Getting Carried Away in Auctions as Imperfect Value Discovery

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Abstract

Bidders in auctions must decide whether and when to incur the cost of estimating the most they are willing to pay. This can explain why people seem to get carried away, bidding higher than they had planned before the auction and then finding they had paid more than the object was worth to them. Even when such behavior is rational, ex ante, it may be perceived as irrational if one ignores other situations in which people revise their bid ceilings upwards and are happy when that enables them to win the auction.

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Rule No. 3: Set a ceiling for your bid.

"People can make emotional decisions. In the cool of the preview, think of how much you want to spend and set a limit, rather than getting caught up in the frenzy of bidding and spending more," Keane says.

"When I go to an auction, I do set a ceiling," says auction lover Renee Alexander. "I've been known to go beyond that. I've also been the object of dealers upping the price. I bought a brass headboard and footboard, and they were bidding me up and I got carried away and paid more than I should have."

But at $200, the brass bed was still a steal, she says.

It's easy, when you're bidding, to lose track of everything but the object of your desire.

"What happens in an auction situation is that people's sense of self is on the line," says psychologist Dick Geist, president of the Institute of Psychology and Investing in Newton. "Once they start bidding, they're holding themselves up for the validation or confirmation of whatever money means to them, be it self-worth or power. . . . You're proving that you can have an impact on the worth of this item."

2. The Model

The two possible bidders in an auction, both risk-neutral, have private values which are statistically independent.

Bidder 1's value is v_1, which has three components: $v_1 = \mu + u + \epsilon$. He knows the value of μ, and he knows that that u and ϵ are independently distributed with mean zero and differentiable densities on $[-\overline{u}, \overline{u}]$ and $[-\overline{\epsilon}, \overline{\epsilon}]$, where $\mu - \overline{u} - \overline{\epsilon} > 0$ so v_1 is never negative. If he wishes, at any time he can pay c and learn the value of u immediately. He cannot discover the other component, ϵ, however, until after the auction.

Bidder 2's value, v_2, is $\underline{v_2}$ with probability θ and $\overline{v_2}$ with probability $(1-\theta)$, with $\theta \in (0,1)$; and with $\underline{v_2} \in (\mu - \overline{u}, \mu)$ and $\overline{v_2} \in (\mu, \mu + \overline{u})$. Figure 1 illustrates the distribution of values. Bidder 2 knows the value of v_2 but not v_1.

Discussion of the Assumptions

Our purpose is to model a situation in which a bidder—Bidder 1 in the model— is uncertain about (a) his value and (b) whether there exists any other bidder who has a higher value. The model's focus is on his decision on whether to incur the cost of learning more about his value.

The low value for Bidder 2, $\underline{v_2}$, is assumed to be less than μ so that if v_2 does take that value Bidder 1 will win the auction even if he just bids up to his initial expected value. Bidder 2's low value is chosen to be greater than $(\mu - \overline{v_2})$ so that if Bidder 1 does win at a price of $\underline{v_2}$, Bidder 1's ex post payoff might be negative.

The possible high value for Bidder 2, $\overline{v_2}$, is assumed to exceed μ so that if v_2 takes that value Bidder 1 will lose the auction if he just bids up to his initial expected value. The value of $\overline{\epsilon}$ is less than $(\mu + \overline{u})$ so that if Bidder 1 does discover u, there is still some chance that $(\mu + u)$ will be high enough that Bidder 1 will win the auction.

3. The Equilibrium

Each bidder must decide on a bid ceiling. Bidder 1 must also decide at what bid level, if any, to pay c to discover u, after which he may wish to revise his bid ceiling.

If Bidder 1 does not acquire any information about his value, his best strategy is to bid up to μ, the expected value of the object to him. If he does discover u, his optimal strategy is to bid up to $(\mu + u)$, his updated estimate of v_1. Bidder 2's optimal strategy is to choose a bid ceiling of v_2. Note that there is no benefit to Bidder 2 in changing his bid ceiling in order to affect the timing of Bidder 1's value discovery; value discovery is instantaneous, so timing is unimportant in this model, unlike in Rasmusen (2002), where value discovery cannot take place late in the auction.

Bidder 1 has three value discovery strategies that might be optimal in equilibrium: early discovery, late discovery, and no discovery. The early discovery strategy is to pay to discover u when the bid level reaches some value $b^* \in [0, \underline{v_2})$, most simply at the start of the auction, so $b^* = 0$. The late discovery strategy is to pay to discover u if the bid level reaches some level $b^* \in [\underline{v_2}, \mu + \overline{u}]$ and Bidder 2 has failed to drop out, most simply if the bidding reaches Bidder 1's initial bid ceiling, so $b^* = m$. The strategy of no discovery is to refuse to pay to discover u regardless of what happens.

Bidder 1's expected payoff if he chooses never to pay to discover his value is the simplest,

$$\pi_1(no\ discovery) = \theta(\mu - \underline{v_2}) + (1-\theta)(0), \tag{1}$$

because with probability θ he will win the auction at a price of $\underline{v_2}$ and with probability $(1-\theta)$ he will lose the auction.

Bidder 1's expected payoff from late discovery— paying c and discovering v_1 if and only if Bidder 2 does not drop out at the price of $\underline{v_2}$— is made up of the expected value of winning at price $\underline{v_2}$ and the expected value of winning at price $\overline{v_2}$ when $\mu + u > \overline{v_2}$.

$$\begin{aligned} \pi_1(late\ discovery) &= \theta(\mu - \underline{v_2}) \\ &\quad + [1-\theta]\left[-c + \int_{\overline{v_2}-\mu}^{\infty} [(\mu+u) - \overline{v_2}] f(u) du\right] \end{aligned} \tag{2}$$

Bidder 1's payoff from early discovery is made up of the cost c plus the expected value of winning at price $\underline{v_2}$ when $\mu + u > \underline{v_2}$ and $y = \underline{v_2}$, plus the expected value of winning at price $\overline{v_2}$ when $\mu + u > \overline{v_2}$ and $y = \overline{v_2}$.

$$\begin{aligned} \pi_1(early\ discovery) &= \theta\left[-c + \int_{\underline{v_2}-\mu}^{\infty} [(\mu+u) - \underline{v_2}] f(u) du\right] \\ &\quad + [1-\theta]\left[-c + \int_{\overline{v_2}-\mu}^{\infty} [(\mu+u) - \overline{v_2}] f(u) du\right] \end{aligned} \tag{3}$$

Proposition 1 uses the following shorthand notation:

$$\begin{aligned} A_1 &\equiv \int_{\underline{v_2}-\mu}^{\infty} [(\mu + u) - \underline{v_2}] f(u) du \\ A_2 &\equiv \int_{\overline{v_2}-\mu}^{\infty} [(\mu + u) - \overline{v_2}] f(u) du \end{aligned} \tag{4}$$

Proposition 1: *Which of the three value discovery strategies is optimal depends on c as follows:*

$$\begin{array}{ll} \text{No discovery} & if\ c \geq A_2 \\ \text{Late discovery} & if\ c \in [A_1 - (\mu - \underline{v_2}), A_2] \\ \text{Early discovery} & if\ c \leq A_1 - (\mu - \underline{v_2}) \end{array} \tag{5}$$

Lemma: The middle range is not empty:

$$\int_{\underline{v_2}-\mu}^{\infty} \left(\mu + u - \underline{v_2}\right) f(u)du - (\mu - \underline{v_2}) < \int_{\overline{v_2}-\mu}^{\infty} (\mu + u - \overline{v_2}) f(u)du. \tag{6}$$

This is true if and only if $(\mu - \underline{v_2}) > \overline{v_2} - \mu$; that is, if the low Bidder 2 value, $\underline{v_2}$, is further from Bidder 1's expected value, μ, than is the high Bidder 2 value, $\overline{v_2}$. This is true by assumption in the model. If this were not true, then as the discovery cost c increased, Bidder 1 would simply jump from early discovery to no discovery. Bidder 1 would choose no discovery if c became too big to justify paying it to avoid overpaying $\underline{v_2}$ when $\mu + u > \underline{v_2}$. But in that case, when the bid rose to $\underline{v_2}$ and Bidder 2 was still in the auction, Bidder 1 would find *a fortiori* that c was too big to justify paying it to gain the chance of winning the auction when $\mu + u > \overline{v_2}$.

Proposition 2: *As the toughness of competition (the level of $\overline{v_2}$) increases, Bidder 1's willingness to pay to improve his estimate of v_1 falls, but that willingness is unaffected by the probability of tough competition (θ).*

Proof:

REPLACE IN HERE

The derivative of A_1 with respect to θ is zero.

Thus, increases in $\overline{v_2}$ expand the parameter range for No Discovery but increases in θ leave it unchanged. ■

Proposition 3: *As $\overline{u}$, the degree of uncertainty over his private value, increases, Bidder 1's willingness to pay to improve his estimate of his value increases, as does his payoff if he chooses early or late discovery.*

Proof. The derivative of A_1 with respect to $\overline{u}$ is

$$\frac{dA_1}{d\overline{u}} = (\mu + \overline{u} - \underline{v_2})f(\overline{u}) > 0. \tag{7}$$

Thus, from Proposition 1 his willingness to pay c increases. Also,

$$\frac{dA_2}{d\overline{u}} = (\mu + \overline{u} - \overline{v_2})f(\overline{u}) > 0. \tag{8}$$

Together, these inequalities imply that Bidder 1's payoff increases if he chooses early or late discovery (it is unchanged if he chooses No Discovery). ■

Interpretation as Getting Carried Away

The main interest of this model is that it provided an interpretation for "getting carried away" in the course of an auction. Suppose we see a bidder winning an auction at a price higher than the most he entered the auction being willing to pay, and that he later regrets having won at that high price–what I will call an "unhappy victory." At the start of the auction, μ was the most Bidder 1 intended to bid. The auction begins, and the bidding rises to μ. Now, however, he reconsiders, and raises his bid ceiling to $\mu + u$. This new ceiling is greater than $\overline{v_2}$, the most Bidder 2 will pay. Bidder 1 thus wins the auction at price $\overline{v_2}$. After the auction is over, however, he discovers ϵ and finds that $\mu + u + y$ is less than $\overline{v_2}$, so he regrets having won. He says to himself: "I got carried away and bid too much. I wish I'd stuck with my original ceiling of μ."

4. A Model with Continuous Densities

Unlike in Section 2, we will now assume that Bidder 2's value, v_2, is distributed according to an atomless and differentiable density $g(v_2)$ on $[0, k]$, where $k > \mu$ and where $g(v_2) > 0$ for all v_2 on that interval. Bidder 2 does not know v_1, but he does know v_2. All parameters are common knowledge.

As in Section 3, Bidder 2's optimal strategy is to choose a bid ceiling of v_2, Bidder 1's optimal bid ceiling is Ex, which will be either μ or $\mu + u$, depending on whether he has paid c to discover u. Bidder 1 must also decide at what bid level p to pay c to discover u, where possibly $p = 0$ (early discovery) or $p = k$ (no discovery).

If Bidder 1 chooses the policy of submitting a bid ceiling of p, his expected payoff is, if $v_2 < p$,

$$\pi_1(v_2) = \int_{\mu-\overline{v_2}}^{\mu+\overline{u}} (\tilde{v_1} - v_2) f(\tilde{v_1}) d\tilde{v_1}. \tag{9}$$

If $v_2 \geq p$, Bidder 1's expected payoff is

$$\pi_1(v_2) = -c + \int_{\mu-\overline{v_2}}^{v_2} (0) f(\tilde{v_1}) d\tilde{v_1} + \int_{v_2}^{\mu+\overline{u}} (\tilde{v_1} - v_2) f(\tilde{v_1}) d\tilde{v_1}. \tag{10}$$

Integrating over the possible values of v_2 yields an overall expected payoff for Bidder 1 of

$$\begin{aligned} \pi_1 &= \int_0^p \left(\int_{\mu-\overline{v_2}}^{\mu+\overline{u}} (\tilde{v_1} - v_2) f(\tilde{v_2}) d\tilde{v_1} \right) g(v_2) dv_2 \\ &+ \int_p^{\mu+\overline{u}} \left(-c + \int_{v_2}^{\mu+\overline{u}} (\tilde{v_1} - v_2) f(\tilde{v_1}) d\tilde{v_1} \right) g(v_2) dv_2. \end{aligned} \tag{11}$$

Proposition 3: *In the model with continuous value densities, Bidder 1 will follow a policy of late discovery if* c *is low enough and otherwise no discovery, but he will never follow a policy of early discovery: (i)* $p > 0$*, if* c *is low enough then* $0 < p < \mu$*, and if* c *is high enough then* $p > \mu$*.*

Proposition 4: *As the degree of uncertainty over his private value increases, Bidder 1 becomes more willing to pay to discover his value: if* $p^* < \mu$ *, then* p^* *falls if we spread density* $f(u)$ *using a strict decrease in* f *on any interval* $[r, s]$ *and* *a strict increase everywhere else while leaving the mean of* u *unchanged at zero.*

"Never go beyond a predetermined limit when bidding. Base this limit on the information you have gathered. Avoid becoming obsessed with an item. Doing so will lead you to bid more than the property (or merchandise) is worth. If you are bidding on a tax sale property, you might bring a certified cheque for the maximum amount you intent to bid. This should ensure that you do not get carried away with the bidding process. If you are the successful bidder and the property is sold for less than the amount on your cheque, the clerk/treasurer will issue a refund for the difference."("Tax Sale Properties/Auction Guidelines" website)

"Avoid catching auction fever. This happens when bidders get carried away with the process; they will bid on anything and everything that is being auctioned and often will end up being the owner of things they did not even want and paying far too much for these items. The opposite of auction fever is auction paralysis. This occurs when the bidder is paralysed with fear and thus is unable to make a bid. Apparently such a state is often due to a fear of overpaying. If you don't overcome it you will never get started. Often, if you fail to do your homework, you will not have the confidence to bid." ("Tax Sale Properties/Auction Guidelines" website)

My story: The bidder rationally revises his estimate of the value of the object upwards during the course of the auction, so that at the moment of purchase he actually does value it at more than the price he pays.

The difference from the standard private-value auction will be that it is costly for the bidder to discover his own private value, so he defers doing so until the middle of the auction.

At that point he might revise it upwards–"auction fever"– or he might revise it downwards– "auction paralysis".

Compte & Jehiel (2000) and Rasmusen (2002): a bidder in a private- value ascending auction is uncertain about his value and will be able to pay a fixed amount to improve his information.

Differences from My Other Auction Paper

The important differences from Rasmusen (2002) is that here if the uninformed bidder pays c then

1. He acquires the value information immediately, not after a time lag, and

2. He only acquires better information about his value, not perfect information.

The absence of a time lag means that the informed bidder has no incentive to strategically delay bidding, the "sniping" phenomenon at the heart of my other article. The imperfection of the information means that even if the uninformed bidder makes optimal decisions ex ante, ex post he may regret having made them.

EMPIRICAL IMPLICATIONS

1. In the value discovery model the carried-away winner would regret having won less than half of the time— less than half, because even though his revised value is still an overestimate, he usually will not have to pay the entire amount to win the auction.

2. A short "cooling off period" would affect an emotional winner more than a value-discovering winner, although even in the value discovery model, the winner would, after thinking more, wish to return the object a significant fraction of the time.

3. The value discovery model implies that if the value is more uncertain, the bidder will be more likely to increase his bid ceiling in the course of the auction, because the option value of value discovery is higher. An emotional explanation might or might not have this implication.