



GAME THEORY PROJECT

POOL B AUCTION STRATEGIES

- FIRST-PRICE AUCTION:

In a first-price auction, participants place their bids concurrently or at the same time, without knowing the bids of others until the auction concludes. The highest bidder among all the simultaneous bids wins the item or service and pays the price they offer, which adds an element of strategy.

- SECOND-PRICE AUCTION:

A second-price auction, also known as a Vickrey auction, is a type of auction in which the highest bidder wins the item or service being auctioned but pays the price offered by the second-highest bidder. In other words, the winning bidder pays an amount equal to the second-highest bid, not their own highest bid. This auction format encourages participants to bid their true valuations for the item, as overbidding does not result in paying more.

GAME 1

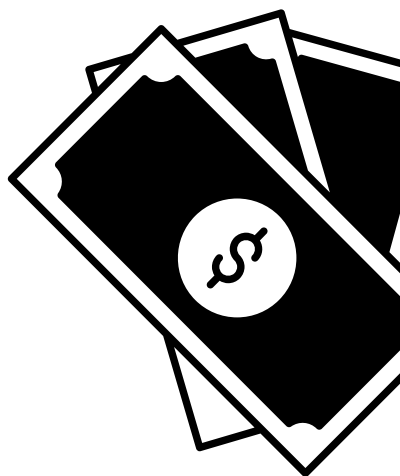
GAMESETUP -

- Players: 5 players
- Components: Deck of startup cards, money tokens.





- The game consists of 15 rounds, with each round representing a startup seeking funding.
- Equal amounts of money tokens are allotted to the players who look forward to investing their desired amount in the startups.
- At the start of each round, a new startup card is revealed, detailing the startup's attributes,
 1. Future market potential
 2. Financial Performance
 3. Sector Analysis
 4. Competition by other companies.
- Each player has to buy at least 2 companies.
- Players take turns engaging in a first-price auction to invest in the startup. The highest bidder secures the investment rights and pays their bid amount to the bank.
- The startup card is flipped, revealing its return(x times).
- Some startups succeed, generating high returns; others may struggle or fail.



SCORING AND WINNING

At the end of the predetermined number of rounds, players sum their returns from successful startups and subtract the investment amounts from unsuccessful startups. The player with the highest total wealth (returns minus investments) wins the game.



STRATEGIES

- **Valuation:** Players must evaluate the startup's attributes and potential success to determine how much they're willing to bid. Higher valuation startups could yield better returns but also demand higher bids.
- **Opponent Analysis:** Understanding opponents' bidding tendencies is crucial. Observing their bids and adapting accordingly can lead to competitive advantages.
- **Scarcity of Funds:** Players must manage their limited funds efficiently. Overspending on a single startup might hinder bidding in future rounds.
- **Game Progression:** As the game progresses, players might take calculated risks, investing more in promising startups to catch up if they're falling behind.



DATASET AND CODE LINK



For the 25 underlying startups growth is given as-
Spreadsheet:

https://docs.google.com/spreadsheets/d/1P8S5IkMfIDB4hLIXv0QUgwJcfixUAUB1XtE_tJ84CoQ/edit#gid=0

Analyzing this data, we use a LINEAR REGRESSION model for 4 variables to predict the growth/return of any company.

Jupyter notebook code file:

<https://colab.research.google.com/drive/1LMRuC-YSihgvuCeLQHnAVM3T7toLBwNd?usp=sharing>

We use equation,

$$y=m1x1+m2x2+m3x3+m4x4+c$$

To predict investment return of each company and invest larger amount on startups that are highly probable to grow.

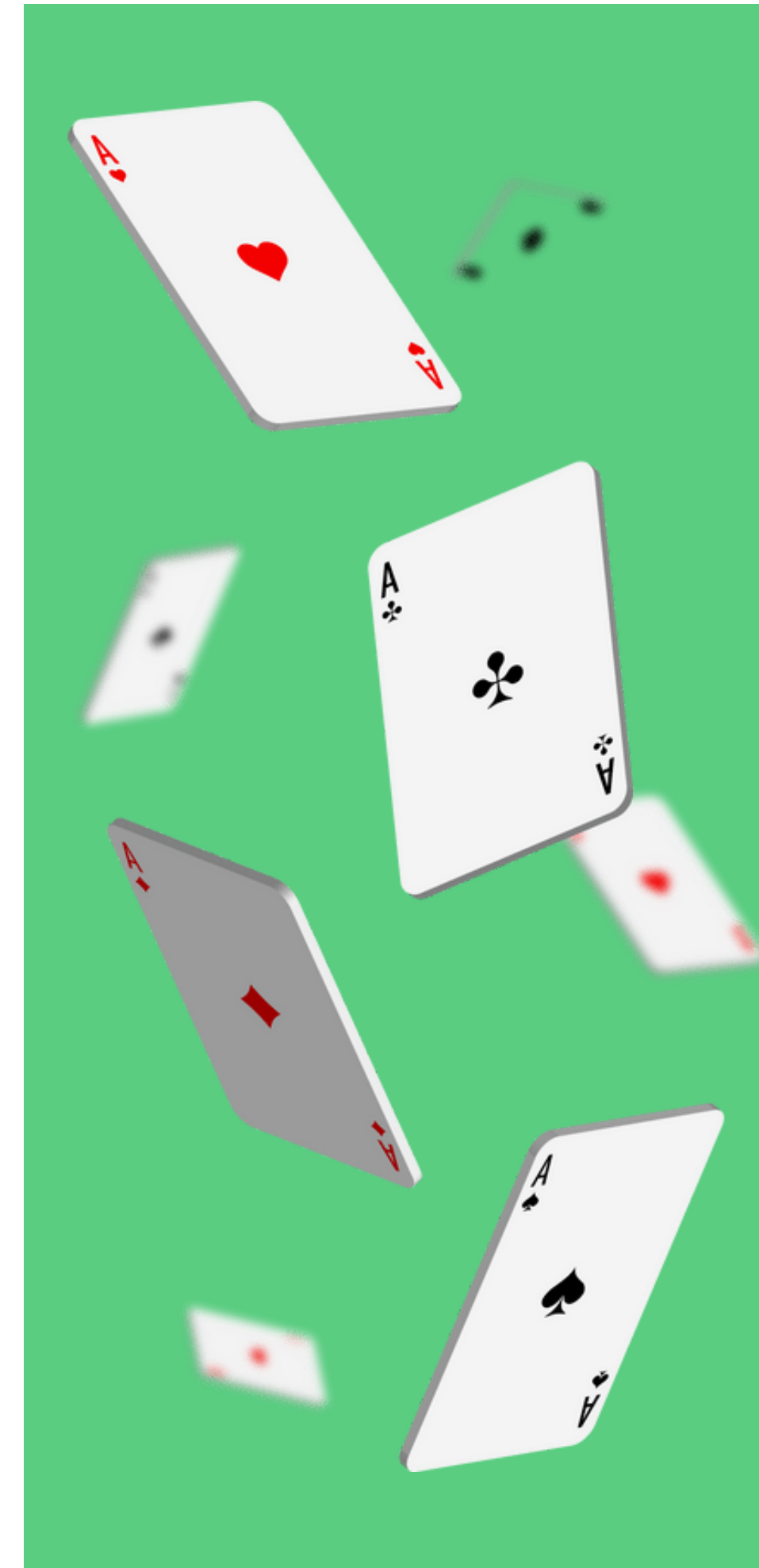
GAME 2

GAME SETUP-

- Players: 4 players
- Components: Resource cards, Tasks

GAMEPLAY

- The game consists of 5 rounds.
- At the start of each game, players will be asked to guess a value between 1-20, we will calculate the average of the values guessed by the players the players receive a set of 5 resource cards, which they have to use as currency to bid for cards that will be put up for auction each round. The closer your guess is to the calculated average the better set of cards you get.



The four sets of cards arranged in best to worst order are:-

- 1) Stone, Trade, Food, Water, Soil.
- 2) Stone, Fire, Wood, Food, Water.
- 3) Fire, Food, Water, Plant, Soil.
- 4) Fire, Wood, Food, Water, Plant.

Values of each card:-

Wood, Food, Water, Plant, Soil: 1 point.
Stone, Fire, Trade: 2 points.
Gold: 3 points.
Magic: 4 points.

The cards one needs to have to complete:-

Easy Task: Stone, Water, Plant.
Medium Task: Gold, Fire, Trade, Soil.
Hard Task: Magic, Gold, Trade, Wood, Food.

The easy task gives you 6 points
Medium task gives you 11 points
A hard task gives you 15 points.



AUCTION FLOW

Cards that will be put up for auction each round:-

- Round 1: Trade, Plant.
- Round 2: Stone, Fire.
- Round 3: Gold, Soil.
- Round 4: Gold, Fire.
- Round 5: Magic, Wood.



This game will follow a second price auction approach for auctions, where the winner of the auction will have to give the cards bid by the second best bidder, if the winner of the auction doesn't have the cards to make the actual payment then the points are cut accordingly from his account.

STRATEGIES

- **Objective Selection:** Evaluate the objective cards available and prioritize ones that offer higher point values relative to their resource requirements.
- **Auction Strategy:** Focus on resource cards that match your objectives or are versatile for multiple objectives. Bid aggressively if a card directly helps you complete a high-value objective.
- **Auction Timing:** Observe when opponents are low on resources or are likely focused on other objectives. This might be an opportune time to win an auction without heavy competition.
- **Resource Points Conversion:** Remember that unspent resource cards contribute their value in points at the end of the game. Consider saving cards with lower values for this purpose.
- **Consider the bids of other players** when determining your own. If you're confident in the value of a card, you can bid higher, but be cautious not to overpay.



Link to the spreadsheet

https://docs.google.com/spreadsheets/d/1G_z1l-WxYYjzSxjmSEeVtaDcKtGp1hISAnGD0uB3nNk/edit?usp=sharing

Points allocation and winning:

At the end of all the rounds, total points will be calculated for each player based on the tasks they complete and the cards they have, the player with the maximum points wins the round, player with the highest number of rounds wins, wins the game

THANK YOU



THE TEAM

Ambuj Mishra

m.ambuj@iitg.ac.in

220121007

Himanshu

himanshu.math22@iitg.ac.in

220123026

Manas Jhavar

j.manas@iitg.ac.in

220123032

Manya Aggarwal

a.manya@iitg.ac.in

220123033