

# Bidding against the Machine: Emotions in Electronic Markets

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We investigate the emotions of market participants and their impact on economic decision-making in first-price sealed-bid (FPSB) auctions. Using the NeuroIS methodology as described in Dimoka et al. (2010), we measure skin conductance response (SCR) and heart rate (HR) of participants during an electronic market experiment. The experiment is separated into two treatments: one with human and one with automated counterparties. The physiological measures serve as proxies for emotions and are combined with market results to provide insight into the interplay of decision-making and emotions—particularly arousal—during the auctions and at discrete events, such as submitting a bid and winning or losing an auction. We can show that arousal is stronger in human only markets and when the stakes of the experiment are higher. Moreover, higher arousal leads to riskier bidding behavior in human only markets.

The experiment was conducted at the Karlsruhe Institute of Technology (KIT) in Karlsruhe, Germany. In total 120 subjects, 27 females and 93 males, participated in the experiment. The experiment was set up with two treatments, a computer opponent (CO) and a human opponent (HO) treatment. Subjects knew which treatment they were in. Each subject participated in 30 FPSB auctions. In FPSB auctions participants submit bids simultaneously and do not see the other participants' bids. The highest bidder wins the auction and pays a price equal to her bid. Each auction is set up with 3 bidders all of which are informed about their independent private value (IPV) of the good being auctioned. The IPV experimental setup is the workhorse of experimental research on auctions (Kagel, 1995). IPVs are independently drawn from a uniform distribution with support on the discrete integer interval (11, 12, 13, ... 110). Participants know their own IPV and the general distribution of IPV's.

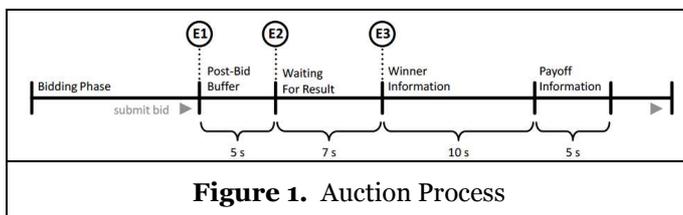


Figure 1. Auction Process

Figure 1 graphs the different phases of the auction process. Each auction starts with an IPV information display. Participants then start the actual auction by submitting their bids (E1), followed by a screen that indicates that all bids have been made and the result will

appear soon (E2). Eventually, the participants are informed, whether they have won or lost the auction (E3). In order to capture the participants' emotional states and the intensity of their emotional reactions, we measure SCR and HR of each participant throughout the experiment.

We find that participants in HO markets are significantly more aroused than in CO markets in terms of SCR amplitudes. This holds for all value levels and for all events (E1–E3). Our results indicate that bidders perceive a more competitive atmosphere during auctions with human opponents (Malhotra, 2010). The SCR amplitudes are stronger in auctions in which the individual value for the commodity is higher. The bidders are more aroused if more money is at stake. In economic terms, we find that the bidders' arousal has an impact on bidding behavior in HO markets, while it does not in CO markets. Using the average HR several seconds before placing a bid as a measure for a bidder's general level of arousal, we can show that higher levels of arousal lead to riskier, i.e. lower bids. Thus, bidders in human only markets are willing to take more risk when they are aroused.

The results have important implications for the broader IS community and in particular for studies of electronic markets where both humans and automated agents are active—eBay is the most obvious example. Our daily life is now permeated with interactions in human only, machine only, and mixed participant markets. We show that there are distinct differences in the behavior of human participants depending on the type of market they are in. These differences have an impact on bidding behavior, market outcomes, and emotional responses. One could imagine more complex interactions and more dynamic market settings (limit order markets). Focusing on a controlled and simple setting, our results present a first step towards understanding the dynamics of emotions in more complex electronic markets.

## REFERENCES

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