"Monty Hall" game analysis

This notebook is to examine the success rates of 3 different types of players

a - never changes his mind b - always changes his mind c- changes his mind 50% of times

In [1]:
```
import matplotlib.pyplot as plt
import numpy as np
from numpy import *
```

In [2]:
```
def grill_car():
    return np.random.randint(1,4) ## returns the range of [1,4)
```

In [3]:
```
def door_first_choise():
    return np.random.randint(1,4)
```

In [4]:
```
def host_shows_goat_door(car_door, first_choise):
    return [index for index in (1,2,3) if index != car_door and index != first_ch
```

In [5]:
```
def switching_decision(player_type, first_choise, goat_door):
    if player_type == 'a': ## sticks with his first choise
        return first_choise

    elif player_type == 'b': ## always switches
        return [index for index in (1,2,3) if index != first_choise and index !=

    else: ## 50% switch 50% not
        fifty_fifty = np.random.randint(0,2)
        if fifty_fifty == 0: ## switch
            return [index for index in (1,2,3) if index != first_choise and index
        else:
            return first_choise
```

In [6]:
```
def check_win(guess, car_door):
    return (guess == car_door)
```

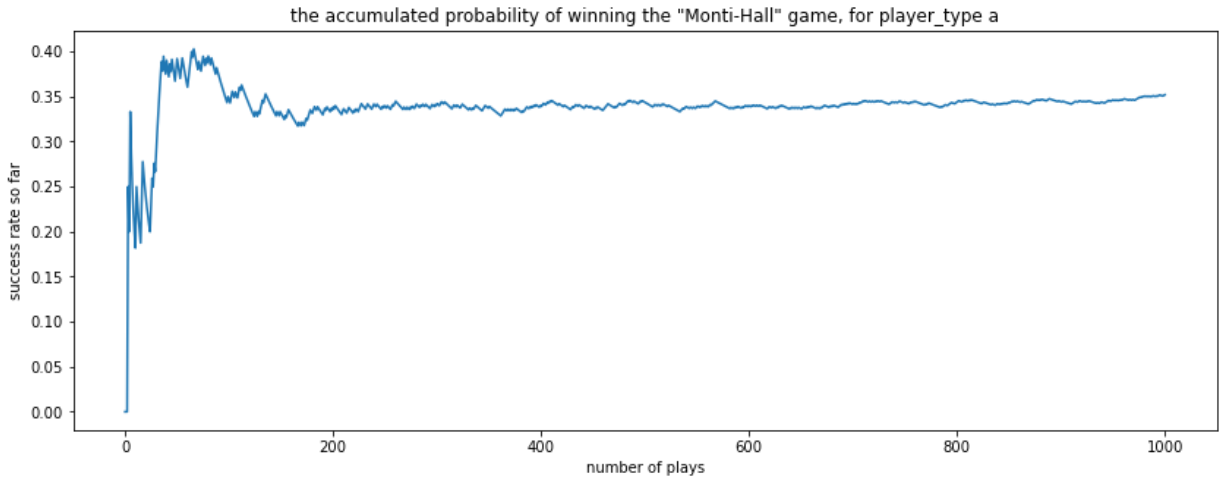
In [7]:
```
def play(player_type):

    car_door = grill_car()

    first_choise = door_first_choise()

    second_choise = swithching_decision(player_type, first_choise, host_shows_goa

    return check_win(second_choise, car_door)
```

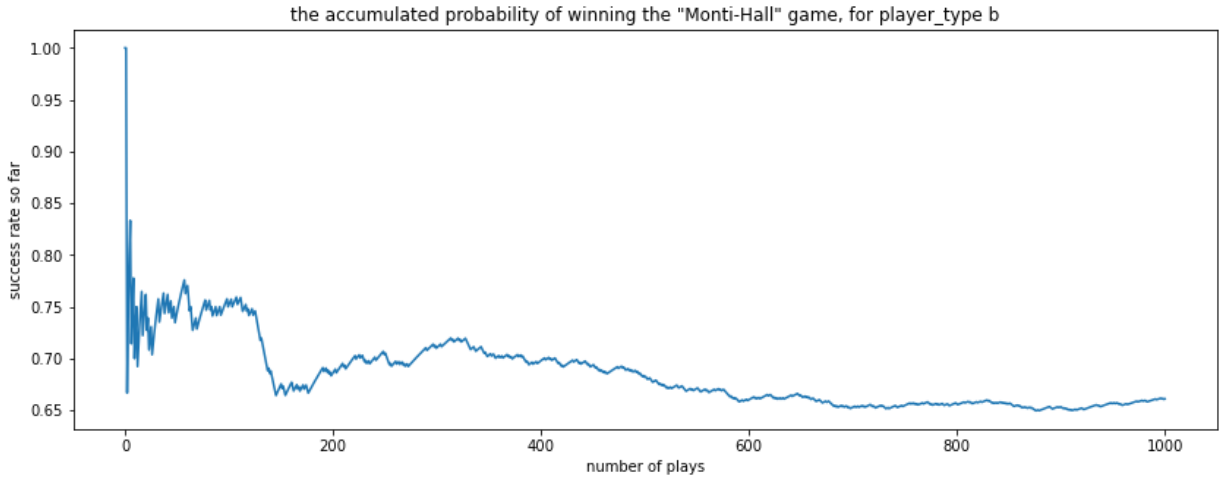
In [8]:
```
def plot_accumulated_array(values, player_type):
    plt.figure(figsize=(14,5))
    plt.plot(np.linspace(0,1000,1000), values)
    plt.xlabel('number of plays')
    plt.ylabel('success rate so far')
    plt.title(f'the accumulated probability of winning the "Monti-Hall" game, for
    return
```

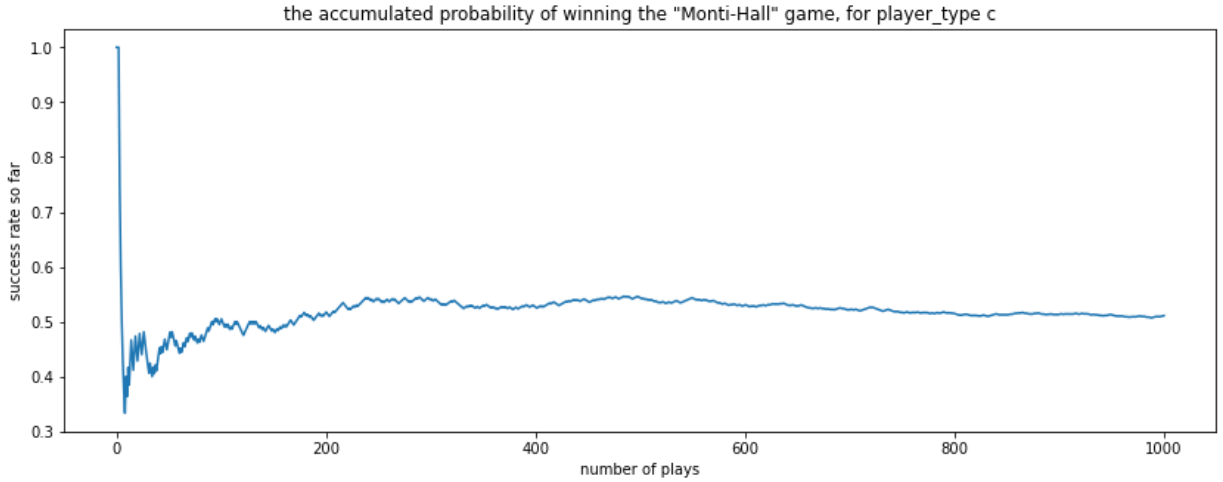
In [9]:
```
def play_1000_times_and_plot(player_type):

    ##playing 1000 times
    results = []
    for i in range(1000):
        results.append(play(player_type))

    ##accumulating the results
    accumulated_results = []
    for i in range(1000):
        accumulated_results.append((sum(results[:i+1]))/(i+1))

    ##plotting
    plot_accumulated_array(accumulated_results, player_type)
    return 1
```

In [10]:
```
def Question2_players_a_b_c():
    play_1000_times_and_plot('a')
    play_1000_times_and_plot('b')
    play_1000_times_and_plot('c')
```

In [11]:
```
Question2_players_a_b_c()
```







explanation about the graphs

The player that had the highest success rate was player b (the one who always switch), It is predicted according to what we studied in class. Player a had an expected rate of 0.3 since it's simple probability (1 out of 3, no manipulations) Player c had combined success rate with a and b, the more times the rand number said 'change' the higher the success rate was.

This, of course, could have been predicted