Monte Carlo Simulation for Poker Hands Probabilities

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Introduction

Monte Carlo Simulation is a method that performs a random sampling to estimate the solution of a problem.

This method can be used to estimate the probability of an event. In this homework we decided to simulate the following distributions of Poker hands:

- Distribution of Double Pair;
- Distribution of Tris;
- Distribution of a Full House;
- Distribution of Four of a kind.

Method

We started by creating a possible Poker hand, with 5 cards, with ranks ranged from 1,...13 and four suits. We set the parameter $nsim = 10^6$.

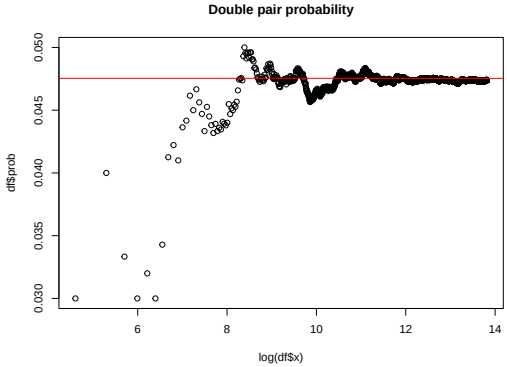
```
montecarlo <- function(f){
  prob <- c()
  count_f <- 0
  prob <- c()
  x <- c()
  j <- 1
  for(i in 1:nsim){

    df <- deck[sample(nrow(deck),5,replace = FALSE),]

    count_f <- count_f + f(df)
    if(i %% 100 == 0){
      prob[j] <- count_f / i
      x[j] <- i
      j <- j +1
    }
  }
  prob_f <- count_f / nsim
  print(prob_f)
  result <- data.frame(prob,x)
  return(result)
}
```

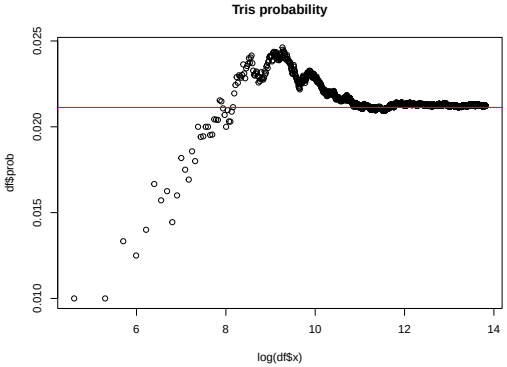
Number of iterations required

Increasing the number of simulations results in a larger sample and therefore greater precision and accuracy (essentially an application of the central limit theorem).

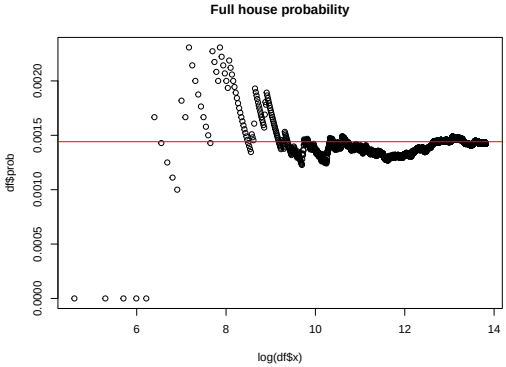
As the number of iterations increases, there is a convergence of the output towards values that would be analytically "exact" (see the red line in the plots).

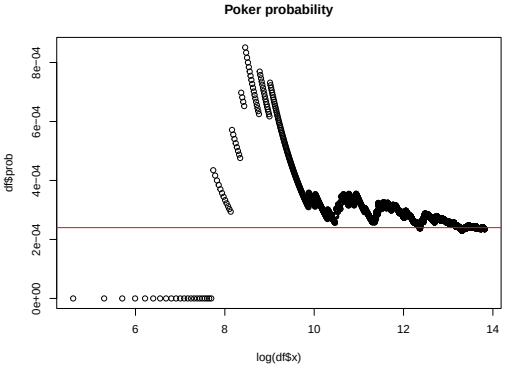
Plots


Double pair probability
df$prob
0.030
0.035
0.040
0.045
0.050
6
8
10
12
14
log(df$x)


Tris probability
df$prob
0.010
0.015
0.020
0.025
6
8
10
12
14
log(df$x)

Plots


Full house probability
df$prob
0.0000
0.0005
0.0010
0.0015
0.0020
6
8
10
12
14
log(df$x)


Poker probability
df$prob
0e+00
2e−04
4e−04
6e−04
8e−04
6
8
10
12
14
log(df$x)

References

Wikipedia contributors (2024).
Poker probability — Wikipedia, the free encyclopedia.
https://en.wikipedia.org/w/index.php?title=Poker_probability&oldid=1214988653.
[Online; accessed 23-March-2024].