Finance and Economics Club

# Game and Auction Theory


**Presented by:**

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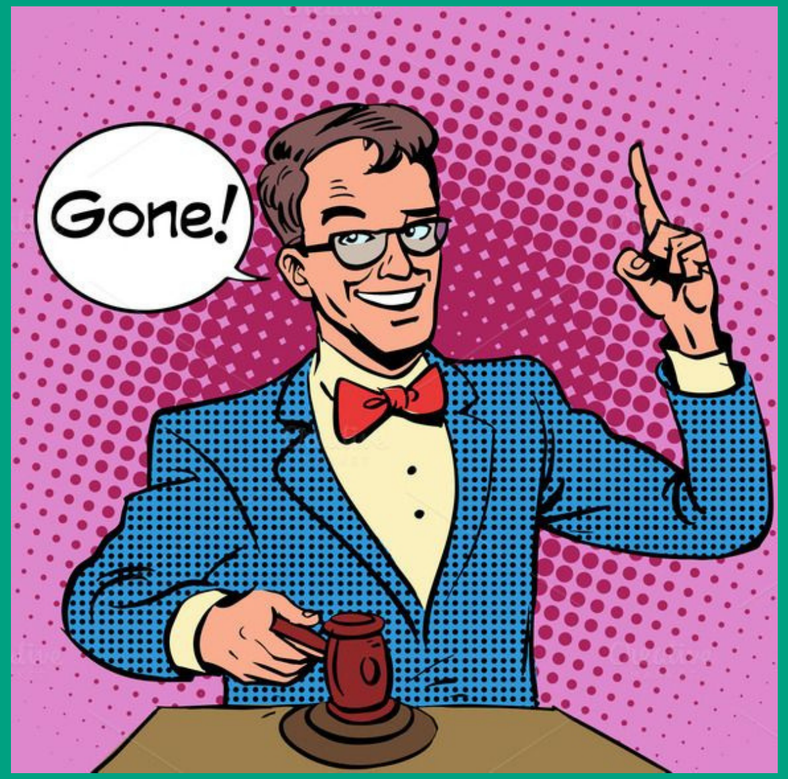
# Introduction




This research project revolves around game theory, focusing on a meticulous analysis of experimental data. This data will be procured by utilizing two uniquely crafted auction games, conceptualized by our efforts.

# What is an Auction?

An auction is a sales event wherein potential buyers place competitive bids on assets or services either in an open or closed format.


## *Types of auction:*

We will be looking at the following types of auctions.

1. **The first-price, sealed-bid auction**
2. **The second - price, sealed - bid (Vickrey ) auction**

# Theory of Auctions

## First Price Sealed Bid Auction

In a first price sealed bid auction, all the participants submit their bids without knowing the bid of any other participant. The person who bids the highest wins the auction and pay the price he/she bids.

In this type of auction, bidders are incentivized to carefully consider their valuation of the item and bid accordingly. However, participants might engage in strategic bidding, often shading their bids lower than their true valuation to secure a better deal if they win.

# Second Price Sealed Bid Auction

In a second price auction, all the participants submit their bids simultaneously, without knowing the bid of any other participants. The person who bids highest wins the auction, but the price paid by him/her is the second highest bid in the process.

The major benefits of second price sealed bid auction are that it promotes honest bidding by the participants and also reduce the risk of 'bid shading'.

# Game 1

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## Based on First Price Sealed Bid Auction

## Implementation

1. Every participant will bid an amount between $100 and $500.
2. Each player will submit 2 sealed bids in each round and their average will be considered for that round.
3. No. of rounds that are to be played in the game =

   max(5, sqrt((maximum bid in first round - minimum bid in first round)/2))

**WINNER: THE PLAYER WHOSE SUM OF AVERAGE OF THE BIDS IN EVERY ROUND IS MAXIMUM WILL BE DECLARED AS THE WINNER.**

# Game 1

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Winner will pay the price equal to the sum of average of bid1 and bid2 in every round divided by the total number of rounds.

$$\text{Payoff} = \sum(\text{avg}(\text{bid1},\text{bid2}))/(\text{number of rounds})$$

In case of a TIE, player whose bid is highest in the last round wins the game. In case of further tie, bid in previous round is considered.
If the tie isn't resolved even after considering all the rounds, winner is chosen randomly.

# Game 1

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**Game 1 Code link:**

https://colab.research.google.com/drive/1sN9iGBxLW0uwG36j4J_Pj0vOFy_w6wRb?usp=sharing

**Game 1 spreadsheet link:**

https://drive.google.com/file/d/19A54fsS3pjc_jsA0VtN3ReN0ejp7s6t0/view?usp=sharing

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# Game 2

## Based on Second Price Sealed Bid Auction

## Implementation

1. Every participant will bid an amount between $10 and $100.
2. Each player will submit only one sealed bid in each round.
3. No. of rounds that are to be played in the game = 10 (fixed)

**Winner of each round is the player whose bid surpasses the average of all bids in that round and is also closest to that average.**

IN CASE OF TIE IN A ROUND, WINNER OF THAT ROUND WILL BE CHOSEN RANDOMLY.

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# Game 2

**WINNER: PLAYER WHO WINS MAXIMUM NUMBER OF ROUNDS WINS THE GAME.**

Winner will pay the cost equivalent to the average of the averages of bids from all the rounds they emerged victorious in.

In case of TIE, player whose payoff is highest wins the game.
In case of further tie, player who won any round first wins the game.

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# Game 2

**Game 2 Code link:**

https://colab.research.google.com/drive/1lPVmyraywpqcnkePgf-4_9qTVXXMuP9Z?usp=sharing

**Game 2 spreadsheet link:**

https://drive.google.com/file/d/1ll3Pa2rj7l4F3opCmHfkrNErc2xmLYkT/view?usp=sharing

# Best Strategy to play the Game

1. **Avoid Overbidding**: While you should bid your true value, avoid overbidding significantly above your valuation. Overbidding can lead to winning the auction but paying more than the item is worth.
2. **Valuation Research**: Before participating in the auction, research the item or service being auctioned thoroughly. Determine its market value and how much you're willing to pay for it. Your bid should be based on this valuation.
3. **Analyzing Competition**: If possible, gather information about your competitors' potential bids. This can be challenging in sealed bid auctions, but if you have insights into their preferences or budgets, it can help you make more informed bidding decisions.

# Thank You