ECE 341 - Homework #12

Markov Chains & Absorbing States, t-Test with a Single Population. Summer 2023

Markov Chains & Absorbing States

Assume player A and B are playing a match. For each game

- A has a 50% chance of winning (+1 point)
- There is a 15% chance of a tie (+0 points), and
- A has a 35% chance of losing (-1 point).

The match is over once you reach +3 points (A wins) or -3 points (B wins).

When the match starts, both players start out at 0 points (no odds).

1) Using matrix multiplication, determine the probability
   - That A wins after 10 games
   - That A wins the series (infinite number of games)

2) Using z-transforms, determine the probabilty
   - That A wins after 10 games
   - That A wins the series (infinite number of games)

Test of a Single Population: 2-pair in 5-Card Stud

The calculated odds of drawing 2-pair in 5-card stud are 21.03 : 1 odds against

- You should draw 2-pair 4755.11 times in 100,000 hands

3) Run a Monte Carlo simulation to determine the odds of being dealt 2-pair in 5-card stud
   - Each simulation goes through 100,000 hands (# of hands that are 2-pair with 100,000 hands of poker)
   - Run the simulation 3 times
   - data = { x1, x2, x3 }

From this, determine the 90% confidence interval for the actual odds of getting a 2-pair with 5-card stud.

- if N = 4755.11 is in this interval, you cannot reject this answer with a probability of 90%

4) Repeat problem #1 with 10 simulations of 100,000 hands.
   - With 10 simulations, what is the 90% confidence interval for the actual odds of being dealt 2-pair?

(over)

Let Y be the sum of rolling two 4-sided dice (2d4) plus three 6-sided dice (3d6) plus four 8-sided dice.

Y = 2d4 + 3d6 + 4d8

```
d4 = ceil( 4*rand(2,1) );
d6 = ceil( 6*rand(3,1) );
d8 = ceil( 8*rand(4,1) );
Y = sum(d4) + sum(d6) + sum(d8);
```

Monte-Carlo

Problem 5: Use a Monte-Carlo simulation to determine

- The probability that Y > 39.5
- The number, a, such that 5% of the rolls are less than a
- The number, b, such that 5% of the rolls are more then b

note: The 90% confidence interval for Y is then

a < Y < b with p = 90%

t-Test with a Single Population

Problem 6: Take four measurements of Y

```
DATA = [];
for i=1:4
   d4 = ceil( 4*rand(2,1) );
   d6 = ceil( 6*rand(3,1) );
   d8 = ceil( 8*rand(4,1) );
   Y = sum(d4) + sum(d6) + sum(d8);
   DATA = [DATA, Y];
   end
```

From this data, determine

- The mean and standard deviation
- The probability that Y > 39.5, and
- The 90% confidence interval for Y

Problem 7: Take ten measurements of Y

From this data, determine

- The mean and standard deviation
- The probability that Y > 39.5, and
- The 90% confidence interval for Y