost no studies investigating the relationship between list price and TOM in a real estate auction context have been carried out. Naturally, time on the market is of little importance in auction studies, as auctions generally occur in auction houses during predetermined dates with approximate closing time. In the market under study, however, auctions do not occur on an auction house; bids are left over the phone to the brokerage agency by potential buyers who visited the property during the showing days. Therefore, these auctions do not have a closing time and it lasts until the last bid arrives. The bidding process can be short (take a couple of days) or it can take several weeks. As bids are not binding in the Swedish real estate market, any bidder can withdraw from the auction without incurring any costs, including the winner, until the purchase agreement is signed; it is only then the bid becomes binding. Thus, it is not uncommon that bidders cross-bid over a number of parallel competing auctions (Hungria-Gunnelin, 2018a). Knowing the risk of losing the winner to a competing object on the market, the real estate broker has the incentive to accelerate the bidding process by trying to get the winner to sign the purchase agreement as soon as possible. Hungria-Gunnelin (2018b) discusses the effect of brokers' influence over the bidding process and stresses that the uncertainty of not knowing if the object is sold, even though bids arrive, may justify the short duration of the auctions. Additionally, because brokerage firms receive many new sales assignments every week [7],

brokers may prefer to guarantee as many sales as possible by accelerating the bidding process and selling at a lower price rather than accumulating unsold objects on their stock, as it would “steal” time from the sale of other objects (Hungria-Gunnelin, 2018b) and harm their reputation. Therefore, it becomes interesting to quantify TOM in this setting.

Of the few studies that have analyzed TOM in an auction environment, the focus has exclusively been on the differences in TOM related to the property cycle and not how the *degree of overpricing* affects TOM (Pryce, 2011; Haurin *et al.*, 2013; Han and Strange, 2014). Other auction studies have indirectly investigated the relationship between list price and TOM through the effect of the list price strategy on the number of bidders and more specifically how list prices encourage participation in an auction and affect the success of the sale. Ong *et al.* (2005) stress the importance of the number of bidders to auction turnout when studying residential real estate auctions in Singapore. Similarly, Stevenson *et al.* (2010) and Stevenson and Young (2015) investigate residential property auctions in Dublin and find out that the underprice strategy used by agents increases the probability of a sale by attracting a higher number of bidders. Based on this finding, we can formulate our second hypothesis:

H2. A low list price compared to market value leads to a quicker sale.

Following the same argument as for *H1*, a lower list price compared to market value will attract more potential buyers. Even if *H1* fails, that is more potential buyers does not necessarily lead to a higher sales price, the probability of the right buyer seeing the apartment should increase, which would then result in a shorter time on the market. From the broker's perspective, this is positive. A shorter time on the market means less work to sell the apartment. On the downside, previous research has shown a negative relationship or a trade-off, between time-on-the-market and the resulting sales price (Asabere and Huffman, 1993). However, as argued by Levitt and Syverson (2008), increments in sales price is a small incentive for real estate agents to provide extra effort to increase sales price, which raises the question of which goal is more important to the broker, selling at a high price or selling quick. Geltner *et al.* (1991) analyze the relationship between the broker and the seller and they find that conflict of interest regarding selling effort is most sensitive at the beginning of the sales contract, while the conflict of interest concerning reservation price is most distressful toward the end. Yavas (1994) also pinpoints that the magnitude of the broker's and seller's interest may differ. He states that brokers are tempted to seek an immediate sale at a price below the seller's reserve to secure the commission [8], in case they fail to find another buyer or risking losing their clients to another broker.

These two hypotheses are not mutually exclusive and could all be valid (or invalid) at the same time. There are also other hypotheses that are related to the list price choice based on behavioral phenomena such as loss aversion (based on prospect theory) and anchoring, for example. However, our data do not allow us to test them (Bokhari and Geltner, 2011; Clapp *et al.*, 2018).

3. Methodological framework

To investigate the two hypotheses we need to adopt a few different methodological frameworks. In the following, we will discuss the methodological approach for each hypothesis separately.

3.1 *H1*

As the first hypothesis concerns the effects of difference in list price compared to market value (in the remainder referred to as the *degree of overpricing (DOP)* following Anglin *et al.*, 2003) on achieved sales price, a hedonic framework is most appropriate. First developed and presented

by [Rosen \(1974\)](#), the hedonic model allows the researcher to estimate the implicit price of a certain attribute, of which the *DOP* is one. Investigating the first hypothesis demands a two-step methodological procedure. The second and most important step, from the perspective of investigating *H1*, largely follows [Asabere and Huffman \(1993\)](#) and a later application by [Björklund et al. \(2006\)](#). The model estimated by [Asabere and Huffman \(1993\)](#) is given by (1):

$$\ln(P_T) = \beta_0 + \beta_1 \left[\frac{P_O - P_T}{P_T} \right] + \beta_2 TOM + \sum_{j=3}^n \beta_j X_j + \varepsilon \quad (1)$$

where P_T is the sales price, P_O is the list price, TOM is time on the market measured as days and X_j is a matrix of both apartment-specific and neighborhood-specific covariates (including the constant). The parameter of interest with regard to *H1* is β_1 . A negative β_1 will lean support the first hypothesis. [Björklund et al. \(2006\)](#) acknowledge correctly that estimating (1) implies an endogeneity problem as sales price appears both on the left-hand and the right-hand side of the equation. Their solution to this was to instead estimate equation (2) given by:

$$\ln(P_T) = \beta_0 + \beta_1 DOP + \beta_2 TOM + \sum_{j=3}^n \beta_j X_j + \varepsilon \quad (2)$$

where sales price (P_T) is exchanged for an estimate of the market value (P_E). *DOP* is calculated as in (3):

$$DOP = \left[\frac{P_O - P_E}{P_E} \right] \quad (3)$$

The first step of the method for the investigation of *H1* is, thus, to create the variable describing *DOP*, by first providing an estimate of the market value [9]. In [Björklund et al. \(2006\)](#), this is done by using a full sample mass appraisal model of 12,168 observations to provide an out-of-sample prediction of a remaining 704 observations on which the analysis of both *DOP* and *TOM* are based. While using out-of-sample predictions of market value in the second step is reasonable, it is unfortunate to throw out 95% of the available data and information available. In this paper, we improve this step with the aim of being able to keep as much of the full data set as possible for the second step of the analysis, thus keeping the information loss as small as possible. Rather than using a large sub-sample of the data set for the mass appraisal model, we use all sales from the preceding year to estimate the price of the current period. That is, using all observations between time periods 0 and t , we estimate prices in time period $t + 1$, for time period $t + 2$, the estimation uses all observations from time periods 1 through $t + 1$, for time period $t + 3$, we use all observations from time periods 2 through $t + 2$, etc. This means that we can provide a mass appraisal without throwing out any more observations than those belonging to the initial time periods, 0 through t [10]. The intuitively appealing part of this approach, compared to a random sub-sample, is that it is likely simulating the approach to which real estate brokers, sellers and buyers form their expectations of future sales prices, by observing apartments that have been sold in the past year or so. We argue that this approach results in market value estimates that are based on information similar to what the actors we are studying have access to. The mass appraisal models all look the same and are given by (4):

$$\ln(P_T) = \sum_{j=1}^n \gamma_j X_j + \mu \quad (4) \quad \text{Brokers' list price setting}$$

We estimate a model explaining transaction price with a matrix, X , of both apartment specific, neighborhood-specific and time period specific covariates. Note that the same matrix of covariates is used in the second step of the analysis given by (2).

3.2 H2

For the second hypothesis, we are interested in investigating whether or not the *DOP* has an influence on the number of days an apartment stays on the market. Here, we will specify the *TOM* model as a function of apartment characteristics, neighborhood characteristics and, most importantly for the analysis, the *DOP*. Following Donald *et al.* (1996) and Anglin *et al.* (2003), we opt for specifying the *TOM* model as a survival model. This is a reasonable approach as *TOM* is, in fact, a duration variable, rather than a continuous variable which are more suitable for a linear or log-linear model to be estimated via OLS. We want to study the probability of survival (or staying on the market) as a function of characteristics of both the apartment itself, the neighborhood and, specifically, the *DOP*. The survival function ($S(t)$) is defined as the probability that *TOM* will last longer than some value, t .

$$S(t) = \Pr(TOM \geq t) \quad (5)$$

The choice between which model to estimate will depend on which hazard function is specified. In both Donald *et al.* (1996) and Anglin *et al.* (2003), a Weibull distribution is specified for the hazard functions. The Weibull distribution, much like an exponential distribution, provides a simple way to estimate the parameters. The difference between the two specifications is that the exponential distribution assumes the probability of a sale or exit of the market measured by *TOM*, does not depend on when the observation is made. The Weibull distribution allows for a change in the probability as time progresses, that is, a lower probability of a sale, the longer an object stays on the market or vice versa. In addition, we can also estimate our model using a Cox proportional hazard function. The Weibull specification, conditional on included covariates described above, can be written as (6):

$$\lambda(t; X; DOP) = \exp(X\beta + \delta DOP) \alpha t^{\alpha-1} \quad (6)$$

where α is a duration dependence parameter, which models changes in probabilities over time. Note that when $\alpha = 1$, this model simplifies the exponential model, where the probability of a sale is constant over time. X is the same matrix of covariates used in the previous models. The parameter of specific interest is δ , which is to be estimated. This parameter will tell us how the *DOP* influences *TOM*, a positive δ will lean support to our second hypothesis.

4. Data and results

Throughout the analysis, we use a set of data containing sales of apartments in Gothenburg from August 2012 through September 2016, gathered from a company called Booli through their online API. Booli gathers information on the highest bids from real estate agencies, which means that we do not necessarily observe the true sales prices of all transactions [11]. This is likely a small problem [12]. In total, we have 11,658 observations. Descriptive statistics for the data used for both hypotheses are presented in Table 1.

Table 1.
Descriptive statistics
used for
investigating the
two hypotheses

	Full sample		Sub-sample	
	Average	SD	Average	SD
Sales price	2,380,085	1,215,370	2,464,236	1,230,012
List price	2,129,489	1,087,512	2,195,701	1,144,238
E(price)	–	–	2,468,247	1,464,765
DOP	–	–	–0.107	0.136
TOM	17.5	13.2	17.2	13.3
<i>Attributes</i>				
Monthly fee	3,648	1,182	3,652	1,183
Area	65.6	23.4	65.4	23.3
Rooms	2.43	0.951	2.42	0.947
Age	58.8	30.7	59.1	31.0
<i>Location</i>				
Dist Kungssportsplatsen	3.79	2.66	3.78	2.67
Dist Hjalmar Brantingsplatsen	4.35	2.34	4.32	2.35
<i>Observations</i>	11,658		9,927	

As this paper concerns, at least to some extent, an auction process on the real estate market, it is necessary to first establish the Swedish context. The role of the list price in real estate transactions varies between countries. In the North American context, the list price is normally understood as an upper bound of prices (Anglin *et al.*, 2003). This is confirmed by Han and Strange (2016), who reproduce statistics from Case and Shiller (1988, 2003) regarding the relationship between list prices and sales prices for US cities. In 2003, a majority of the observed dwellings were sold at list price (48.4%) or below (25.5%). This is not true for the Swedish context, at least not for Gothenburg over the observed period August 2012 through September 2016. Moreover, the list price does not disclose sellers' reservation prices [13]. It is rather used in a strategic manner to attract a higher number of visitors to the showings. This is an important difference from other international housing markets. The information carried in the list price in the Swedish context is not one of a price ceiling from which negotiations can begin. In Table 2, we present the fractions of transactions with sales price below-, at- and above-list price divided on both grouped neighborhoods in Gothenburg and apartment size (number of rooms).

The evidence presented in Table 2 clearly shows that the list price in the Swedish context has another meaning than in the North American one. A vast majority (86%) of all dwellings sell at a price exceeding the price it was listed for. The relationship between the sales price and the list price is consistent between neighborhoods, with no clear pattern. There is, however, a pattern toward fewer dwellings selling above list price the larger they are. Of one-room apartments, 89% sold above list price. This decreases consistently over apartment size and, for five-room apartments, only 77% sell above list price.

Table 2 also provides evidence that we are studying a *sellers' market*. In addition, the descriptive statistics presented in Table 2 provides evidence against the hypothesis that lower list price than sales price is due to a lack of knowledge on part of the broker. If this were the case, real estate brokers would be just as likely to set list prices below as above sales price or market value, which is clearly not the case. However, it supports the hypothesis that there is a stable equilibrium in which brokers are reluctant to set list prices differently than other brokers.

In Table 3, we present descriptive statistics for *TOM* and average sales price, still divided on the relationship between the sales price and list price.

	Sales price < list price (%)	Sales price = list price (%)	Sales price > list price (%)	#Observations	Brokers' list price setting
<i>Neighborhood</i>					
Angered	4	9	87	205	
Central	6	11	83	2,301	
West	4	16	80	25	
East	3	6	90	728	
Majorna-Linné	5	8	87	2,334	
Hisingen	4	10	86	384	
Örgryte-Härlanda	4	11	85	2,131	
Askim-Frölunda-Högsbo	6	9	86	1,503	
Lundby	7	10	83	1,194	
<i>Number of rooms</i>					
1 room	4	7	89	1,508	
2 rooms	4	8	88	4,840	
3 rooms	5	10	84	3,243	
4 rooms	8	12	80	1,052	
5 rooms	13	10	77	267	
<i>Full sample</i>					
Average	5	9	86	11,658	

Table 2.
Sales price below,
at- and above-list
price for
neighborhoods,
number of rooms and
full sample

	Sales price < list price	Sales price = list price	Sales price > list price	Full sample
TOM	28.2 (23.9)	21.2 (15)	16.5 (11.7)	17.5 (13.2)
Sales price	2,464,849 (1,482,452)	2,317,453 (1,254,107)	2,381,970 (1,193,338)	2,380,085 (1,215,370)
#observations	584	1,091	9,986	11,658

Table 3.
Time-on-the-market
(TOM) and sales
price for sales
price – list price
relations

Note: Standard deviations within parenthesis

Dwellings that fetch a sales price below the listed price stay on the market for an average of 28.2 days, which is almost 11 days more than the full sample and 12 days more than dwellings that fetch a sales price above their listed price. These dwellings also fetch a higher sales price, on average. This descriptive statistic is consistent with previous evidence of a trade-off between the sales price and *TOM*. This simple statistic does, however, not show us that this is the case for Gothenburg during the studied period. There is an additional argument for the relationship between the sales price and *TOM* to be negative. A dwelling that stays long on the market might signal to potential buyers that previous potential buyers have found some problem, unobservable from advertisement, with the dwelling. This argument implies that dwellings with a longer *TOM* might fetch lower sales prices when controlling for other factors. Another hypothesis, in line with the positive relationship between *TOM* and sales price, is that as increased underpricing increases the number of bidders (Hungria-Gunnelin, 2018a), the auction process is prolonged simply because of more bidders in the auction (the time on market measure includes the time period of the ongoing auction). Then the increased number of bidders increases sales price.

As described in the methodological section, the full sample (11,658 observations) will only be used for the mass appraisal model in the first step. This is to be able to estimate the *DOP* variable which will be used on all other models. This also means that the total amount of observations left for the analysis will be slightly less, 9,927. For the period under study, the average sales price (2.4m SEK) has been slightly higher than the average list price (2.1 million). On average, suggested by our mass appraisal model, apartments are underpriced by approximately 10% and stay on the market for 17.2 days.

The apartment attributes available to cover the monthly fee measured in SEK (a fee paid to the housing cooperation for maintenance, collective debt services and future renovations), the area of the apartment (measured in square meters), as well as the number of rooms and the age of the structure. For locational variables, we have distances to two points of interest: Kungssportsplatsen, which can be considered the CBD of Gothenburg and Hjalmar Brantingsplatsen, which is a large sub-center just outside the city center. In addition, binary variables for neighborhood and time will be used in the analysis.

The first part of the analysis is to estimate the *DOP* variable to be used in the following analysis. As described previously this is done by estimating the market value of each sold object through a mass appraisal model using all previous transactions. That is, for August 2013 (which is the first month we estimate market values for), we use all observations from August 2012 through July 2013. In total, it is necessary to estimate a total of 38 mass appraisal models. For the presentation in this paper, we opt for showing the mass appraisal model applied to the full sample. In terms of coefficient of determination (R^2), the 38 models estimated do not differ from the one applied to the full sample. The results of this model are presented in the first column of Table 4. This model corresponds to equation (4).

When first running the model we detect a problem with heteroscedasticity. Although the primary aim of the mass appraisal model is to predict values, which means heteroscedasticity is not as a severe problem, we attempt to correct for this by clustering the errors on real estate agency, this is done for all following models. The explanatory power is quite high, 0.9022. This is likely due, in part, to a granularly fine control for both time (year and month) and location (67 neighborhood dummies). The only unexpected result is the positive coefficient for distance to Hjalmar Brantingsplatsen. This is likely due to a problem

Table 4.
Results of the
regression model for
the full sample and
model for *H1*. The
dependent variable is
ln(sales price)

	Full sample mass appraisal		<i>H1</i>	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
DOP	–	–	0.8471	0.000
TOM	–	–	–0.0009	0.000
Monthly fee (100's)	–0.0063	0.000	–0.0069	0.000
Area	0.0102	0.000	0.0100	0.000
Rooms	0.0718	0.000	0.0650	0.000
Age	–0.0044	0.000	–0.0036	0.000
Age ²	0.00003	0.000	0.00002	0.000
Dist Kungssportsplatsen	–0.1241	0.000	–0.1299	0.000
Dist Hjalmar Branting	0.0836	0.000	0.0829	0.000
Intercept	13.91	0.000	14.77	0.000
Location dummies	Yes		Yes	
Time dummies	Yes		Yes	
Clustered errors	Yes		Yes	
Obs	11,658		9,927	
R^2	0.9022		0.9588	

with multicollinearity between the two distance variables; the correlation between them is 0.88. The model is semi-log, so all coefficients can be interpreted as semi-elasticities. The monthly fee has an expected negative and significant coefficient. The effect is small but this should be expected as the monthly fee is measured in 100's of SEK, which means that 100 additional kronor in monthly fees do not have a large impact on price. For each additional square meter, the price is expected to increase by roughly 1% and an additional room gives a price hike of around 7%. Age follows a non-linear pattern, which is usually found for Swedish transaction data. The most sought after apartments are either newly constructed or from the turn of the 19th century, in between prices are generally lower, *ceteris paribus*. Using the estimated values provided from the mass appraisal models, together with the list price, we calculate the *DOP* using equation (3).

In the second column of Table 4, we present the results investigating the first hypothesis. The first hypothesis states that one possible explanation for a lower list price in relation to market value is that brokers and sellers, expect this to lead to a higher sales price by attracting more potential buyers. In line with Björklund *et al.* (2006), Bokhari and Geltner (2011), Bucchianeri and Minson (2013) and Hungria-Gunnelin (2018a), we find that a greater *DOP* actually positively correlates to a higher selling price. This is contradictory to what we would expect to find if *H1* was true. The coefficient is furthermore economically significant. An increase in the *DOP* with 10%, on average, increases the selling price by 8.5%. We have also performed the analysis by splitting the sample in two, above and below median list price, to see whether there are any price segmentation effects. The results in Table 5, however, show no segmentation effect. *H1* is rejected for both sub-samples.

In Table 6, we present the results as hazard ratios from both the hazard model assuming a Weibull distribution and the Cox proportional hazard model. One difference between the two models is that the latter does not assume a base hazard. The estimate of α (the Weibull parameter) in the Weibull model suggests that the probability of a sale is increasing over time. This is an intuitive and reassuring result. The interpretation of the hazard ratios is straightforward. A hazard ratio of 1 suggests there is no effect of the studied covariate; a ratio above 1 suggests an increased hazard and consequently, a quicker sale. A ratio below 1 suggests, instead, a lower hazard and a slower sale. There are no large differences between

	Below median list price		Above median list price	
	Coefficient	p-value	Coefficient	p-value
DOP	0.7949	0.000	0.8215	0.000
TOM	-0.0008	0.010	-0.0010	0.000
Monthly fee (100's)	-0.0080	0.000	-0.0063	0.000
Area	0.0101	0.000	0.0097	0.000
Rooms	0.0682	0.000	0.0655	0.000
Age	-0.0030	0.000	-0.0039	0.000
Age ²	0.00001	0.000	0.00002	0.000
Dist Kungssportsplatsen	-0.1209	0.000	-0.1386	0.000
Dist Hjalmar Branting	0.0674	0.000	0.0963	0.000
Intercept	14.61	0.000	14.39	0.000
Location dummies	Yes		Yes	
Time dummies	Yes		Yes	
Clustered errors	Yes		Yes	
Obs	4,767		5,160	
R ²	0.8959		0.9588	

Table 5.
Results for *H1*:
effects for different
price segments. The
dependent variable is
ln(sales price)

Table 6.
Determinants of
TOM: survival
models for *H2*

	Weibull hazard model		Cox proportional hazard model	
	Hazard ratio	z-value	Hazard ratio	z-value
DOP	0.580	0.003	0.739	0.003
DOP ²	0.977	0.920	1.03	0.758
Monthly fee	0.995	0.022	0.993	0.000
Area	1.00	0.731	1.00	0.770
Rooms	0.975	0.544	0.990	0.693
Age	1.00	0.038	1.00	0.009
Age ²	0.999	0.072	0.999	0.022
Dist Kungssportsplatsen	0.872	0.062	0.956	0.269
Dist Hjalmar Branting	1.08	0.316	1.00	0.804
January	1.61	0.000	1.57	0.000
February	1.61	0.009	1.54	0.004
March	1.43	0.070	1.41	0.022
April	1.03	0.857	1.44	0.008
May	0.952	0.810	1.57	0.001
June	0.952	0.855	1.62	0.002
July	0.840	0.582	1.42	0.060
August	0.954	0.827	1.54	0.003
September	0.817	0.199	1.23	0.025
October	0.854	0.422	1.23	0.146
November	0.800	0.150	1.22	0.223
Intercept	0.007	0.000	–	–
Location dummies	Yes		Yes	
Time dummies	Yes		Yes	
Clustered errors	Yes		Yes	
Obs	9,919		9,919	
α	1.758		–	
Log-likelihood	–8,362.5		–8,1836.5	

the two models. The first model suggests apartments sell faster during the early months of the year; there are significant effects for January through March. The second model suggests this effect is extended to all months but October and November when apartments do not sell at a different rate compared to December. Higher monthly fees tend to result in a slower sale, which is reasonable. The effect of age is ambiguous, the hazard ratios are statistically significant in both models, but the economic significance is small.

The parameters of interest for this analysis are those regarding *DOP* and *DOP*². While the linear term of *DOP* is statistically significant, its quadratic term is not. The results from both model specifications suggest that as *DOP* becomes higher, the smaller is the hazard and, thus, the longer will the apartment stays on the market. A higher *DOP* means that list price and estimated market value lie closer to each other, as the average *DOP* is negative. Hence, the lower the list price, compared to the estimated market value, the quicker will the apartment sell. This result is in line with what we would expect to find if *H2* was true. In other words, both of these models lend support to the second hypothesis.

As in the test of *H1*, we study potential price segmentation effects by splitting the sample in two: above and below median list price. The results for the partitioned sample, using the Weibull hazard model, are presented in [Table 7](#).

As seen in [Table 7](#), the relationship between list price and time-on-market for both sub-samples remains the same as in the full sample, albeit in the below-median sub-sample the squared *DOP* variable is significant instead of the linear.

	Weibull hazard model Below median list price		Weibull hazard model Above median list price		Brokers' list price setting
	Hazard ratio	z-value	Hazard ratio	z-value	
DOP	0.805	0.475	0.428	0.001	
DOP ²	4.64	0.016	0.852	0.564	
Monthly fee	0.987	0.000	0.998	0.546	
Area	1.00	0.248	0.997	0.333	
Rooms	0.945	0.238	0.985	0.745	
Age	1.00	0.012	1.00	0.046	
Age ²	0.999	0.008	0.999	0.082	
Dist Kungsportsplatsen	0.905	0.234	0.889	0.388	
Dist Hjalmar Branting	0.974	0.718	1.15	0.249	
January	1.58	0.001	1.70	0.000	
February	1.67	0.009	1.61	0.027	
March	1.32	0.130	1.68	0.034	
April	1.16	0.479	1.10	0.718	
May	0.924	0.761	1.18	0.555	
June	1.05	0.882	1.06	0.840	
July	0.726	0.391	1.22	0.633	
August	0.969	0.909	1.13	0.741	
September	1.07	0.723	0.69	0.141	
October	0.810	0.354	0.975	0.905	
November	0.925	0.540	0.801	0.374	
Intercept	0.008	0.000	0.003	0.000	
Location dummies	Yes		Yes		
Time dummies	Yes		Yes		
Clustered errors	Yes		Yes		
Obs	4,764		5,155		
α	1.810		1.866		
Log-likelihood	-3,894.5		-4,194.8		

Table 7.
Determinants of
TOM: effects for
different price
segments

5. Conclusions

This paper examines two different hypotheses regarding the strategic setting of list price by the broker/seller of condominiums in Gothenburg, Sweden. The examined hypotheses are:

- (1) lower list price compared to market value leads to the higher sales price; and
- (2) lower list price compared to market value leads to a quicker sale.

Contrary to the commonly held view among brokers in Sweden and what is put forth in the Swedish media debate, *H1* is rejected. Setting a low list price in relation to the market value of the apartment does not increase the selling price. On the contrary, the effect is strongly negative. As discussed in the data and results section, the coefficient on *DOP* may, however, be overestimated due to omitted variable bias, hence some caution is warranted in the interpretation of the coefficient. Still, the result is in line with several other studies by Björklund *et al.* (2006), Bucchianeri and Minson (2013), Hungria-Gunnelin (2018a, 2018b) and Stevenson *et al.* (2010), who examine the effects of list price strategies in Sweden and elsewhere. The size of the coefficient is further very similar to the one estimated in Hungria-Gunnelin (2018b), for another period in time and for transactions of single-family houses and where data allows more elaborate methods for mitigating omitted variable bias.

H2 is, on the other hand, supported by the results. Both models estimating the duration of sale imply that a higher list price compared to market value correlates with a longer expected time on the market. This result is in line with the results found by [Stevenson and Young \(2015\)](#), who conclude that a higher list price reduces the arrival of bids, which generally increases the amount of time the property is on the market.

But what are the social implications of this research? For one, the results can be used to inform actors on the market, including real estate brokers. Sellers might benefit, depending on their objective trade-offs between the transaction price and time on the market, from better information. If a seller would be interested in a higher transaction price, more than a quick sale, she might want to think about setting a list price such to achieve this objective. Real estate brokers might find the results interesting from the point of view of what strategies to apply.

Furthermore, there is a policy dimension. Policymakers may see it as beneficial to control the behavior of real estate brokers. Depending on how policy is developed, real estate brokers can be incentivized and steered such that they take sellers, buyers or both perspectives into account. Understanding how real estate brokers respond to incentives is key to developing intended policies. The results in this paper suggest that real estate brokers might be maximizing their own pay-offs, preferring quicker sales to higher prices. To reach such a conclusion would, however, demand a more detailed study of the reasons for pricing strategies, rather than its outcomes. Future research may want to approach this question.

Notes

1. For a more detailed description of the sale mechanism and the institutional framework in Sweden, see [Hungria-Gunnelin \(2013\)](#).
2. Other countries in which auction of non-distressed homes are common are Australia, Denmark, Ireland, New Zealand, Norway and Scotland.
3. This strategy is commonly known as *underpricing*.
4. In Swedish housing sales, list price does not indicate a seller's reservation price. Sellers' reservation prices are never disclosed and, in the majority of sales, list price often lies below sellers' reservation.
5. Other studies on search markets also stresses the problem of the relationship between list price and *TOM*, as both are functions of the *probability of sale* and are, therefore, simultaneously determined (e.g. [Hayunga and Pace, 2018](#); [Krainer, 1999](#); [Krainer and LeRoy, 2002](#)). In the Swedish condominium market where auctions are the dominant selling mechanism list prices are seldom adjusted (unless the list price is unrealistically set or the market is in a severe down-turn, which was not the case during the time period under study). Thus, we posit that the causality in this study only goes from list price to *TOM*.
6. Assuming that selling price represents the market value of a property.
7. On average, approximately 2,000 new apartment listings are registered on Hemnet (the largest Swedish real estate listings portal) every week ([Hungria-Gunnelin, 2018b](#)).
8. In Sweden, brokers normally receive commissions upon a closed sale only.
9. Market value is defined as "the most probable selling price of a property on the valuation date between a willing buyer and a willing seller in an arm's length transaction, after proper marketing and where the parties had each acted.knowledgeably, prudently and without compulsion" ([IVSC, 2016](#)). The *ex-ante* market values estimated by the brokers are never disclosed to the public; only list price and winning bid can be observed.

10. The initial time period for our analysis is 12 months.
11. In Sweden, a large portion of condominium apartments takes the form of *tenant-ownership*, which implies that the ownership of apartments belongs to private condominium associations. What is, in fact, sold in the auctions is the right to use a specific condominium unit and the buyer does not become the owner of that apartment unit, rather a member of the condominium association, where he or she has the right to sell the right to use the unit on the market when moving out. Thus, in practice no real estate transaction occurs and the final sale price is never registered on the official property price cadaster, which justifies the reason why it is not possible to verify the actual transaction price or if the sale has been realized at all. However, we rely on the fact that brokers have the incentive to report the final sales price on the brokers' price database, which is a country-wide database created by brokers (Svensk Mäklarstatistik) to analyze current market prices for both condominiums and single-family houses.
12. In Sweden both the seller and the winning bidder can, without penalty, back out of a transaction prior to signing the sales contract. Hence, the winning bid reported on Booli.se may not be the sales price for that apartment. That the winning bid is not the same as the sales price is, however, not common.
13. Normally, list price lies below seller's reservation price and a bid equal to the list price is often not accepted by the seller.

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