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The Role of List Price in Transaction Outcomes

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Abstract. *The purpose of the study is to analyze the effect of list price strategies on two transaction outcomes, transaction price and time on market. The study quantitatively tests two hypotheses concerning transaction price and time on market. This is performed using both a hedonic modelling framework, as well as duration modelling. The models are applied to a set of property transactions for the capital region in Iceland, a total of 35,000 transactions between 2014 and 2020. This study concludes that the choice of list price does affect transaction outcomes. In particular, a low list price in relation to market value adversely affects transaction price, and speeds up the transaction process. Thus, the findings confirm an existing trade-off between achieving a higher price, or selling a property quicker. The findings of this study may come to practical use in the sales process of real estate, as it may inform real estate agents as to the expected outcomes of different list price strategies. The results of this study are in line with previous findings under different sales processes, thus suggesting that list price strategies work similarly independent of sales processes. As such, this study increases understanding of the role of list prices.*

JEL-classifications: *D12, D82, R31*

Keywords: *anchoring effect, duration model, hedonic pricing model, list price, pricing strategies, real estate agents, sales price, trade-off*

1 Introduction

The purpose of this study is to investigate the impact of list prices on transaction outcomes of real estate. More specifically, we hypothesize that low list price strategy, in relation to a property's market value, speeds up the transaction process at the cost of achieving a lower transaction price, and vice versa. We test our hypotheses on a set of property transactions in Iceland, spanning the period from January 2014 through August 2020. Using these transactions calculate a measure of the degree of overpricing for a property, the percentage deviation between list price and estimated market value. We then test our hypotheses using this measure.

The methodology largely follows that of similar research carried out on different housing markets (e.g. Hungri-Gunnelin et al., 2020 for Sweden). The sales process of residential property in Iceland stands in contrast to that of other Nordic countries, whose sales format is predominantly based on a procedure with public bids, e.g., Sweden (Hungria-Gunnelin et al., 2020) and Norway (Olaussen et. al., 2018; Khazal et al., 2020; Sønstebø et al., 2021) where bids are open. In Iceland, buyers are placing their bids without observing other bids or the number of bidders involved. Hence, the procedure of selling and purchasing real estate in Iceland can be categorized as a standard sealed-bid auction, in which bids remain secret and unobservable to participating bidders throughout the auction process. It can be argued that low list price spurs a bidding war and thus results in higher prices. The empirical results do not support this however (see e.g. Björklund et al., 2006; Bucchianeri and Minson, 2013; Hungria-Gunnelin et al., 2020). In any case, the auction process could be expected to have some impact. Thus, studying the Icelandic housing market provides additional information on the subject of list prices and their effect on the transaction outcome.

In a sealed-bid auction, the announced *list price* becomes a particularly important piece of information. According to findings in previous empirical research, list prices are argued to positively impact the number of bidders (Hungria-Gunnelin, 2013; Han and Strange, 2014; Han and Strange, 2016), negatively impact transaction price (Björklund et al., 2006; Bucchianeri and Minson, 2013; Hungria-Gunnelin et al., 2020), alter buyers perception of quality (Taylor, 1999) and adversely impact duration on market (Genovese and Mayer, 2001; Stevenson and Young, 2015; Hungria-Gunnelin et al., 2020). Since real estate agents usually facilitate property sales, list prices can be argued to be one of the major tools in affecting transaction outcomes. For instance, real estate agents might desire to attract a broad field of buyers, increase the potential for a higher return and close deals quickly. List prices have received attention as an area of research in regard to these desired outcomes.

Against this background, this study will address the impact of list prices on transaction outcomes in the context of a sealed-bid system with unlimited bids per bidder, with the Icelandic residential housing market serving as example. We will test two hypotheses. The first hypothesis concerns the impact of list price on the sales price, where we hypothesize that a lower list price in relation to market value will result in a lower transaction price. Our second hypothesis concerns the impact of list price on time-on-market, where we hypothesize that a lower list price in relation to market value will result in a quicker sale.

This study addresses, similar to several other studies, the impact of list price in regard to sales price and time-on-market. Furthermore, the existing research examines list prices with auction formats different to the one practiced in Iceland, that are characterized by sealed bids. To our knowledge, this is the first study examining list prices in the Icelandic housing market.

The remainder of this study is organized as follows. Section 2 provides a description of the sales process on the Icelandic housing market. Section 3 provides a description of the previous research literature underlying our two hypotheses. Section 4 provides a detailed overview of the data used for analysis. Section

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5 provides a description of the methodological approach. Section 6 provides a presentation of data and results. Section 7 concludes.

2 Institutional background

Sales of residential properties in Iceland are commonly intermediated by real estate brokers that work on behalf of both sides of a transaction. According to law, Icelandic brokers must act in the best interests of both parties. The process of broker-assisted property sales in Iceland follows the standard procedure of listing, marketing, viewing, negotiation, contract signing, etc. The initial process includes counseling the seller in determining an appropriate asking price for their client's property before putting it on the market for sale. Real estate agencies usually have their own websites where the property is advertised for sale but the main sales channel is via two popular websites.[1] A standard advertisement includes pictures, a basic description of the property and associated costs of buying the property. An open house viewing is typically arranged a few days after listing when the interest among buyers usually is at its highest (normally the initial three to five days after listing).

Eventually, when the seller is matched with a buyer and both parties have agreed, a contract is signed and thereby, the contract becomes binding. Some agreements are also conditional on certain prerequisites, e.g., a loan must be granted, or buyers have to sell their current house, which has to be fulfilled before the purchase can go through. Usually, it takes around 4–8 weeks from when a bid initially is placed until a contract is signed, then additionally 1–2 months until the actual hand over of the housing unit. 30–60 days after this, title deeds and the final payment will be made.

There are several costs associated with a property transaction. The seller's costs for a brokers' service includes a commission fee, that commonly is based on a percentage rate of the transaction price between 1.5 and 3%. Also, a cost of capital gains tax at 22% if they have owned the property less than 2 years (otherwise tax free) and normally a contract fee. In addition to the transaction price, the buyer bears the cost of the authorization of the documents and the stamp duty at 0.8% of the total estimated value of the property (0.4% for first time buyers and 1.6% for legal entities), and a fixed fee in brokerage service.

The standard procedure of buying a property in Iceland is that prospective buyers place sealed bids, i.e. bids are unrevealed to other bidders involved. Brokers do not directly reveal the bids that have been placed. Instead, buyers involved in a bidding process will usually receive some information about whether their bid is considered reasonable and worth a try or that somebody else involved in the bidding process has already matched the listed price. If demand is high, buyers will be asked by the real estate broker if they have placed their final and best bid. The bid must be in written form and signed in order to become legally binding. The buyer is then not able to withdraw their bid. The seller also cannot back out of the transaction once they have accepted a bid. Usually, a bid is made to be valid

[1] www.mbl.is/fasteignir and www.fasteignir.is.

for a day and the seller must decide within that time frame whether they want to accept the bid or not. It is common that a seller makes a counterbid if the bid is close to their reserve price.

3 Previous research and hypotheses

A few different strands of research literature and theoretical considerations are relevant to the current study. First, the literature on anchoring effects (see Jacowitz and Kahneman 1995, and Staff 2019) has a bearing on list prices. List price may work as an anchor when it comes to the bidding process (Staff, 2021). Potential buyers use the list price as a bearer of information when formulating an idea regarding their own willingness to pay for the property. This bargaining strategy is applicable to residential real estate transactions where list prices work as anchors (Sergio, 2019). Kahneman (2011) claim that people are influenced by the property's list price when considering their reservation price. He argues that the value of the same property will appear higher if the list price is high compared to if it is low (Kahneman, 2011). The assertion of a positive relationship between list prices and sale prices is supported by several studies including a paper written by Bucchianeri and Minson (2013). By investigating a large and diverse data set of residential market transactions, they found that higher list prices are correlated with higher selling prices. Their result showed that a higher list price leads to an increase in sales price. Hence, the theory implies that list prices serve as a point that buyers refer to when estimating a house' worth. Thus, anchors are linked to price expectations since high anchors (list prices) generate higher estimates (bids).

Björklund et. al (2006) found a similar relationship based on data in the county of Stockholm. Enegren (2017) and Hungria-Gunnelin et al. (2020) analysed whether a low list price would lead to a higher sales price, based on the assumption that low list prices would attract more potential buyers. They both found the opposite relationship between list price and sales price, i.e., a low list price generated a low transaction price. This result also holds for Norwegian data (Anundsen et al., 2020).

Other studies address the issues of agents' informational advantages and its effects on prices and the transaction process. A low list price has been argued to reflect a brokers' incentive to earn a commission quickly. Real estate agents will sometimes counsel sellers to set a low price in the hope of attracting multiple bidders (Han & Strange 2014; Hungria-Gunnelin, 2013), as it increases the willingness among buyers to incur the costs of visiting a particular house (Chen and Rosenthal, 1996). In auctions, low list prices tend to lead to "bidding wars" due to its potential of engaging more bidders, especially during housing booms (Han & Strange, 2014). Also, the chance of receiving bids of a superior amount increase (Pryce, 2010).

A major concern from the seller's point of view in establishing a list price is its impact on time on market (TOM) and sales price. Selling at the highest possible price and as quickly as possible are considered as two incompatible "attributes" and thus, the seller faces a trade-off, which is suggested in Miller (1978), Trippi (1977) and Björklund et. al (2006). A high list price compared to the property's

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market value may lead to an extended TOM, due to difficulties in finding buyers that are willing to pay the higher price (Genesove & Mayer, 2001; Stevenson & Young, 2015). The chances of maintaining a flow of buyers will decrease as the price is set at a higher level (Haurin et al., 2013; Haurin et al., 2010). Conversely, low list prices might shorten the length the property is out for sale at the expense of lower sales price, due to the "shortened" market exposure (Anglin et al. 2003).

Miller (1978) found a positive relationship between sales price and TOM. He argues that a seller is more likely to capture a relatively superior selling price, the longer a property stays on the market. Trippi (1977) and Jud et al. (1996) found a similar correlation. In contrast, Cubbins (1978) found an inverse relationship (higher sales price - shorter TOM and vice versa). Another inverse relationship between TOM and list price was found in a study by Tucker et. al (2013). They compared the difference in sales price before and after the introduction of a policy that prohibited sellers to relist their houses and hence manipulate the total length of TOM. The results showed that when exposing the total TOM of a relisted property, the sales price significantly decreased (USD$16000).

Taylor (1999) bids a possible explanation for an inverse relationship between TOM and sale price or list price. He argues that a reason for buyers being cautious to elongated listings of properties is that they may signal poor quality due to flaws detected by earlier prospective buyers. Hence, stigmatization is built up among speculators when a property has been listed for too long (Taylor, 1999). Haurin et. al (2010) conclude that a longer TOM might be advantageous for atypical properties in order to find a match between buyer and seller. Furthermore, several papers have studied the effects between list price and TOM by considering the number of bidders which in turn, affects the length of TOM. The chances of maintaining a flow of buyers will decrease as the price is set at a higher level is found in Haurin et al. (2013) and Haurin et al. (2010). Thus, lower list prices will improve agents' chances of a quicker transaction relative to a comparable property priced above market value (Zahirovic-Herbert et al. 2019). According to Genesove and Mayer (2001) and, Stevenson and Young (2015), a high list price compared to the property's market value leads to an extended TOM due to difficulties in finding buyers that are willing to pay the higher price.

The degree of overpricing has also emerged in the literature to study the impact different degrees of deviation from the market price (positive and negative) has on the property's sales duration. Hungria-Gunnelin et al. (2019) studied this relationship, expressed as DOP, on the number of days an apartment stays on the market. They found a positive correlation, indicating that the lower DOP, the lower TOM. Thus, a high list price in relation to a property's market value reduces the arrival rate of bids and in turn, lengthens TOM. The lower the DOP, the quicker sale is also confirmed in Anglin et al. (2003), who also applied the DOP parameter.

Knight (2002) studied the causes and effects of changes in list prices. The result indicates that mispricing is costly both in money and in time. Houses with large list price changes have both a longer TOM and sell at lower prices. Setting the correct list price is argued to be of crucial importance as a revision of it has been shown to negatively affect the final sales price of the property (Knight, 2002).

Asabere and Huffman (1993) show how a list price (both low and high relative to the property's market value) lead to deviations from optimal TOM and mispricing. Xiaolong and Arno (2019) found that a revise in homeowners' list price is more likely to occur when they expect to make a loss when selling their home. They will change the list price downward and in a more aggressively manner than other home sellers.

Hoeberichts et al. (2013) address list price dynamics in boom-and-bust markets. They analyse the interaction between initial price setting by the seller, list price reductions and the probability of sale in the Dutch housing market. They found that the impact of overpricing differs over the housing cycle. In boom periods, overpricing tends to extend the sales period and increase the probability of a list price reduction, suggesting a "start high-reduce quickly" pricing strategy. In contrast, the opposite effect is true during busts, where overpriced homes are least likely to result in list price adjustments downwards (Hoeberichts et al., 2013).

In summary, there are a handful empirical studies related to list prices in different manners and with somewhat varying findings. Nonetheless, several of the studies show a positive correlation between list prices and sales price as well as between list prices and TOM. Drawing from this previous literature we will test the following two hypotheses:

H1: *A list price below a property's market value leads to lower sale prices*

H2: *A list price below a property's market value leads to shorter time-on-market*

4 Data

The data used in this study has been provided by the Housing and Construction Authority in Iceland and is sourced from National Registers Iceland and the Association of Real Estate Agents. The data contains transactions of residential houses (apartments, detached and semi-detached houses) in the Capital Region during the period January 2014 through August 2020. The total set of data contain 36,314 observed transactions with information on size in meters squared, number of rooms, location, dates of listing and contract as well as listing price and transaction price.

Table 1 provides an overview of the variables included on both models. In the hedonic model, the dependent variable is the natural logarithm of sales price, *lnPT*, and *TOM* is the dependent variable of interest for the duration analysis. The variables *DOP*, *nr of rooms*, *sq meters*, *apartment, loc* and *time* will be used in both models as independent variables.

Three of the variables, controlling for location (assessment area), size and number of rooms were included since they are considered as fundamental price determinants. Degree of overpricing (*DOP*) describes the percentage difference between list price and estimated market value. *DOP* is a key variable of interest, and its creation is described in detail in the methodological section.

The variable of size indicates a house's number of square meters which is one of the most prominent characteristics of a property. A large sized house increases the ability of changing floor plan. Also, a larger house has a greater potential to fit the activities a household usually approaches such as kitchen, hobby room and

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Table 1. *Variables included in the regression models.*

Variable	Description
ln(PT) (%)*	Sales price of the home, dependent variable of the hedonic model
TOM (in days)*	Time on the market (date of contract – date of listing), dependent variable of the duration model
DOP (%)*	Degree of overpricing $[(P_L–P_E)/P_E)]$, percentage ratio (%)
nr of rooms	Number of rooms
sq meters	Size of the property in square meters
Apartment	(0,1) Dummy variable for housing type, apartment or single family
loc (dummy)*	(0,1) Dummy variable for location
time (dummy)*	(0,1) Dummy variable used for estimation of P_E

Note: * Variables that have been modified or generated.

storage. Hence, we expect this variable to have a positive relationship between price and size. Comparably to the principle of large sized homes, a house or apartment with several rooms has a great potential of fitting different activities and attributes into the home. Thus, the variable of number of rooms is also expected to be positive.

The transaction data included three different variables controlling for geographical location: postal code, street and assessment area. Assessment area refers to different geographical areas in the Capital Region defined for real estate valuation purposes where properties are considered comparable. These areas are divided into smaller areas and are greater in number than postal code areas and therefore describes variations in price to a larger extent. A dummy variable for each of the assessment areas was created, resulting in a total of 80 location dummies (*loc*). Furthermore, a total of 80 time dummies (*time*) were created describing the year and month the transaction took place.

Table 2 shows descriptive statistics of variables included in the regression models with mean, standard deviation and the maximum and minimum values.

The average property in our data sample has a living area of 112 m^2 divided on 3 rooms and takes roughly 72 days from initial listing until the contract is signed. The transaction price and list price are close in value, yet the listing price exceeds

Table 2. *Descriptive statistics of variables.*

Variable	Mean	St. deviation	Min	Max	No. obs
P_T *(ISK)*	44,400,000	18,100,000	4,700,000	192,000,000	36,314
P_L *(ISK)*	45,500,000	18,800,000	5,500,000	218,000,000	36,314
P_E *(ISK)*	37,400,000	14,300,000	13,000,000	62,100,000	31,671*
DOP (%)	0.035	0.1918	–0.8842	11.545	31,671*
TOM (days)	71.979	60.233	0	365	36,314
nr of rooms	3.734	1.513	1	25	36,314
sq meters	111.517	47.803	16.4	350	36,314
Apartment	0.7448	0.4359	0	1	36,314

Note: * The number of observations for P_E and *DOP* differ from the full sample of 36,314, as the transactions in 2014 was excluded in the estimations of P_E, see section 5.

the sales price. The estimated market price falls below both the transaction price and the list price. The mean value of *DOP* is 0.0353 with a standard deviation of 0.1918 which indicates that the property, on average, is over-priced in relation to the estimated market value. However, the degree of overpricing is relatively small.

Table 3 displays different *list price-sales price* relations based on our transactions over the studied time period. In addition, differences in *TOM* are displayed.

Table 3. *Different sales price-list price relations.*

Relation	$P_L < P_T$	$P_L = P_T$	$P_L > P_T$	**Full sample**
Frequency (%)	11.4	16.1	72.5	100.0
List price (m.ISK)	43.9	46.1	45.7	45.5
Sales price (m.ISK)	45.1	46.1	43.9	44.4
TOM (days)	50.8	78.6	74.0	73.0

As shown in Table 3, 11.4% of the properties were sold at a price exceeding the list price, on average 1.2 million ISK higher than list price. These properties had a shorter sales duration (around 50 days) than properties sold at a price equal to or above the listed price. Nearly 16% of the transactions were sold at list price, with an average sales process of 79 days. The majority of transacted properties, 73%, were sold at price below the list price, corresponding to an average price difference at 1.8 million ISK. Thus, there is evidence of a predominantly share of properties being listed at a price above the actual transaction price in Iceland.

5 Methodological considerations

Since the two hypotheses of the paper concern two different outcomes, one regarding transaction price and the other regarding time on market (*TOM*), two different methodological approaches are warranted. Hypothesis 1 will be tested using a hedonic modelling framework and Hypothesis 2 using a duration model framework. Thus, we are following the methodological approach of Hungria-Gunnelin et al. (2020). In the following, we will describe the research design for each hypothesis.

Hedonic price model and Hypothesis 1

The hedonic pricing model, first suggested by Rosen (1974), provides an approach with wide applications in studies of real estate prices and values. The hedonic model allows for estimation of implicit prices of attributes related to real property, for instance the initial pricing strategy. The hedonic model to be estimated to test Hypothesis 1 can be stated as (1):

$$\ln\left(P_T\right) = \beta_0 + \beta_1 DOP + \beta_2 DOP^2 + \sum_{j=3}^{n} \beta jXj + \varepsilon \tag{1}$$

There the transaction price in log ($\ln(P_T)$) is regressed on a measure of the degree of overpricing (*DOP*) as well as matrix (*X*) of relevant property characteristics. Variables included in *X* can be divided into different categories. Some variable describe the listed property itself. In our models we use, as

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previously described, size measured in both square meters and number of rooms. We also have information regarding housing type, apartment or single family home. In addition, it is typical to include locational variables. Distance to city center or other amenities falls under this category. We do however not have access to georeferenced data, and as such we cannot calculate any distances. It is also common, and often of great importance, to control for time. This can either be done by deflating the observed prices, or by including time dummies. We opt for the latter.

The variable *DOP* has been applied in studies by Asabere and Huffman (1993), Björklund et. al. (2006) and Hungria-Gunnelin et. al. (2020). These studies do however differ in how they generate the variable. Asabere and Huffman (1993) calculated *DOP* as the percentage deviation between initial list price (P_L) and the transaction price (P_T). Such an approach does however imply a problem of endogeneity as sales price appear on both sides of the equation. In order to solve the endogeneity problem, Björklund et al. (2006) developed Asabere's and Huffman's (1993) measure of *DOP*, by replacing sales price with an estimate of the market value (P_E). In this study we adopt the approach of Björklund et al. (2006) with *DOP* being defined as (2):

$$DOP = \frac{P_L - P_E}{P_E} \tag{2}$$

Using an estimate of the market value rather than the actual transaction price does however necessitate a discussion of how the market value is to be estimated. Björklund et al. (2006) used a mass-appraisal model as a first step to provide an out of sample estimate of market values. Their approach implied using 95% of available observations to provide the out of sample estimate for the remaining 5% of observations, thus left for the analysis to follow. Hungria-Gunnelin et al. (2020) improves on this methodology with the aim of keeping a greater part of the original observations, and at the same time providing a more reality based approach to appraisals.

Rather than using one mass-appraisal model with a large part of available and random sampled observations, the approach suggested by Hungria-Gunnelin et al. (2020) uses only observations from the past twelve months. For example, when providing an estimate of the market value of property sold in January 2015, we use observations for all of 2014. This approach not only limits the information discarded to the first year of observations (compared to 95% of the sample in Björklund et al. (2006)) but also better resembles how real estate agents, sellers and buyers likely form their expectations of value. The mass appraisal model can be expressed as (3):

$$\ln\left(P_T\right) = \sum_{j=1}^{n} \gamma jXj + \mu \tag{3}$$

Where transaction price in log ($\ln(P_T)$) is regressed on a matrix of property characteristics the same as for (1). In total we estimate 68 mass appraisal models. The first estimation will be the market price for January 2015, where we use all previous transactions made between January 2014 and December 2014. The estimated market value for February 2015, is in turn based on transactions from February 2014 through January 2015, and so on, until the last month of observations in August 2020.

The second step to provide the variable *DOP* is to use the regression results from the 68 mass appraisal models to estimate market value P_E, this is obtained as follows (4):

$$\ln\left(P_E\right) = \ln\left(\widehat{P_T}\right) = \sum_{k=1}^{n} \widehat{\gamma_k} X_k \tag{4}$$

where $\widehat{\gamma j}$ are the estimated coefficients from (3). With (4) we have the necessary information to calculate the *DOP* using (2).

When estimating (1), the sign and magnitude of the *DOP* coefficient, β_1, is of primary interest. β_1 will indicate the percentage change in sales price (due to the log-transformation) by a one-unit (1%) change in *DOP*. Our first hypothesis, that a lower list price relative to market value results in a lower sales price, will receive support if the sign of β_1 is positive.

Duration models and Hypothesis 2

Duration models, also known as *survival models* or *hazard models*, are commonly used to model the length of time spent in a given state or the time elapsed until a particular event of interest occurs. For instance, duration models have been employed for modeling durability of unemployment, machine functioning, etc. (Arkes, 2019) and also duration of rental vacancies (see Sternberg (1994) and Gabriel and Nothaft (2000)] and houses' duration on market (see Zuehlke (1987), Yang & Yavas (1995), Donald et al. (1996) and Hungria-Gunnelin et al. (2020)).

A duration model is built on a survival function, S(t), used to model the probability of a duration, T, *past* some given period in time *t* or, alternatively, the probability of an event of interest *not yet occurred* by duration *t* (Arkes, 2019).

The *hazard rate* is part of the hazard function and is defined as the risk of occurrence of a certain event per time unit (t). A hazard ratio > 1 means that the probability of exit a state increases over time. Conversely, a hazard ratio < 1 means that the probability of exit decreases over time. A hazard ratio of 1 means no association between time and the probability of an exit.

The distribution of survival times can be approximated by different functions. A widely used distribution for modeling survival statistics of various types of engineering applications, e.g., failure rates of mechanical components, is the *Weibull distribution* (Lai, 2006). The Weibull distribution is a generalized form of the exponential distribution; it reduces to an exponential distribution if $\alpha = 1$. This indicates no time dependence, or, a hazard rate that remains constant over time (Lai, 2006), represented by a straight line in the hazard function. However, this assumption might be inappropriate in cases when the impact on the hazard rate changes over time. The Weibull distribution has the advantage that it allows for such changes as time progresses (Arkes, 2019). For instance, the chances of a house sale might increase from time zero and up to some point, followed by a

 https://doi.org/10.30672/njsr.102913

decline in probability the longer the property stays on the market (see Björklund et al., 2006).

In order to investigate our second hypothesis, we estimate the TOM model by specifying the hazard function based on the Weibull distribution, which has been done in previous studies (see Jud. et al. (1996), Hungria-Gunnelin et al. (2020), Yang and Yavaş (1995). As mentioned, the Weibull specification allows for varying probability in sale or "exit of the market", and hence, it provides a more accurate parameter estimates and a better fit to our data set than an exponential distribution would do.

Our duration random variable of interest for this hypothesis, T, is the *TOM* variable. The survival function, *S(t),* will in this context be defined as the probability of *TOM* exceeding some time *t* (Jud et al., 1996; Hungria-Gunnelin et al., 2020). Thus, our model can be specified as (5):

$$S(t) = \Pr(TOM \geq t) \tag{5}$$

The hazard rate will be the conditional probability of a unit being sold on a particular day, given that it "survived" on the market until then. For instance, it is more likely that a property is sold the longer it stays on the market, due to exposure to a larger number of potential buyers.

To model the relationship between duration time and our set of explanatory variables, we express the hazard function as conditional on these variables as (6):

$$h(t \mid X, DOP) = \lambda(t) * \exp(\beta X + \delta DOP) \tag{6}$$

The explanatory variables are the same covariates used in Hypothesis 1. β is the vector of regression coefficients representing the effects of the units' characteristics on *TOM* at time *t*. Parameter δ represents the effect of *DOP* and is of main interest for investigating Hypothesis 2. It will describe how list price (measured in *DOP*), affects the probability of sale, and in turn, the sales duration (*TOM*). A hazard ratio ($\delta < 1$) will support our second hypothesis. This will indicate that the higher *DOP*, the less likely it is for the property to exit the market and, in turn, increase *TOM*. That is, if list price is set lower than market value, a decrease in *DOP*, will lead to a decrease in expected *TOM* (a smaller number of days on the market).

6 Estimation results and analysis

The following section will provide the results from estimated models, as well as an analysis of what qualitative conclusions can be drawn.

Testing our first hypothesis

Table 4 depicts the results from the analysis based on the hedonic price model, as expressed by (1). The hedonic model is estimated on a sample of 31,671 sales transactions, excluding all of 2014 as these observations were used to create the *DOP* variable. Table 4 also includes a baseline model. The baseline model is used to derive the key variable of interest, *DOP*, although not using the full set of data as previously described.

Table 4. *Results of the hedonic model.*

	Baseline model			**Hypothesis 1**		
Explanatory variable	**Coeff.**	**P-value**	**St.err.**	**Coeff.**	**P-value**	**St.err.**
DOP	–			0.9047*	0.000	0.00249
DOP2	–			–0.0827*	0.000	0.00062
Sq meters	0.0052*	0.000	0.00003	0.0049*	0.000	0.00001
Nr of rooms	0.0164*	0.000	0.00110	0.0199*	0.000	0.00050
Apartment	–0.0452*	0.000	0.00282	–0.0359*	0.000	0.00130
Constant	16.64*	0.000	0.01488	16.69*	0.000	0.00644
Location dummies	Yes				Yes	
Time dummies	Yes				Yes	
No. of obs.	36,310				31,671	
R-squared	0.8001				0.9600	
Adj. R-squared	0.7992				0.9598	

Note: * denotes a significance level at 1%.

The explanatory power of the baseline model is relatively high, at 0.8001. This indicated that our model can explain 80% of the variation in price. Locational dummies and time control are included in the estimation but excluded from presentation. All coefficients are significant and carry the expected sign. Larger homes, both measured with number of rooms and square meters, fetch higher sales prices. Apartments, as compared to single family homes, fetch lower prices on average. Including two measures of size, number of rooms and square meters, may potentially create a problem of multicolliearity. The correlation between the two variables is high (0.8194), but post-estimated variance inflation factors (VIF) do not suggest multicollinearity to be a severe problem (VIF of 3.92 and 3.40 for square meters and number of rooms respectively).

The explanatory power of the model testing our first hypothesis is high, at 0.9706, indicating that 97% of the variation in the logarithm of sales price is explained by the independent variables included in our model. The higher R^2 is to be expected when including *DOP*, as it does contain information about estimated prices. No other coefficients are affected in a significant fashion from this inclusion.

As depicted in Table 4, the coefficient of *DOP* is 0.9047 indicating that for each percent increase in *DOP,* the sales price increases by 0.9047%. Conversely, for each percent of under-pricing (negative *DOP*), the sales price decreases by –0.9047%. For instance, a property under-priced with 10% will result in a sales price reduction of 9.047%. Hence, we have received support for our hypothesis (i.e., larger "under-pricing" in relation to the market value leads to a lower sales price). The negative value of *DOP2* at –0.0827, however, indicates a non-linear relationship between *DOP* and sales price. This can be interpreted as the effect of *DOP* will be positive up to a certain point, then reach an "optimum" and the price then starts to decline, which similarly is found in Björklund et. al. (2006). An explanation is the lack of

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interest among buyers as the price increases as well as the constraint in buyers' willingness to pay a price that largely exceeds the market value.

The finding of a positive relationship between *DOP* and sales price are similarly found in recent empirical research examining the Stockholm and Gothenburg housing market (see Björklund et. al., (2006) and Hungria-Gunnelin et al., (2020)) and the U.S housing market (Bucchianeri & Minson (2013)). A possible explanation of this relationship could be the state of market, that has been rising during the observed time period and hence, it has been more of a "seller's market". A high demand and low interest rates are suggesting an increased willingness-to-pay among households. Thus, properties are likely to sell even though the *DOP* would be substantially high, and the properties then would be "overpriced".

Our findings are strongly related to the theory of anchoring. The anchoring effect can be considered as particularly applicable to the Icelandic housing market. Due to the sealed bids system, buyers are inhibited from price information revealed through other bidders' behavior which prevents the individual buyer from getting an idea of the market value of the unit. Hence, the list price is the only accessible piece of price information and the anchoring theory implies that bids likely will be placed close to the list price. Consequently, if the list price is set high relative to the market price, bidders' bid will also tend to be high. However, too high list prices might scare off buyers.

It should be taken into account that the results may be affected by different sources of error. A potential issue with the model concerns the estimation of expected market value through the mass appraisal models for obtaining *DOP*. Systemic errors in data arise from lack of value-bearing factors. This might lead to either overestimations or underestimations of the properties' market value and in turn, affect the *DOP* and the estimation of the model. Another possible error is lack of independent variables controlling for quality. Quality has a major effect on house prices as it, for instance, reflects the construction of a house which includes architecture, materials, standard and condition.

Testing our second hypothesis

Table 5 depicts the results from the duration model assuming a Weibull distribution. The hazard ratio of *DOP* is of main interest for Hypothesis 2.

The results of the duration analysis are presented as hazard ratios. A hazard ratio greater than 1 implies an increased probability ("risk") of sale and conversely, less than 1 suggests a decrease in probability. A ratio exactly equal to 1 indicates that there is a lack of impact of independent variable in question on the sales speed.

The variables *Sq meters* and *Nr of rooms* are both relatively close to 1. They are however statistically different from 1. That is, the impact of the size and number of rooms have a negligible effect on the probability of sale per time unit and in turn, the sales speed. Since both variables are in some way a measure of size, and correlate to each other positively, the effects will counter each other.

Apartments stay longer on the market than single family homes do. Going back to the descriptive statistics, we may find an explanation in the relative

Table 5. *Results of the duration model.*

	Hazard ratio	**z-value**	**p-value**
DOP	0.6918*	–11.76	0.000
Sq meters	0.9934*	–27.51	0.000
Nr of rooms	1.060*	9.64	0.000
Apartment	0.9168*	–5.03	0.000
Location dummies	Yes		
Time dummies	Yes		
No. observations	31,663		
α	1.437		
Log-likelihood	–36,381.988		

Note: * denotes a significance level at 1%. Standard errors within parentheses.

amounts of the two types sold. Roughly 75% of listings are apartments, which likely means there are more viable substitutes to apartments than single family homes. A greater competition may lead to longer sales periods.

The hazard ratio of *DOP* at an estimated value of 0.6918 leans support to our second hypothesis, stating that *a list price below market value leads to a shorter time-on-market*. The ratio implies a decreasing probability of sale (and thus, the duration on the market will be shortened), the higher *DOP* is. In other words, the more a property is overpriced in relation to its market value, the less likely it is for the property to be sold. Put differently, for a given amount of time a unit increase in *DOP* results in only 7 sales compared to 10 sales for similar objects. However, one must also keep in mind that the probability of sale changes with time itself, denoted by α being larger than unity.

A possible explanation of the result is an increased interest among buyers of properties listed at lower price levels. A lower list price, considering buyers will differ in their reservation prices, will attract a larger crowd. The number of potential buyers will rise because the interval of matching reservation prices of buyers increases. Also, buyers might see a chance of making a bargain, which further adds to the crowd of speculators. A large number of bidders will raise the competition, which in turn may trigger the sales speed. Matching becomes smoother. A reason for higher list prices leading to an extended TOM could be the increased difficulties of finding a buyer who is willing to pay a higher price which, in turn, leads to a longer time on the market. In general, more expensive properties takes longer time to sell. A longer duration means a higher risk of a stigma effect building up among potential buyers, as properties that have been marketed for too long may signal “poor” quality.

7 Conclusions

In this study, we have examined the impact list prices have on the final sales price as well as the length of sale in Icelandic housing transactions. We have posed two hypotheses based on previous findings: (1) A list price below a property’s market

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value leads to lower sale prices, (2) A list price below a property's market value leads to shorter time-on-market. We find support for both hypotheses.

By using a comprehensive set of residential transaction data sold in the Capital region of Iceland during January 2014 to August 2020, we have estimated both a hedonic model and a duration model to test our proposed hypotheses. Our evidence suggest that a *low list price decreases the sales price*, which gives support to our first hypothesis (1). Our second hypothesis (2) also received support, stating that *low list prices leads to shorter time on market*. Thus, according to our findings, a list price below market value is linked to a lower sales price and shorter time on the market, respectively.

The empirical findings from the regression models confirm that a *trade-off* between the sales price and TOM exists; low list prices shorten the TOM but at the expense of the sales price, which becomes lower. Contrariwise, higher list prices are related to an extended duration on the market, but the extended exposure enables sellers to capture more superior selling prices (Anglin et al., 2003). These findings are similar to other studies including Miller (1978), Trippi (1977), Björklund et. al (2006), Enegren (2017) and Hungria-Gunnelin et al. (2020).

The trade-off implies that both the broker and seller are facing a dilemma of either increasing the chance of selling within a shorter time or at a higher price. The brokers' choice of pricing strategy might be strongly dependent on the type of brokerage fee they charge. By fixed fees, there are larger incentives of selling at a higher speed (rather than maximize the sales price) as they will only charge a set amount per sold unit. Brokers will be aware of the final payoff in advance and will not benefit from putting more effort into increasing the potential of higher sales prices and hence, their incentives are lowered.

Our findings show clear evidence of *price anchoring*, a theory proposing that low values (list prices), gives rise to low estimates, i.e., buyer' bids. We believe the anchoring theory to be particularly applicable in the context of list prices in a sealed-bid system as in Iceland. This is due to individual buyers' inability to receive any signals about the true value of a property through estimates of their bidding opponents. Instead, their judgment will only be dependent of their own valuation (private value) of the property in question. Hence, the list price serving as the major reference of buyers' bids. In contrast, in the case of public bids, one can get an idea of the "common value" both by observing the list price and, maybe most important, the bids of their competitors.

As the results of Hypothesis 2 show, a low-pricing strategy reduces the duration of sale. A possible explanation for this result is quicker buyer response and a more vigorous bidding activity as it evokes a greater interest among people. This stimulates the competition which in turn, speeds up a sale. Furthermore, the property will receive less market exposure. In general, more expensive houses take a longer time to sell. The positive correlation between low list prices and low sale prices (Hypothesis 1) might be explained by low-listed properties are signalling "low quality".

Another explanation of a positive correlation (high list prices-high sale prices) is the rising state of the Icelandic housing market, which means a larger likelihood of selling even though list prices are set at a high level in comparison with the market demand. The lowering of interest rates, causing drops in the mortgage lending rates, means that more people can finance their housing investments and buy properties even at higher price levels. The positive price trends for both apartments and single-family houses that have been on a stable rise the last decade also tend to higher the expectations of prospective buyers, who will expect the prices continue to increase and might tend to buy even overpriced properties. Noteworthy is that our findings are applicable to a rising market but would perhaps have been different if observing a falling state of the market.

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