Probabilities in the Game of Monopoly

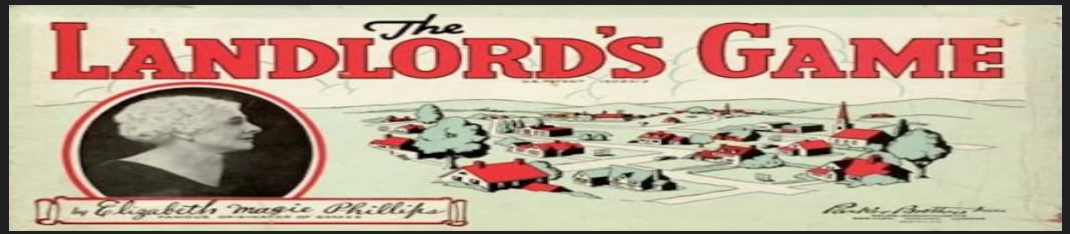
Samuel Herrera

What is Monopoly? A brief history

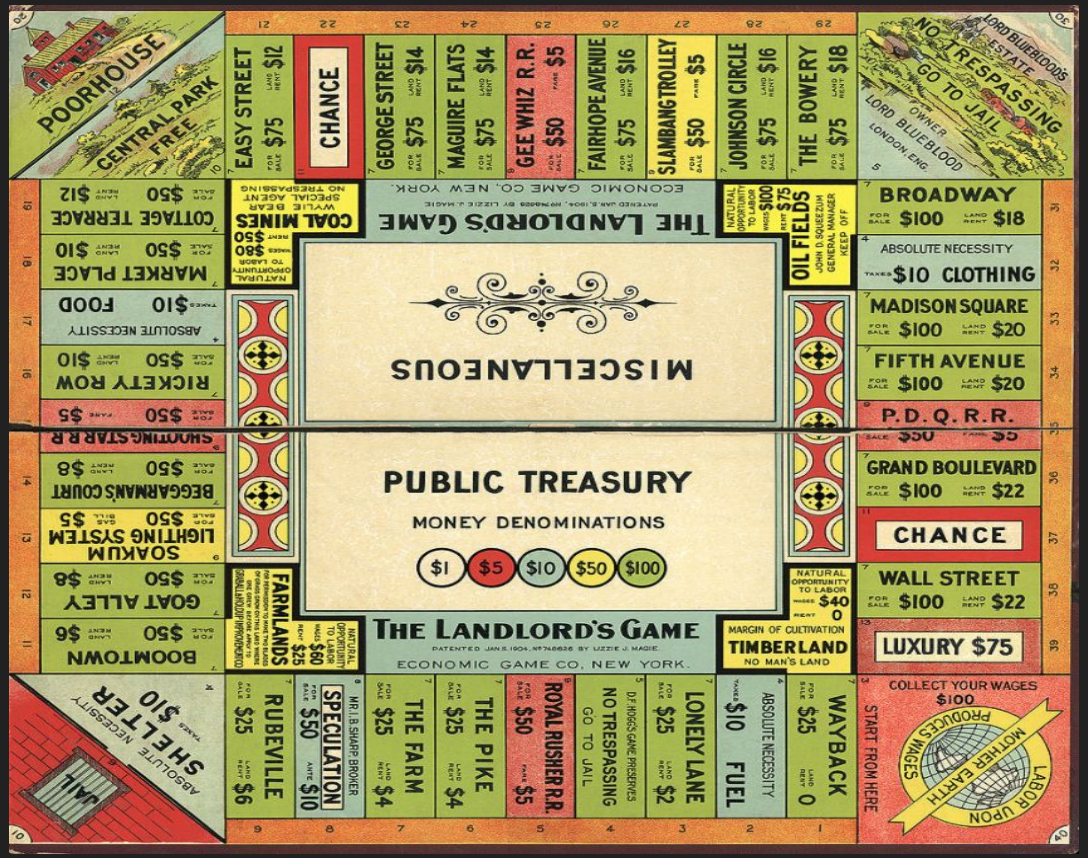
- Monopoly is board game published by Hasbro. First Publicated in 1935, Designed by Lizzie Maggie & Charles Darrow.

- Precursor to Monopoly named “The Landlord’s Game,” was designed by Lizzie Maggie

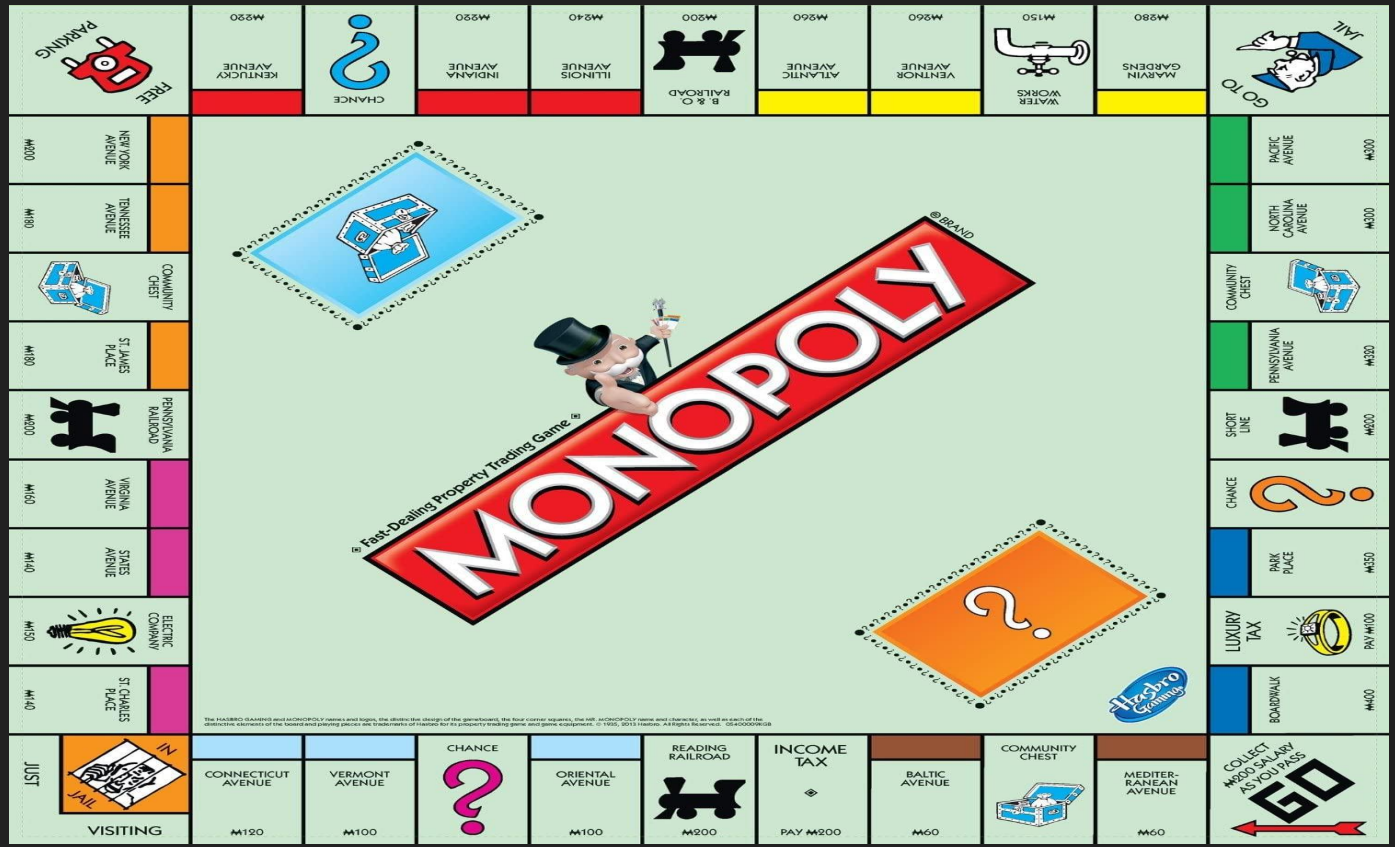
- A way to demonstrate that an economy that rewards wealth creation is better than one where monopolists work under few constraints



A brief look at The Landlord's Game



A Closer Look at the Monopoly Board



The Goal of Monopoly and the Contents of the Board

- In Monopoly, players buy, sell, rent, and trade real estate in a competition to bankrupt their opponents.
- They take turns rolling a pair of dice, with the totals indicating how many spaces to proceed along an outside track that includes:
- 22 Properties
- 4 Railroads
- 2 Utility Companies
- 3 Chance Squares
- 3 Community Chest Squares
- 6 miscellaneous squares labeled Go , Income Tax , Just Visiting, Free-Parking, Go to Jail , and Luxury Tax

Goal of Monopoly and Contents of the board cont.

- All players start at Go. If doubles are rolled, you get another roll. Rolling 3 consecutive doubles sends a player directly to the “In Jail” square.

- To get out of jail, the player must throw doubles, pay a fine of $50, or use a **get-out-of-jail-free card.**

Now that we understand the game, Let’s Apply what we’ve learned!

- In Chapter 7 of Discrete Mathematics and Its Applications 8th edition, the topic of discussion was Discrete Probability. With our knowledge of this section let's apply it

The Question :

What are the probabilities of landing on each square of the Monopoly Board?

What are the probabilities of landing on each square of the Monopoly Board?

- Using a C program that simulates a single person rolling the dice and moving around the board a great number of times, we obtain the probabilities of landing on each square

- This program uses all of the rules of Monopoly regarding going to Jail , and the Chance and Community Chest squares

- Two calculations based on different strategies in the game. Short Jail stay and Long Jail Stays.

Explaining the Differing Strategies from our Probabilities

- In the start of a game of Monopoly, you want to avoid Jail to the best of your ability so you can purchase as much property as possible. If the player is sent to jail at the start, they will most likely use a get-out-of-jail-free card or pay the $50 fee to get released.

- Inversely, at the later point of Monopoly, to avoid landing on the property of other players, many would rather stay in Jail to avoid the fees that follow landing on enemy property.

- With these two methods in mind , our program calculates the likelihood of landing on each square with both methods, separately.

Spreadsheet of Probabilities Separated

Long Jail Stay

https://docs.google.com/spreadsheets/d/1LHRxcKntYVo29C19FnCE6a3-nF1WJeFPTk-wzSRPI8M/edit#gid=0

Short Jail Stay

https://docs.google.com/spreadsheets/d/1bKVXkCtrnSYXxD6p3JT7Jy4YAPCMGz-jr80ynkhhxFM/edit#gid=0

Using our newfound data to our advantage

- All Railroad Squares are a great investment :

The railroad squares; Reading Railroad , Pennsylvania Road, B&0 Railroad & Short Line all have a landing probability > 2.5% in both Long and Short Jail Stays.

- Anticipate Landing in Jail :

With our data we can conclude that going to Jail is very likely as this square has the highest likelihood of being landed on. In a short stay the Jail square has a probability of 3.9499%. In a Long Jail stay , Landing in Jail is 9.4569%.

- Landing in Chance has the lowest probability :

In a short jail stay, the average probability of landing on a Chance square is 0.927% and in a Long Jail stay approach is lowered to 0.892%. Do not rely on landing on this square.

- The best properties to purchase Are the orange properties namely :

  St. James Place , Tennessee Avenue , and New York Avenue. These properties are right before the free parking square which has a landing probability of about 2.8% so this makes sense logically with our data.

Closing Statement

Thank you for listening!

Due to time constraints we couldn’t go over all of the functions of my code and instead went in depth on the most important one. I believe it would fun for you all to observe the code and see all that it can do.

I will attach the code for you all to view at your leisure. My program has other functions such as: calculating income from chance and community chest , counts the number of times you’ve passed go and much more. I urge you all to mess with code and leave me feedback!