Real Estate Auctions – An Empirical Analysis of Auction Strategies

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Licentiate Thesis

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Stockholm, February 2015

Rosane Hungria Gunnelin

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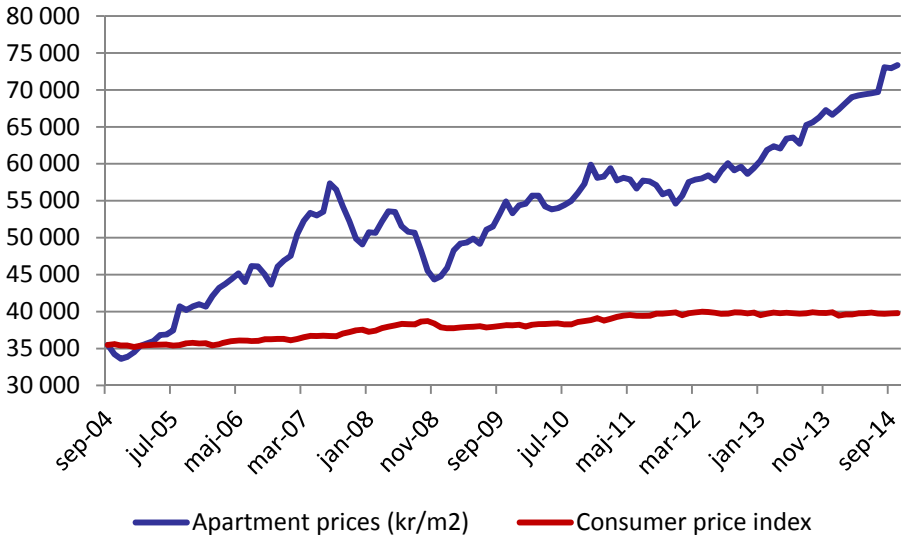
Part I – Overview

1 Introduction

Stockholm has experienced a significant growth in population during the past decades, partly because of a birth rate excess and partly due to the increasing immigration rates of people from other parts of the country and of people from and outside Europe (Boverket, 2014). Typical for fast growing regions, the housing market experiences growing pains where supply is not catching up with demand and, consequently, finding an apartment in the city of Stockholm has become increasingly difficult. Of the apartments in central Stockholm, 37 percent are rental apartments with regulated rent (Fastighetsägarna, 2013) and, consequently, long queuing time to get a contract making these apartments more or less inaccessible for "outsiders".[1] The remaining apartment space in central Stockholm consists mainly of condominium apartments. Not surprisingly, prices of condominium apartments have risen very quickly (see Figure 1), while the development of single-family house prices has been modest during the same period if compared to the development of apartment prices (Boverket, 2014).

Figure 1 – Average price increase for condominium apartments in Central Stockholm (2004-2014)



Source: Svensk Mäklarstatistik AB and Statistics Sweden.

The longevity of the imbalance between supply and demand for housing in Stockholm has affected the way in which homes are advertised and sold. Home brokers have long realized that selling non-distressed homes through auctions is a good way to capitalize satisfactory prices in a market where supply is lagging demand and virtually all residential space is sold

[1] In newly constructed rental apartments, rents are allowed to be close to or at market rent levels and, hence, queuing time is shorter for high-income entrants on the Stockholm rental housing market. This segment is, however, small in comparison with the stock of condominium apartments in Stockholm.

through an auction-like process.[2] Brokers also believe that announcing homes for sale for a list price below their market value (also known as "underpricing strategy") attracts a higher number of visitors to the showings and, consequently, to the auctions. Although auctions have been the predominant sales mechanism for homes during a considerable time period in Sweden, and in Stockholm in particular, home buyers are mainly *amateurs* who participate in a transaction that represents one of the biggest economic decisions they have to make in their lives and within a very competitive environment, which implies that in many cases decisions are made under "pressure" in a very short time span.

There has been an ongoing debate in the Swedish media concerning this selling strategy (underpricing), as it is considered by many as deceptive (FMI[3], 2011). However, the degree of underpricing has decreased as market conditions have changed since the advent of the global financial crisis that started to gain momentum in 2007 and hit the Stockholm real estate market a year later. During the period January to October 2007, sales price was on average 33.0 percent higher than the list price in Stockholm's inner-city (Hungria-Gunnelin and Lind, 2008). During the time period 2010-2011, the sample period covered by the dataset used in this thesis, the discrepancy between list price and selling price in my dataset had come down to 25.6 percent on average. However, as seen in *Table 1*, smaller apartments in the dataset still displayed a large spread between list price and selling price.

Table 1 - Sales Premium of apartments sold in Stockholm's inner-city per number of rooms (2010-2011)

Apartment size (in number of rooms)	Frequency	Sales premium [(Sales price/List price)-1]			
		Mean (%)	Std. Dev.	Min.(%)	Max.(%)
1-room	259	+35.0	0.160	-5.0	+87.0
2-room	363	+26.0	0.150	-5.0	+66.0
3-room	161	+16.0	0.122	-7.0	+60.0
4-room	52	+12.0	0.110	-4.0	+40.0
>5-room	18	+11.0	0.106	-3.0	+35.0

Source: e-bud, 2010-2011.

The starting point for this thesis was my curiosity regarding how sellers and buyers looking for apartments act in order to maximize their revenue from a transaction of an apartment in the auction-like environment that characterize sales in the Stockholm condominium market. While there are several ways a seller can act in order to maximize revenue, e.g. the choice of the type of auction, this thesis focus on the list price strategy, i.e. how the choice of list price affect selling price. With respect to buyers' means of maximizing revenue, I have chosen to focus on bidding strategies. In order to develop the hypotheses that underlie the choice of auction strategy variables, one of the questions in a survey that was sent to customers of a residential brokerage firm located in Täby, Stockholm[4] during the last quarter of 2011, inquired about the bidding strategy (if any) the broker's clients had pursued. The main results from 199 respondents were as follows: 24.6 percent of the respondents kept giving the minimum bid increase until other bidders jumped off the auction; 19.1 percent used a jump bidding strategy, where they place a big bid increment; 25.1 percent believed that placing a

[2] According to Zenou (2011), 95 percent of homes for sales in Stockholm are done through auction and the remaining through private negotiations. The data comes from Värderingsdata.

[3] The Swedish Estate Agents Inspectorate (FMI) was prior to year 2012 known as The Swedish Board of Supervision of Estate Agents (FMN).

[4] A collaboration study between the brokerage firm Mäklarringen in Täby and the Department of Real Estate Management & Construction at KTH. The survey was made by Engström, R. and Hungria-Gunnelin, R. (September 2011).

bid during the early stage of the auction is a way to show their interest in the object; 10.6 percent, on the other hand, believe that there are greater chances to win the auction if you arrive late and place the first bid when they feel the auction is about to end; and 20.6 percent have used other bidding strategies to win the auction, such as mixing large and small bid increments and placing a bid soon after another bidder placed a bid. Some respondents also used a strategy that lies outside the auction system, which is placing a bid prior to the official showing of the unit for sale. This way, sellers may feel tempted to accept the bid in order to avoid a quite stressing sale process and simultaneously avoiding the risk that no interested buyers will come to the showing of the apartment prior to the auction. This latter strategy is outside the context of this study, as the present study only focuses on auction sales.

From the respondents' answers, it was possible to identify three main factors describing their bidding strategy for residential real estate: *when to enter*[5], *how much to bid over previous bid* and *how fast to respond to previous bid*. This goes in line with the findings of Park and Bradlow (2005). They identify four components of bidding behavior in online auctions for notebooks, i.e. whether an auction will have a bid at all, (if so) who places bids, timing of the bids, and how much they have bid over the entire sequence of bids. In other words, these factors should be simultaneously considered by a bidder when making decisions during an auction.

2 Aim of the thesis

The aim of this thesis is to shed light on buyers' and sellers' strategies in open ascending-bid auctions of non-distressed condominium apartments in Stockholm. I specifically analyze how bidding strategies with respect to bid increases and reaction time to previous bid and list price strategies affect competition (the number of bidders) and sales price. To my knowledge, no previous study has empirically examined these questions in a real estate auction context. Hence, the empirical results in the thesis contribute to knowledge in this area of research.

3 Different ways to sell residential real estate

In most property markets, residential real estate is transacted through private treaty sales. Auctions of residential real estate are normally associated with forced sales of distressed properties or with sales of very exclusive and luxurious estates. There are a limited number of markets where auctions are the common selling mechanism for non-distressed residential properties. Examples of these markets are Australia, New Zealand, Scotland, Ireland, Denmark, Norway, and Sweden (Lusht, 1996; Hungria-Gunnelin, 2013; Chow *et al*., 2014; Stevenson and Young, 2014).

[5] I did not include "when to enter" in the study as it is somewhat random due to the procedure used by brokers. The broker normally calls interested buyers and simply starts from the top of the list of names s/he collected during the showings.

The choice of sales mechanism for residential real estate is related to the property cycle. Previous studies have showed that auctions become more attractive for sellers in a booming market (Mayer, 1995; Gan, 2013; Haurin *et al.*, 2013). Even in the United States, where private treaty sales are traditionally the most commonly found sales mechanism for non-distressed properties, it has been observed that auction-like transactions have steadily increased in popularity during boom periods, and have stayed at a higher level even after the event of the latest financial crisis (Han and Strange, 2014a). A market that has broadly adopted auctions for selling non-distressed residential real estate – independently of the timing in the property cycle – is the Swedish housing market, where auctions have long dominated the way homes[6] are sold in the market, which include periods of booms and busts.

4 Auction types and private value vs. common value auctions

Earlier studies of auctions have been crucial in developing our understanding of other methods of price formation. In auction environments, both sellers and buyers are actively involved in determining the price of the good being sold (Klemperer, 2004). Apart from choosing the sales mechanism (private treaty or auction) and setting the list price (starting price in an auction), sellers may also choose between different types of auctions when deciding to auction their goods. According to Klemperer (2014), there are four basic types of auctions: the *ascending-bid auction* (also known as open, oral, or English auction), the *descending-bid auction* (also known as the Dutch auction), the *first-price sealed-bid auction*, and the *second-price sealed-bid auction* (also known as the Vickrey auction).

In the *ascending-bid auction*, increasingly higher bids arrive until only one bidder remains. In other words, if no other competing buyer challenges the standing bid within a certain time frame, the bidder with the highest bid wins the auction and the item is sold at a price equal to the winner's bid. In this setting, auctions are transparent in the sense that the identity of all auction participants is disclosed to each other during the auction, and participants can observe when their competitors quit. A variation of the ascending-bid auction, known as the Japanese auction, does not, however, allow bidders that quit to enter the auction at a later stage. Ascending-bid auctions are usually used in the sales of arts, antiques and houses.

In contrast, the *descending-bid auction* is run in the exactly opposite way: the starting price is set high and it is lowered consecutively until a bidder accepts the current price. This bidder wins the object and pays the price she accepted. This type of auction is employed e.g. to sell flowers in the Netherlands, tobacco in Canada, and fish in Israel (Klemperer, 2004).

In the *first-price sealed-bid auction*, bidders submit their bids unknowingly of what other auction participants bid. The winner is the one that submits the highest bid and he pays the price equal to his bid (i.e., the price is the highest or "first" price bid). Mineral rights in government-owned land, artwork and real estate are examples of goods sold through this type of auction. In the same manner, in the *second-price sealed-bid auction*, all bidders submit their bid without knowledge of the other bids, and the winner is the one that places the highest bid. The difference between this auction type and the first-price sealed-bid

[6] All types of homes, from ordinary to luxurious.

auction is that the winner pays a price for the item equivalent to the second-highest bid. This form of auction is used e.g. in multi-unit versions for selling stamps by mail and is also used by government and companies to sell foreign exchange currency and to buy back shares, respectively (Klemperer, 2004).

Ascending-bid auction for houses are found e.g. in markets such as Melbourne, Australia (Lusht, 1996) and in larger cities in Sweden (Hungria-Gunnelin, 2013), while auctions with sealed-bid characteristics are employed in Scotland (Pryce, 2011). There are also residential multiple-object auctions found e.g. in New Jersey, U.S. (Ashenfelter and Genesove, 1992), when multiple residential units are sold simultaneously. These auctions take place in both the single-family and in the multi-family (condominium apartment) residential markets (Han and Strange, 2014b).

Besides the division into specific rules that originates in different types of auctions, auctions have also traditionally been divided into two categories, depending on the information symmetry or asymmetry of the good being auctioned. These models are known as the *independent private-value model* and the *pure common-value model* (Klemperer, 2004).

In the *independent private-value model*, the item for sale has a different value for each bidder, each of whom knows the item's value with certainty. Differences in value arise from heterogeneous preferences over the attributes of the item (*private value*). In this context, other bidders' values have no influence whatsoever over other participants' valuations (independent value). Examples of goods which characterize an independent private-value auction are consumption items and memorabilia.

In the *pure common-value model*, on the other hand, the value of the auctioned good is the same for all auction participants, but bidders have different private information about its true value. In other words, no bidder knows with certainty the true underlying value of the good. Each bidder uses her own private information to estimate the true value (therefore, bidders will likely obtain different estimates of the good's true common value). A typical example of such a good is oil drilling rights. The value of these rights depends on how much oil is under the ground, which, to a first approximation, is worth the same to all auction participants (Goeree and Offerman, 2003). However, bidders may have access to different geological information about the amount of oil under the ground. Therefore, the unfolding of an auction provides signals from bidders that they might have access to new information, which can influence the valuations of competing bidders, who may interpret rivals' bids as "they know something that I don't" (Klemperer, 2004). When bidders are uncertain about the item's true common value, they are likely to use competing bids as pieces of information to update their value estimates, resulting in positively correlated valuations among bidders. This positive correlation is an effect of the so-called affiliation of bidders' valuations originally discussed by Milgrom and Weber (1982) in their affiliated value auction model. Another phenomenon that may occur in common-value value auctions is the so-called *winner's curse*, see e.g. Kagel and Levin (1986). The winner of an auction is the bidder with the highest value estimate. If we assume the average bid to be the true value, then the highest bidder overestimates the item's value and is likely to overpay for the item. The severity of the winner's curse increases with the number of bidders. This is because the more bidders, the greater the chance that some of them have overestimated the auctioned item's value (Kim, 1989; Tse *et al.*, 2011).

In most real-world auctions, we can find a combination of common and private value, as most auctioned items are not solely private-value or pure common-value in nature. The combination of these two categories of auction is also known as the *almost common-value model.* For example, the value of a painting depends mostly on the bidder's private information (his preferences) but also somewhat on competitors' private information (their preferences), as this affects the resale value and/or the prestige of owning it (Klemperer, 2004). Residential real estate falls under the same category. A bidder may purchase a house with the purpose of increasing, for example, his status, at the same time as he is making an investment in case of resale (Quan, 1994).

5 Positioning the thesis in the literature on real estate auctions

Only a small fraction of the theoretical literature on auctions is dedicated to real estate (Han and Strange, 2014b). As real estate auctions usually are associated with forced sales of distressed properties in most markets, the existing theoretical literature has, in many cases, analyzed auctions from this setting. The question of sales mechanism is inseparable from the sales tradition in a certain market and how this market interprets property sales through auctions. Adams *et al*. (1992) model non-distressed real estate transactions as a "slow Dutch auction" in a market where private negotiations are the predominant sales mechanism. According to them, when a seller faces a stationary environment, it is optimal for the seller to maintain a fixed asking price, instead of trying to accelerate the sales process by calling an auction. Quan (1994) discusses the general theory of auction with applications to real estate and his paper provides a good survey of previous studies of real estate auctions. Similar to Adams et al. (1992), Mayer (1995) in a theoretical model arrives at the result that, except for a very "hot" market, negotiated sales yield higher prices on average than auctions.

Of the studies that have empirically addressed auctions of non-distressed properties, the majority has focused on the preference between auctions versus negotiated sales with respect to sellers' revenues. Contrary to predictions of earlier theoretical literature, several empirical studies have found that real estate auctions under various circumstances yield higher revenues to the seller than negotiated sales. Ashenfelter and Genesove (1992), Lusht (1996), Quan (2002), Gan (2013), and Chow *et al*. (2014) are examples of such studies.

Other topics covered by empirical studies include the comparison between auction methods with respect to revenue maximization (Chow and Ooi, 2014), determinants of sale probability in auctions (Ong *et al*., 2005; and Stevenson and Young, 2014), buyer's remorse and the winner's curse (Kim, 1989; and Tse *et al.* (2011).

Missing from the empirical literature on real estate auctions is, however, studies analyzing the unfolding of auctions in terms of bidding strategies and if bidder behavior affects competition at the auction (the number of participating bidders) and the selling price. Furthermore, only a few studies have examined how underpricing affects the outcome of auctions, (Stevenson et al., 2010; and Lazear, 2012). One important reason for the lack of studies in these areas is the unavailability of the detailed property auction data that is required for such studies (Han and Strange, 2014b). My thesis is an attempt to fill this gap in

the literature using a database that is detailed enough and with sufficient amount of observations to construct variables describing a few strategies that bidders can pursue.

6 The institutional framework of Swedish residential real estate auctions

The Swedish housing market has adopted the open ascending-bid auction type as the sales format for residential real estate. Nonetheless, there are main features that are specific to the Swedish auction system that makes its settings quite unique. Unlike most auction markets, Swedish residential real estate auctions do not take place on an auction house. Bids are submitted over the phone or sometimes online and where the online bid is publically available on the brokers' internet home pages. Furthermore, bids in real estate auctions are not legally binding. This means that a buyer can – without cost – back out of the deal until it has been signed. Similarly, a seller is never bound to sell until the sales contract is signed. Sellers are also forbidden to place bids on their own property. Another interesting aspect of the Swedish housing market, but which is not directly related to the auction system, is that brokers are legally bound to protect sellers' and buyers' interests equally well.

The fact that bids are not binding is, by Swedish housing market experts, believed to be one of the main causes for the debate and criticism the Swedish media has lifted on the way housing sales are conducted in Sweden. For them, changing the Swedish legislation concerning real estate auctions in the direction of making bids binding would be beneficial for consumers and the housing market as a whole (Hungria-Gunnelin and Lind, 2008). The ability to participate in an auction without incurring any cost increases the probability of attracting non-serious bidders, as they may see participation as an opportunity to learn how the process works or as a costless option to place bids in simultaneous auctions in order to increase the probability of winning at a low price. This strategy is confirmed by Anwar *et al*. (2006) who analyze online auctions where bidders tend to bid at several auctions simultaneously, especially if competing auctions end at approximately the same time, which is the case for condominium auctions in Stockholm, where they have similar duration and normally starts simultaneously after the weekend showings. In a real estate context, Ashenfelter and Genesove (1992) also find in their study on post-auction price outcomes for identical condominium apartments in New Jersey, where units sold through auctions where bids were not binding, ended in sales prices 13 percent higher than prices for the units sold through private negotiations. Their findings are complemented by Ong (2006) that investigates auctions from an institutional setup, where hammer prices[7] and auction sales are binding. He concludes that only genuine bidders participate in such auction framework.

6.1 Disclosure of seller's reservation price

During the spring 2011, the underpricing of condominiums was brought to attention and regularly discussed in the media in Stockholm. As a result, the Swedish Home Broker's Association (Mäklarsamfundet) was receiving frequent complaints from home buyers

[7] The price at which an item is sold at an auction.

regarding the use of aggressive underpricing. Also, the supervising authority of Mäklarsamfundet, the Swedish Estate Agents Inspectorate (FMI), was critical to the increasing practice of underpricing (Mäklarsamfundet, 2013). As a response to this critique, a majority of the brokers in Stockholm adopted the practice of publishing a so called "Accepted price" in the advertisement of condominiums.[8]

Accepted price has the meaning that, unless there are more bids, the seller will accept a bid equal to the *accepted price*. The Accepted price may be seen as a price that is equal to, or near, the seller's reservation price. Even though the promise to sell at the Accept price is not legally binding, it is a signal from the broker and the seller that there will not be a situation where the seller rejects final bids at, or above, the list price due to the bids being below the price the seller expects to receive, which in a market with frequent and aggressive underpricing is significantly higher than the list price. After the agreement to use Accepted price, the underpricing decreased significantly to about four percent during 2012. During 2013, however, the underpricing started to increase again as the temperature of the Stockholm housing market kept rising (Mäklarsamfundet, 2013).

7 Data Availability and Methodology

There is no official or privately managed database in Sweden that continuously store auction data concerning sales of individual condominium apartments. However, some brokerage firms report online the development of bids of specific object being auctioned. In 2005, an online portal[9] was initiated through the collaboration between Handelsbanken and different brokerage firms with the objective to report real-time the auction development for individual sales of houses and condominium apartments in the country. Since 2012, this portal no longer exists but it was the main source of data-gathering for this thesis. Thus, this dataset which is used in both *Papers 1* and *2* is quite unique.

Following a long strand of work in the real estate economics literature analyzing property prices, the two papers in the thesis are methodologically based on *hedonic pricing models*, i.e. property prices are explained using a regression of property characteristics and other explanatory variables, including auction variables, on observed transaction prices.

The property transaction data was collected from two data sources: e-bud and Svensk Mäklarstatistik. The data used in Paper I is gathered from the e-bud dataset for the period January-November 2010 and it contains 512 observations. Paper II's regression models are also based on e-bud's dataset, but this time for a longer time period: January 2010 through December 2011, with 853 transactions prior to the selection of relevant observations. Paper II also uses the data gathered from Svensk Mäklarstatistik, which covers the period December 2009 – December 2011 and is much larger than the e-bud dataset, with a lit bit

[8] In the city of Gothenburg, brokers adopted the same policy in December 2012.

[9] The portal used by brokerage firms to report the auction development of individual home sales was known as *e-bud*.

more than 20,300 observations. This dataset is solely used for the purpose of estimating the market value[10] of the properties documented in the e-bud dataset.

8 Summary of Articles

Paper I: Impact of Number of Bidders on Sale Price of Auctioned Condominium Apartments in Stockholm

The aim of Paper I is to empirically analyze the effect of the *number of bidders* on sales price of condominium apartments sold through auctions in the inner-city of Stockholm, Sweden. The analysis is based on a hedonic pricing model in which the number of bidders is one of the explanatory variables. The estimation of the model shows a positive and strongly significant relationship between selling price and the number of bidders. This positive relationship between competition among bidders and selling price is in line with the findings in the general auction literature. The results are also in line with sellers'/home brokers' use of underpricing in the Stockholm condominium market in order to attract as many potential buyers as possible to the showing of apartments for sale. This paper is, to my knowledge, the first to empirically test the effect of the number of bidders on selling price of residential real estate.

Paper II: Auction strategies: do they really work? An empirical study of residential real estate auctions

Paper II can be seen as a continuation of Paper I. While Paper I provides strong support for the hypothesis that the selling price in an ascending English auction increases with competition among bidders, the study does not analyze how different bidding and list price strategies affect the number of bidders in an auction and if the relationship between the number of bidders and selling price is dependent on these strategies. The aim of Paper II is, thus, to empirically test how bidding and list price strategies affect competition among bidders and the selling price of condominium apartments in the inner-city of Stockholm. The main result of the study is that auction strategies significantly affect auction outcomes. Increased bid increments reduce competition, however not enough to offset an increase in selling price. A fast auction in terms of a short average time between bids seems to increase the probability of a bidding frenzy, which, in turn, increases the number of bidders and selling price. While average behavior of all bidders with respect to jump bidding and reaction time to previous bid significantly affect the number of bidders and the selling price in an auction, the difference in behavior of the winner and the losers does not significantly affect competition or selling price. The results with respect to the sellers' list price strategy show that while an increased underprice – a low list price in relation to assessed market value – increases competition by attracting more bidders, this competition is not enough to increase the selling price. Hence, while increased number of bidders *on average* increases selling price as shown in Paper I, the results in Paper II show that one cannot draw the conclusion that all strategies that increases competition lead to a higher selling price. On the contrary, some strategies seem to reduce selling price.

[10] The market value is part of one of the variables computed in Paper II's regression model.

9 Results

There are four main findings of the empirical analysis presented in this thesis. The first finding is that there is a positive and strongly significant relationship between competition in form of the number of bidders in an auction and selling price. This result is in line with the findings in the large body of literature on auctions in general. The result also validates the view among brokers that it is important to attract a high number of visitors to a showing in order to increase the number of bidders, which, in turn, increases the selling price.

The second main result is that although an underpricing strategy indeed attracts a higher number of bidders, it has a negative effect on sales prices. This result seems to be in conflict with the frequent use of underpricing in the Stockholm condominium market. However, the results in previous research on the effect on sales price of underpricing have been mixed. Some studies report a positive correlation between list price and sales price and some the opposite.

The third finding in this thesis is that an increased degree of jump bidding reduces competition by reducing the number of bidders. However, this reduction in competition is not sufficient to reduce the selling price. Thus, a higher average bid increment in an auction on average lead to higher selling price.

Finally, the results also show that a high speed of an auction in terms of a short average response time to previous bid seems to increase the probability of a so-called auction fever or bidding frenzy which, in the behavioral economics-based auction literature, is associated with irrational bidding behavior and increased risk of a winner's curse. Indeed, in the data used in this thesis, there is a negative and significant relationship between the average response time to previous bid and transaction price. That is, the shorter the average response time, the higher is the transaction price.

10 Concluding Remarks

There are very few studies analyzing bidding behavior in real estate auctions, mainly due to the difficulty in obtaining sufficient and relevant auction data. In this perspective, the database used in this thesis is quite unique and, while it is not a large data base, it is large enough to yield statistically significant estimates of how competition and transaction prices are affected by buyers' and sellers' auction strategies. Hence, the thesis contributes with valuable results to the field of real estate auctions. There is plenty of room to extensions of the studies in the thesis. For example, initially I aimed at including an analysis of how various auction strategies affect the probability of a winner's curse. Such a study, however, relies on very precise market value estimates of the transacted apartments since the dependent variable must contain the market value estimate in order to capture a winner's curse. Probably, the best way to proceed with such a study is to base the winner's curse measure on the brokers' *ex-ante* market value estimate, which was not available in the dataset used in this thesis. I therefore dropped this analysis from the thesis.

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