SIG742

Modern Data Science

Part 2 Mid Term Assessment Report

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Introduction

The sum of my Student ID is 32, which is an even number. Hence selected version2 for this essay.

The Monty Hall problem, is rooted in TV game show, aids as statistical illusion, challenging conventional insight on probability. Essay aims to clarify the problem through simulation, providing experimental evidence on effective strategies for winning.

Gameplay:

In the Monty Hall game, players pick one of three doors behind one is a car, and goats are behind the others. Monty who knows contents, reveals a goat behind one of remaining doors. Players can either stick with their initial choice or switch.

Common Assumptions:

Intuition suggests that odds are 50/50 after Monty's reveal. But statistical illusion misleads due to flawed understanding of probabilities.

The Reality:

Switching doors actually doubles winning chances from 33% to 66%. This inconsistency was promoted by Marilyn vos Savant and has been verified through simulations and mathematical proofs. Monty's knowledge of prize location skews odds, debunking the idea that this is a game of mere chance.

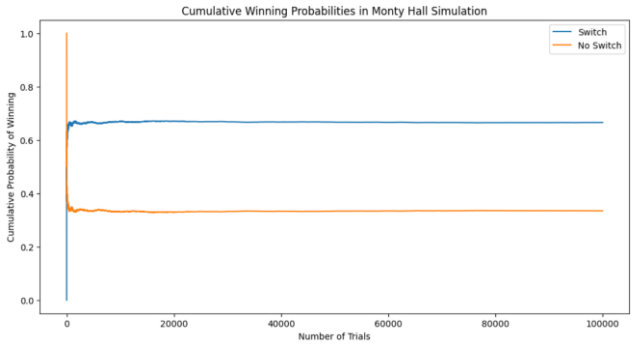
Objective and Methodology:

The primary objective is to empirically validate the winning probabilities through simulation. The Python code for this task incorporates random placements of the car and player's choice, Monty's deliberate reveal, and the evaluation of outcomes when sticking or switching doors.

Results:

The simulation, run over 100,000 trials, revealed that switching doors leads to a 66.6% chance of winning, compared to 33.3% when sticking to the original choice.

The outcomes align closely with the expected 1/3 and 2/3 probabilities for sticking and switching, respectively in the below chart. Initial random fluctuations are smoothed out over time, reaching a steady state that offers a more accurate representation of the true odds. The conclusive takeaway is the distinct advantage of switching doors, which nearly doubles the winning probability to approximately 66.6%, as compared to a mere 33.3% when sticking to the initial choice.



Conclusion:

The Monty Hall problem, while appearing as a simple game show challenge, has profound implications for statistical reasoning. It serves as a cautionary story about the risks of relying solely on intuition when interpreting probabilities. Not only can this puzzle mislead seasoned statisticians, but it also emphasizes the need for empirical evidence to substantiate or challenge our assumptions.

As such, the problem has educational merit far beyond entertainment; it acts as a compelling classroom example that prompts both budding and experienced statisticians to scrutinize their initial assumptions. The simulation outcomes, corroborating theoretical probabilities, solidify the importance of switching doors as the optimal strategy. Therefore, the Monty Hall problem is much more than a curious oddity; it is a powerful pedagogical tool for teaching the nuances of statistical analysis and critical thinking.

References:

Jim Frost (2022) "The Monty Hall Problem: A Statistical Illusion" Read and understood & detailed the understanding below for the monty hall problem from https://statisticsbyjim.com/fun/monty-hall-problem/

NOW PLAYING (Apr 21, 2023) "Game Theory Scene" watched and have better understanding from youtube
link: https://www.youtube.com/watch?v=CYyUuIXzGgI