

An Empirical Analysis of Bidding Behavior in Simultaneous Ascending-Bid Auctions

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Abstract—Collecting auction data on jinmajia.com, we make an analysis on bidding behaviors in simultaneous ascending-bid auctions. Our results indicate that it is not optimal for bidders to use the late- and cross-bidding strategies in the large simultaneous ascending-bid auctions with the soft ending rule.

Keywords—*Simultaneous ascending-bid auctions; Bidding strategy; Cross-bidding; Late-bidding*

I. INTRODUCTION

With the development of network technology and the innovation of people's shopping awareness, online auction becomes a new way of shopping and play a pivotal role in e-commerce. Due to the environments in which online auctions are conducted, its rules are different from the traditional auctions and have been paid great attention in the academic community.

Vakrat and Seidmann^[1] collected 324 online auctions data and made an analysis on the customers' arrival process. They found that 70% of customers present at the early of the auctions, and pointed out that the auction duration is a very important decision variable. It had a significant impact on the number of customer and the auction price. By use of the laptop auction data, Park and Bradlow^[2] analyzed the effect of factors on whether the customer is involved in the auction or not, (if involved) when he submits a bid and how much he will bid. Wood et al.^[3] analyzed the impacts of some controllable variables, i.e., the starting price, the auction ending time, the auction duration, and goods brands, on the consequence of auction. They concluded that the sellers can choose a lower starting price and shorten auction duration in order to improve their profits.

Researchers mentioned that in online auctions, the bidding often reaches a climax at the end of the auction. They define bidders who first bid at the end of the auction as *snipers* and their bidding behavior as the *late-bidding* strategy. Bajari and Hortacsu^[4] used a unique data set of eBay coin auctions and explored the determinants of bidder and seller behavior. They

found that bidders engage in "sniping". By collecting computer and antique auction data from eBay and Amazon, Roth and Ockenfels^[5-7] compared the bidder behavior on eBay and Amazon. The results showed that there is much more late bidding with the eBay fixed ending rule than with the Amazon automatic extension rule, and that this tendency increases with experience. Park and Bradlow^[2] showed that about 75 percent of bidders arrive after 97% of the auction time has elapsed. They suggested that sellers should shorten the auction process and risen the starting price.

Most existing literatures study on bidding behavior shown on online English auction (i.e. based on eBay), where the seller has one unit for sale and the bid ascends. By observing eBay auction data, Bapna^[8] classified bidders can be divided into three categories according to the bid time, i.e. evaluators, participators, and opportunists. In this paper, we intend to study different bidding behavior shown in simultaneous ascending-bid auctions.

Using CPU auction data from eBay, Sajid et al.^[9] found that in simultaneous ascending-bid auctions, a significant proportion of bidders do bid across competing auctions and winning bidders who bid cross pay lower prices on average than winning bidders who do not. They define this type of bidding behavior as *cross-bidding* strategy. English auctions run on eBay use a hard-closing rule. That is, auctions have a pre-specified duration, which always range from 24 hours to 7 days. The auction ends immediately, when the end time is reached. Our paper study bidding behavior in simultaneous ascending-bid auctions with soft ending rule which is used widely in auction sites, e.g. Amazon and Yahoo!. We compare the auction price which winners who use different bidding strategies pay and find the optimal bidding strategy.

The rest of the paper is organized as follows. Section II describe auction rules used in simultaneous ascending-bid auctions. In Section III, we use auction data and make an analysis on bidding behavior. Finally, we conclude and present directions for future research.

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II. PROBLEM STATEMENT

It is well known that China has successfully hosted the 29th Olympics Games in 2008. 2008 fou (a traditional Chinese drum) which appeared in the opening ceremony of the Olympics Games impressed the public deeply. In March, 2009, a part of 2008 fou were auctioned in jinmajia.com, which is a domestic professional auction site and provides a good network platform for equity exchange service. The information on fou auctions was released in jinmajia.com and China Central Television one month ago. It attracted many people's attention and their participation. In this activity, 90 fou were auctioned simultaneously, with the same starting price, the same bid increment and the same auction duration. It is noted that the soft-ending rule is used here. That is, 90 auctions have a pre-specified duration, which first last 24 hours, and then extend the ending time if there is bidding activity in the last 10 minutes of the auction. We collect all auction data and make an analysis of bidding behavior shown in 90 simultaneous ascending-bid auctions.

III. ANALYSIS OF CUSTOMER BIDDING STRATEGY

There are 388 customers participate in this fou auction. Based on Bapna^[8], we classify bidding behavior shown by consumer in the simultaneous ascending-bid auctions according to participating in one or more auctions, i.e. truthful-bidding and cross-bidding strategies. Then, we make a detailed analysis on bidding behavior.

A. Truthful-bidding Strategy

Auction data show that there are 57 bidders who participate in one auction. Most of these people occur at the end of the auction and bid only once. It implies that they always monitor the progress of the auction and not anxious to bid. They have a certain valuation on the fou and their valuations are not affected by others easily. They will not bid until the current bid increases to their willingness-to-pay. So, we define this type of bidder as *evaluator* and their bidding behavior as *truthful-bidding* strategy.

Among these customers, 5 bidders win the auction. The average trade price generated by using truthful-bidding strategy is ¥128,060.

B. Cross-bidding Strategy

We observe that in simultaneous ascending-bid auctions, 331 bidders participate in several auctions simultaneously, which account for 85.31 percent of the total number of bidders. This type of bidders always seeks the lowest current price in auctions and participates in it. Their bids are equal to the required minimum bid. Borrowing from the definition of Sajid et al.^[9], we regard this type of bidder as *cross-bidders* and their bidding behavior as *cross-bidding* strategy.

Among these bidders, 65 win 85 Fou¹ and the average trade price is ¥143,878. We make a comparison of the number of winners and the average trade price when bidders respectively use truthful-bidding and cross-bidding strategy, seen in Table I.

TABLE I. THE COMPARISON OF TWO BIDDING STRATEGIES

| | Truthful-bidding Strategy | Cross-bidding Strategy |
|-------------------------|---------------------------|------------------------|
| The number of bidders | 57 | 331 |
| The number of winners | 5 | 65 |
| The average trade price | 128,060 | 143,878 |

From Table I, we can see that the average trade price that winners using the cross-bidding strategy pay is higher than winners using the truthful-bidding strategy pay. Because of the dynamics of auctions, it is difficult for cross-bidders to submit bids on the auction with the lowest current price when 90 auctions run simultaneously. Consequently, the bidder who uses the truthful-bidding strategy has chance to win the auction with a lower trade price. In our sample, 5 winners who use the truthful-bidding strategy pay ¥87,200, ¥98,200, ¥110,200, ¥160,700, and ¥184,000, respectively. Especially in two auctions with the trade price of ¥87,200 and ¥98,200, there are less bidders participating, and auctions end immediately as soon as the end time is reached. In addition, our data indicates that bidders who cross-bid participate in seven auctions on average. Thus, the average trade price is not as low as imagined.

C. Late-bidding Strategy

Many literatures have discussed the *late-bidding* strategy, i.e. bidders first occur in the last minutes of the auction. This type of bidders is always defined as *snipers*. We observe that in 90 auctions, 216 bidders first bid in the last hour of the auction, which account for 55.67 percent of the total number of bidders. Among these bidders, 44 win the auction and the average trade price is ¥154,253.

Then, we further divide snipers into two categories according to whether they participate in several auctions simultaneously at the end of the auction. In our sample, 45 snipers participate in only one auction, of which 3 win the auction with the average of trade price ¥143,967. 171 snipers bid in several auctions simultaneously, of which 41 win the auction with the average of trade price ¥154,910. We make a comparison of the number of winners and the average trade price when bidders use the different late-bidding strategies, seen in Table II.

TABLE II. THE COMPARISON OF LATE-BIDDING STRATEGIES

| | Late- and Truthful-bidding | Late- and Cross-bidding |
|----------------------------|----------------------------|-------------------------|
| The number of participants | 45 | 171 |
| The number of winners | 3 | 41 |
| The average trade price | 143,967 | 154,910 |

Table II indicates that a large proportion of bidders use the late- and cross-bidding strategy, while the average trade price winners who use the late- and cross-bidding strategy pay is higher than that winners who use the late- and the truthful-bidding strategy pay. The main reason lies in the fact that it is

¹ Among these bidders, some win two or three fou.

hard to find the auction with the lowest current price when 90 auctions run simultaneously. On the other hand, the auctions use the soft ending rule. Auctions extend the ending time if there is bidding activity in the last 10 minute of the auction. Our data shows that 90 auctions extend one hour on average. The bidding reaches a climax at the end of the auction. With the process of auctions, the bidding ascends. Then, bidders who monitor the auctions and use the late- and cross-bidding strategy are not likely to win the auction with a lower price.

For the above discussion, we obtain the following conclusion.

Proposition1. *The late- and cross-bidding strategy is not optimal in the large simultaneous ascending-bid auctions with the soft-ending rule.*

IV. CONCLUSION

Simultaneous ascending-bid auctions are used widely online when the seller has many goods. By collecting 90 auction data in jinmajia.com, we make an analysis on their bidding behavior in simultaneous ascending-bid auctions and conclude that the late- and cross-bidding strategy is not optimal when the number of auctions run simultaneously is large and the auctions use the soft ending rule. Based on it, we will further discuss the optimal design of auction mechanism for multiple goods.

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