Poker hand simulation - three of a kind probability

Global parameters

In [1]:
```
sample_size = 100
simulation_size = 200
poker_hand_size = 5
confidence = 0.95
```

Create class for deck cards

In [2]:
```
from enum import Enum

class Suit(Enum):
    __order__ = 'CLUBS DIAMONDS HEARTS SPADES'
    CLUBS = 1
    DIAMONDS = 2
    HEARTS = 3
    SPADES = 4

class Card:
    def __init__(self, value, suit):
        self.value = value
        self.suit = suit
```

Create deck

In [3]:
```
deck = []
for v in range(13):
    for s in Suit:
        deck.append(Card(v, s))
```

Declare simulation function

In [4]:
```
import random

def runSimulation():

    three_of_a_kind = 0

    for n in range(simulation_size):

        #shuffle deck
        random.shuffle(deck)

        #counts
        pairs_count = 0
        three_of_a_kind_count = 0

        #init dic
        count = {}
        for i in range(13):
            count[i] = 0

        #count cards
        for i in range(poker_hand_size):
            card = deck[i].value
            count[card] += 1

        #count pairs
        for i in range(13):
            if count[i] == 2:
                pairs_count += 1

        #count three_of_a_kind
        for i in range(13):
            if count[i] == 3:
                three_of_a_kind_count += 1

        #count three_of_a_kind only if not full house
        if three_of_a_kind_count == 1 and pairs_count == 0:
            three_of_a_kind += 1

    probability = three_of_a_kind / simulation_size

    return probability
```

Run simulations

In [5]:
```
data = []
for i in range(sample_size):
    probability = runSimulation()
    data.append(probability)
```

Print statistics

In [6]:
```
import pandas as pd

df = pd.DataFrame(data)
df.describe()
```

Out[6]:

	0
count	100.000000
mean	0.020450
std	0.009721
min	0.000000
25%	0.015000
50%	0.020000
75%	0.025000
max	0.045000

In [7]:
```
import numpy as np
import scipy.stats

a = 1.0 * np.array(data)
m, se = np.mean(a), scipy.stats.sem(a)
h = se * scipy.stats.t.ppf((1 + confidence) / 2., sample_size - 1)
print("confidence interval is: [" + str(m - h) + ", " + str(m + h)
+ "] at " + str(int(100 * confidence)) + "%")
```

```
confidence interval is: [0.018521197984723212, 0.02237880201527678
7] at 95%
```

Print global parameters

In [8]:
```
print("confidence: " + str(confidence))
print("sample_size: " + str(sample_size))
print("simulation_size: " + str(simulation_size))
print("poker_hand_size: " + str(poker_hand_size))
```

```
confidence: 0.95
sample_size: 100
simulation_size: 200
poker_hand_size: 5
```