Monty Hall simulation

Using python.

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Monty Hall simulation

This problem is so not intuitive that generated controversy in the academic community.

There are three closed doors, and you must select one to win a car, behind the doors, there is a car, and behind the other two there are goats. After select the door, another door with a goat it is showed to you, then you can change your first election, the main problem is if you must remain in the selected door or change?
Notice that the initial probability of win the car is the $1/3$.

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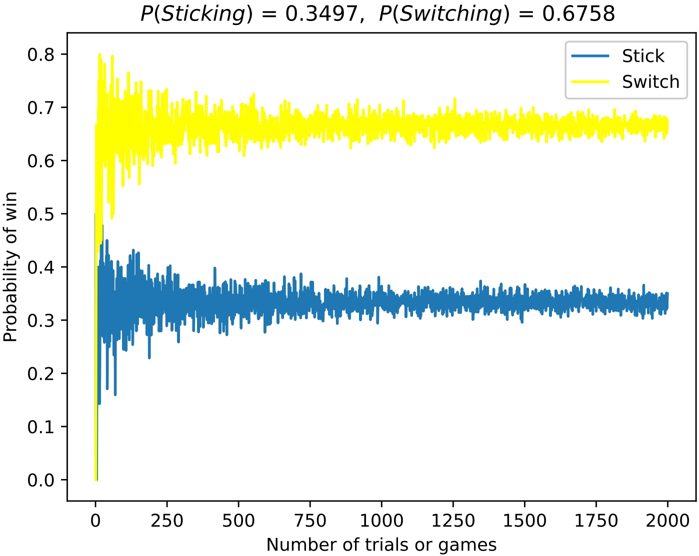

Monty Hall problem

Python code

```
def monty_game():
  doors=[1,2,3]
  doors_variable = doors.copy()
  winner = random.randint(1,3)
  select_one = random.randint(1,3)
  values = [winner,select_one]
  switch = list( set(doors) - set(values))
  select_two = random.randint(switch[0], switch[-1])
  s1,s2 = 0,0
  if winner == select_one:
    s1 += 1
  else:
    s2 +=1
  return [s1,s2]
```

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Python code

```
trials=2000
s1_=[]
s2_=[]
for n in range(1,trials):
  prob_s1 = sum([monty_game()[0] for _ in range(1,n)])/n
  s1_.append(prob_s1)
  prob_s2 = sum([monty_game()[1] for _ in range(1,n)])/n
  s2_.append(prob_s2)
plt.plot(np.arange(1,trials),s1_, label='Stick')
plt.plot(np.arange(1,trials),s2_, label='Switch',color='yellow')
plt.title('$P(switching)$ = {:.4}, $P(sticking)$ = {:.4}
    '.format(prob_s1,prob_s2))
```

Monty Hall

Bayesian solution

The event D_i the i winner door and M_j monty open j door, for $i, j = 1, 2, 3$.

$$P(D_i \mid M_j) = \frac{P(M_j \mid D_i)P(D_i)}{P(M_j)} \tag{1}$$

you select the first door and monty the second, therefore the question is $P(D_3 \mid M_2)$. Notice that $P(M_2) = \sum_{i=1}^{3} P(M_2 \mid D_i)$. given the rules of game, $P(M_2 \mid D_2) = 0$, and $P(M_2 \mid D_3) = 1$, if monty could select random in two choices $P(M_2 \mid C_1) = 1/2$ and finally, switch strategy have a probability of $2/3$.