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Empirical Evidence Of The Influences On First-Price Bid Auction Premiums

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This study examines the determinants of auction premium using data from a first-price sealed bid auction of Federal Government Landed Properties in Nigeria. The results indicate that the number of bidders and location are important determinants of auction price premiums. These findings are consistent with the auction theory. The empirical estimates also suggest that property type as well as bidder characteristics may also influence auction premiums.

Keywords

Real estate markets; First-price bid auction; Auction price premium; Nigeria

1. Introduction

The auction mechanism has gained acceptance as an effective method of disposing real estate assets. The open bid auction has been found to be an effective means of optimising returns in the auction mechanism and reducing the impact of the winner's curse. Depending on the timing of the decisions (sequential or simultaneous bids), and the amount that the winner is required to pay, auctions can be classified into four basic types (Milgrom, 1989; Baye, 2003; and, Klemperer, 2003): English, first-price sealed bid, second-price sealed bid, and Dutch.

With an English auction, bidders observe the bids of others, and decide whether or not to progressively increase their bids. In sealed–bid auctions, bidders simultaneously submit written bids. 'First-price' means the highest bidder is selected and pays the bid amount. In a 'second-price' auction, the highest bidder is selected, but pays the second highest bid. In a Dutch auction, the auctioneer begins with a high asking price and gradually reduces the asking price until a bidder announces a willingness to accept the price.

An important issue explored by auction theorists is revenue generation resulting from each auction type. According to Azasu (2006), the revenue equivalence theorem provides the answer by stipulating that the English, Dutch, and sealed bid auctions yield exactly the same expected profit for every bidder valuation (bid) and the same expected revenue for the seller with independent private values. The author further argues that where this independent private value assumption is relaxed, the ability of the auctioneer to extract incremental profits is dependent upon a stronger concept of affiliation. For instance, if the price paid by the buyer can be more effectively linked to exogenous variables that are affiliated with the bidder's private information, the bidders are worse off and the seller is better off. Thus, if the seller has information about the object that would materially increase the bidder's valuation, then revealing such information is beneficial to the seller in that bidders will offer higher bids, resulting in a higher selling price, allowing the seller to extract the bidder's surplus (Milgrom, 1989, as cited in Azazu, 2006).

If the argument of the seller's ability to extract profit is valid, then auctions should lead to higher transaction prices relative to private negotiation in "healthy" markets. This apparently, explains why the auction mechanism is presently gaining popularity as a 'normal' way of trading real estate. On the other hand, the use of auctions as an alternative to private negotiated sales provides an opportunity to observe and compare price formation between both markets for real estate analysts. Efficient market conditions and the law of one price argue that prices in both markets should be similar as found in Allen (2001). Vickery (1961) suggests that even if the number of auction participants is relatively small compared to potential bidders interested in the object in a non-auction environment, competition between participants will keep prices comparable between markets, provided that participants do not engage in collusion, side payments, communications, or signalling.

Auctions have been a topic of academic research for two main purposes: comparison of revenues from various auction types to private negotiations, and evaluation of the determinants of auction success, defined as consummating a transaction. The present study focuses on the first objective with emphasis on factors influencing pricing differences in both markets.

Price formation and comparison has been a primary topic in the real estate literature. Prior studies have used hedonic pricing models to examine auction discounts and premiums relative to private sales. In response to an earlier theoretical exposition by Adams et al. (1992), and Mayer (1995), for instance, Mayer (1998) examines the relationship between auction prices and predicted sales prices using auction data in Los Angeles. Mayer finds evidence that auctions are associated with price discounts. Similarly, Allen and Swisher (2000) find that auction prices exhibit discounts relative to predicted market values that vary across sub-samples of the data. The authors also document that the order of sale may indeed impact auction prices, probably due to increased desperation of bidders to secure the property as the auction proceeds. Contrary to the findings of Mayer (1998), and Allen and Swisher (2000), Ashenfelter and Genesove (1992) find evidence that auctioned properties sell at price premiums in a United States (US) sample.

In Australia, Lusht (1990, 1996) finds results that are similar to Ashenfelter and Genesove. In the Melbourne housing market, Lusht (1990) finds that a vendor would achieve an additional 5.6% by auctioning rather than selling through a private treaty. In an expanded study of the same market, Lusht (1996) indicates that auctioning produces an 8% price premium. In New Zealand, Dotzour et al. (1998) also finds that auctioned properties sell at price premiums above average housing prices. In the Ireland property market, Stevenson and Young (2004) also discovers that auctioned properties sell, on average, at higher prices than private negotiated sales and auctioned properties are more likely to receive large premiums.

Two conflicting conclusions can be drawn from the foregoing regarding the price effects of real estate sales by auctions. In the US, most auction studies (Mayer, 1998 and Allen and Swisher, 2000) find price discounts. In Australia, New Zealand and Ireland, auction research (Lusht, 1990; 1996; Dotzour et al., 1998 and Stevenson and Young, 2004) supports price premiums. Mayer (1998) attributes these found differences to market conditions and omitted variable bias. The author notes, for instance, auction premiums may be found in rising markets, where inexperienced buyers tend to overbid, creating a “winner’s curse” situation.

It is also noted in academic studies that compare privately negotiated and auctioned transactions, only Allen and Swisher (2000) attempt to explain the size of auction discounts. Utilizing data from the English auction format, the authors observe that prices at the auction are17.45% less than predicted market values, although the mean discount varies significantly across geographical subsamples. Also, the order in which the properties are sold at the auction is found to be positively and significantly related to auction prices, suggesting that those who purchase properties later in the

auction are more likely to pay higher prices relative to predicted market value than those who purchase earlier in the auction.

This present study is a pioneering attempt to understand the determinants that influence auction price formation in the first–price sealed bid auction, an auction format largely overlooked in real estate literature. In addition, we examine the relationship between reserve and auction prices. The remainder of the paper is organized into four sections. The next section presents the data and empirical model. The empirical analysis of the findings is reported in the third section and followed by the conclusion.

2. Data and Empirical Model

The data consists of 220 residential properties owned by the Federal Government, located in Ikoyi, Lagos that were auctioned on October 11, 2005. The auction format employed was the first-price sealed bid. This auction type is a simultaneous move auction in which bidders simultaneously submit bids on pieces of paper and the auctioneer awards the auctioned property to the highest bidder.

A list of properties to be auctioned was provided to the public and interested bidders were given opportunities to inspect the properties. Each bidder was required to submit their sealed bid within 30 days of advertisement (made in THE GUARDIAN on Monday 20, 2005) in addition to a bank draft/certified cheque equal to 10% of the bid value.

Bode Adedeji & Partners, a local estate surveying and valuation firm, handled the auction preparation. Independent professional estate surveyors and valuers valued all auction properties to determine open market values. The open market value estimates were used to set the reserve prices, which were prices that had to be achieved for the properties to be sold at the auction. Reserve prices were not released prior to the auction.

All bidders were invited to attend the auction venue where bids were opened publicly and winning bids announced. Consistent with the first-price sealed-bid auction format, properties are sold to the highest bids exceeding reserve prices. However, not all properties were vacant at the time of the auction, and legal sitting tenants were given the right of first refusal. In other words, the winning auction bid prices were offered to the legal sitting tenants who had the option of accepting the winning bid and paying 10% down. If the legal sitting tenant failed to accept the offer within 14 days, the highest bidder was then notified in writing. The transaction data for this study are obtained from Vol. 11, No. 3834 edition of the ThisDay newspaper.

Two alternative econometric models are used in this study. The first examines the difference in auction sale price relative to the reserve price and based on Brown (1985), and Stevenson and Young (2004). The model is as follows:

$$1n(value) = \alpha + \beta 1n(price) + \varepsilon \quad (1)$$

The dependent variable; value, is the reserve price that has to be achieved for properties to be sold at the auction. The independent variable is the winning auction bid for each sold property.

The second model, which is similar to Ong et al. (2005), is aimed at analysing the determinants of the size of the premium that auction bidders were willing to pay over the reserve price. The model is as follows:

$$PRM = f(BEDR, BQ, LOC, SIZE, TYPE, HBIDDER, NUM) \quad (2)$$

The dependent variable; auction premium (*PRM*), is the percentage difference between the property's highest bid price and the reserve price, divided by the reserve price. Independent dichotomous variables for the auction properties are created to distinguish property type (*TYPE*) into semi detached (SEMID), detached (DETACH), duplex (DUP) and block of flats (BFLAT). The data set also allows for classification of all the auction properties as either prime or non prime as a proxy for location (*LOC*) and whether the auction property has a boys quarters (*BQ*) or not. These property attributes are expected to have a positive impact on auction premium. In addition, there is information on other property attributes, such as the number of bedrooms (*BEDR*) and size of the plot area (*SIZE*) occupied by each auctioned property. Both variables are also included in the model and expected to have positive influences on the dependent variable.

The characteristics of bidders have both been theoretically (Sirmans et al., 1990; Sirmans and Turnbull, 1993) and empirically (Harding et al., 2003a; Harding et al., 2003b) confirmed as indirectly having effects on relative bargaining skills or power and subsequently. influencing residential transaction prices. Ooi et al. (2006) also argue in their auction model that buyer characteristics affect the optimal bidding strategy to the extent that different types of buyers have varying bid–rents curves that lie either above or below that of competing buyer types. In this vein, and considering the nature of our data set, a dummy variable of whether the highest bidder (*HBIDDER*) is a company/corporation or private individual is created to capture the effect of bidder characteristics. Our supposition is that company/corporate organisations will have higher bargaining skills, including greater experience and hence, pay a lower premium than private individuals, on average.

According to the auction theory, the number of bidders (*NUM*) is predicted to have a positive effect on the auction transaction prices and premiums. This expectation is based on the auction theory and results found in several empirical studies (see, for example, Saidi and Marsden 1992; Chen et al., 2003; Ching and Fu, 2003; Ong, et al., 2005; and Ooi, et al., 2006).

3. Empirical Results

3.1 Relationship between Reserve and Auction Prices

Table 1 presents sample summary statistics for the four property types. On average, it can be observed from Table 1 that the highest bid price is lower than the reserve price for the entire sample as well as each property type. This is against the fact that the majority of the properties (54.5%) are sold at prices equal or greater than their corresponding reserve prices. This is quite surprising, but thus indicates that the variance of the highest bid price relative to reserve prices is higher for the unsold properties than the sold properties. Indeed, if one examines the percentage difference, it can be seen that the average absolute percentage difference (53.72%) with respect to the unsold properties is substantially higher in comparison to the average absolute percentage difference (11.33%) obtained for the sold properties.

Also, the level of variance observed in Table 1 (the average absolute difference of 17.61% is obtained for the entire sample), is indicative of the fact that the reserve price may not have acted as a good proxy for auction prices, as observed in most valuation accuracy literature (see, for example, Hager and Lord 1985; Brown 1985; Matysiak and Wang 1995; Stevenson and Young 2004; and Aluko 2007). To investigate this further, a simple linear regression model is used to examine the relationship between bid and auction prices. These findings are displayed in Table 2.

In Table 2, the beta coefficient is found to be significantly different from unity at conventional levels. Moreover, in every case, a statistically significant intercept term is also reported, thus indicating that reserve prices have not acted as a good proxy for auction prices. A potential cause is that the panel of valuers engaged to provide advice on the market values of the properties may have deliberately overpriced a significant number of the properties in order to increase their professional fees. This is even more so because there is no possibility of their principal (government) defaulting in payment of the fees.

One other issue of importance observed in Table 1 is that the average absolute difference of the bid price relative to the reserve price is negatively correlated with the number of properties for sale in the different property type categories, thus suggesting a possible influence of the popularity and resulting in greater liquidity of some property types. It is noticeable from Table 1 that detached properties appear to be the most liquid with a least average absolute difference of 12.55% while duplex properties are the least liquid with an average absolute difference of 25.44%. Furthermore, a regression (presented in Table 3) of the absolute difference of the bid relative to the reserve price to the number of bids shows negative, but statistically significant coefficients, with the single exception of the duplex category. This result further provides support for the observation made earlier from the descriptive statistics where the average absolute difference of the bid price relative to the reserve price is negatively correlated with the number of properties for sale in the different property type categories.

Table 1 Summary Statistics for the Reserve Prices (RP) and Highest Bid Prices (HBP)

	Entire Sample	**Semi Detached**	**Detached**	**Duplex**	**Block of Flats**
Number of Observations	220	48	116	27	30
Average Reserve Price	166, 021,564	109, 670, 833	177, 207, 276	125, 746, 153	247, 836, 667
Average Highest Bid Price	138, 012, 062	82, 542, 190	156, 836, 309	96, 021, 797	188, 905, 033
Number of Properties with HBP $\geq$ RP *(Property Sold)*	120	24	68	14	15
Number of Properties with HBP < RP *(Property Unsold)*	100	24	48	13	15
Average Absolute % Difference* *(Total Sample)*	17.61%	21.79%	12.56%	25.44%	24.58%
Minimum % Difference for Unsold Property	-99.44%	-98.08%	-97.31%	-99.44%	-98.33%
Maximum % Difference for Sold Property	53.72%	27.93%	53.73%	19.07%	14.29%
Average Absolute % Difference *(Overpricing)*	52.62%	59.78%	46.27%	64.00%	52.31%
Average Absolute % Difference *(underpricing)*	11.33%	14.95%	11.23%	7.74%	7.11%

* refers to percentage difference of highest and reservation prices

Table 2 Results of Log of Reserve Prices (RP) Regressed Against Log of Highest Bid Prices (HBP)

	Constant	Auction Prices
Entire Sample		
Coefficient	6.486	0.211
Standard Error	0.215	0.027
T – Statistics	30.191**	7.812**
Block of Flats		
Coefficient	7.939	0.054
Standard Error	0.338	0.042
T – Statistics	23.496**	1.288*
Semi Detached		
Coefficient	7.501	0.066
Standard Error	0.360	0.046
T – Statistics	20.864**	1.422*
Detached		
Coefficient	5.420	0.344
Standard Error	0.346	0.043
T – Statistics	15.673**	8.017**
Duplex		
Coefficient	7.378	0.089
Standard Error	0.383	0.049
T – Statistics	19.273**	1.809*

Notes: * indicates significance at a 90 percent level; ** at a 99 percent level

3.3 Determinants of the Size of Auction Premium

The next series of analysis examines the determinants of auction premiums. The descriptive statistics of the explanatory variables are first examined, followed by an empirical analysis, which uses the second model discussed earlier. The model is estimated using the ordinary least square method on the sample of 120 properties that were actually sold at the auction.

Table 3 Results of Variance of Bids Regressed against Number of Bids

	Constant	No. of Bids
Entire Sample		
Coefficient	40.636	-6.043
Standard Error	3.591	1.729
T – Statistics	11.315**	-3.495*
Block of Flats		
Coefficient	49.612	-12.265
Standard Error	12.900	7.490
T – Statistics	3.846*	-1.638*
Semi Detached		
Coefficient	49.817	-7.886
Standard Error	9.429	5.482
T – Statistics	5.284**	-1.439*
Detached		
Coefficient	34.806	-4.388
Standard Error	4.206	1.749
T – Statistics	8.276**	-2.509*
Duplex		
Coefficient	43.844	-7.937
Standard Error	21.352	15.881
T – Statistics	2.053*	-0.500

Notes: * indicates significance at a 90 percent level; ** at a 99 percent level

3.3.1. Descriptive Statistics

Table 4 provides summary descriptive statistics of the explanatory variables. The descriptive statistics display the means for the sample of 120 properties sold during an auction of Federal Government residential properties in Ikoyi, Lagos, Nigeria. These statistics show that the average auction premium for all categories of auctioned property is 11.33%. The dummy variables for the four types of property indicate that semi-detached and detached houses represent about 20% and 57% respectively of the entire sample of all the sold properties.

Table 4 Descriptive Statistics

Variable	Mean	SD	Minimum	Maximum	Skewness	Kurtosis
PRM	11.33	10.70	0	53.73	1.101	3.801
SIZE	2, 873	1, 791	400	12, 153	1.655	5.191
LOC	0.55	0.45	0	1	-0.204	-1.992
BFLAT	0.12	0.32	0	1	2.419	3.914
DUP	0.12	0.32	0	1	2.419	3.914
DETACH	0.57	0.50	0	1	-0.272	-1.959
SEMID	0.20	0.40	0	1	1.519	0.312
BEDR	4.57	3.80	2	24	3.186	11.594
BQ	0.40	0.49	0	1	0.413	-1.860
NUM	1.98	1.34	1	7	1.674	2.475
HBIDDER	0.72	0.45	0	1	-0.974	-1.070

Note: Descriptive statistics based on 120 observations

3.3.2 Sample Selection Regression Results

The ordinary least squares results (OLS) for the sample of 120 sold properties are shown in Table 5. The regression has the auction premium as a dependent variable and nine independent variables, including four continuous and five dichotomous.

This model presents the determinants of the premium that auction bidders paid above reserve prices. The results indicate that location, style (semi-detached), and a relatively high number of bidders influence auction premiums.

Location (LOC) has a strong influence on the premium, as indicated by a significant and positive coefficient. This is expected, as properties in prime locations usually generate greater interest and participation by virtue of their location advantage coupled with the fact that they are usually limited in supply. This result is also consistent with the findings of Deboer et al. (1992) where as many as three–quarters of surveyed bidders in an auction of land parcels are influenced by the location of the parcel when bidding. Intuitively, the location advantage will translate into high bidding prices, thus resulting in greater premiums.

The number of bidders (NUM) is positive and significant at the 5% level, supporting the theoretical expectation that higher turnouts are associated with a significant increase in auction prices and greater premiums. This result is consistent with the

earlier empirical work of Saidi and Marsden (1992), Chen et al. (2003), Chin and Fu (2003), and Ooi et al. (2006).

Table 5 Ordinary Least Square Regression on Premium (dependent variable)

Dependent Variable: PRM			
Variable	**Coefficient**	**t-statistic**	**p-value**
Constant	0.233	0.450	0.654
BEDR	-0.416	-0.203	0.840
BQ	-1.865	-0.899	0.371
LOC	0.945**	1.832	0.070
SIZE	-0.001	-0.801	0.425
SEMID	5.791*	2.223	0.028
DUP	-2.249	-0.704	0.483
BFLAT	-5.488	-0.872	0.385
HBIDDER	2.721	1.296	0.198
NUM	1.870*	2.506	0.014
R-squared		0.126	
Adjusted R-squared		0.055	
sigma^2		98.680	
Durbin-Watson stat		2.105	
Nobs, Nvars		120, 10	
* Significant at the 0.05 level			
**Significant at the 0.10 level			

Of the three residential types, only semi-detached has a positive impact on the auction premium and significance at the 5% level. This can be attributable to the highest under pricing (14.95%) for semi-detached as reported earlier in Table 1.
Bidder's characteristic (HBIDDER) is positive, but not statistically significant. The positive coefficient means that corporate organizations/companies are perhaps more likely to offer a higher premium than private individuals. This result provides important support for the findings of prior work that show a positive association between buyer characteristics and residential selling prices (Sirmans et al. 1990; Sirmans and Turnbull 1993; Harding et al. 2003a; Harding et al. 2003b; and Ooi et al. 2006). In this sample, it is likely that corporations have superior access to market information and capital, resulting in higher selling prices and auction premiums. Finally, explanatory variables of the number of bedrooms (BEDR), size of the lot (SIZE) and presence of boys' quarters (BQ) have statistically insignificant effects on auction premiums.

4. Conclusion

This article examines the determinants of auction premiums using empirical evidence from first–price sealed bid auction of Federal Government Landed Properties in Nigeria. The findings indicate that location and bidder turnout, and proxy by number of bids, are important determinants of auction premiums observed in the Nigeria auction data. These findings are consistent with the auction theory, which suggests that bid prices are less than zero–profit asset value in first–price sealed bid auctions and that optimal bids rise with the number of bidders (Ooi et al. 2006). The findings are also in line with Mayer's (1995) observation that increasing the number of bidders increases the likelihood of a high–value bidder participant.

It is also interesting to note that buyer characteristics may also affect the level of auction premiums. The empirical estimates show that corporate organizations/companies are likely to submit higher bids than private individuals. These results complement earlier empirical results observed in the Singapore auction data (Ooi et al. 2006). Finally, the results also suggest that property types (in this case, semi-detached and block of flats) are also important determinants of auction premium, although these findings are not statistically significant in the models.

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