

Distribución hipergeométrica

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Distribución hipergeométrica

z

$$X \sim H, (N, M, n)$$

- la función de densidad es

$$f(k) = \frac{\binom{N}{k} \binom{M}{n-k}}{\binom{N+M}{n}}$$

- La función de distribución es

$$F(x) = \begin{cases} 0 & \text{si } x < 0 \\ \sum_{k=0}^x f(k) & \text{si } 0 \leq x < n \\ 1 & \text{si } x \geq n \end{cases}$$

Esperanza $E(X) = \frac{nN}{N+M}$

Varianza $Var(X) = \frac{nNM}{(N+M)^2} \cdot \frac{N+M-n}{N+M-1}$ Supongamos que tenemos 20 animales, 7 son perros y los demás, no lo son.

¿cómo medir la probabilidad de encontrar un número de perros al azar si elegimos $x = 12$ animales ?

en R

```
library(Rlab)
```

```
## Rlab 2.15.1 attached.
```

```
##
```

```
## Attaching package: 'Rlab'
```

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
## dexp, dgamma, dweibull, pexp, pgamma, pweibull, qexp, qgamma,
```

```
## qweibull, rexp, rgamma, rweibull
```

```
## The following object is masked from 'package:datasets':
```

```
##
```

```
## precip
```

```
M=7
```

```
N=13
```

```

K=12
dhyper(x=0:20,m=7,n = 13, k=K)

## [1] 0.0001031992 0.0043343653 0.0476780186 0.1986584107 0.3575851393
## [6] 0.2860681115 0.0953560372 0.0102167183 0.0000000000 0.0000000000
## [11] 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
## [16] 0.0000000000 0.0000000000 0.0000000000 0.0000000000 0.0000000000
## [21] 0.0000000000

phyper(q=0:12,m=M,n=N, k=K)

## [1] 0.0001031992 0.0044375645 0.0521155831 0.2507739938 0.6083591331
## [6] 0.8944272446 0.9897832817 1.0000000000 1.0000000000 1.0000000000
## [11] 1.0000000000 1.0000000000 1.0000000000

qhyper(p=.5, m=M,n=N,k=K)

## [1] 4

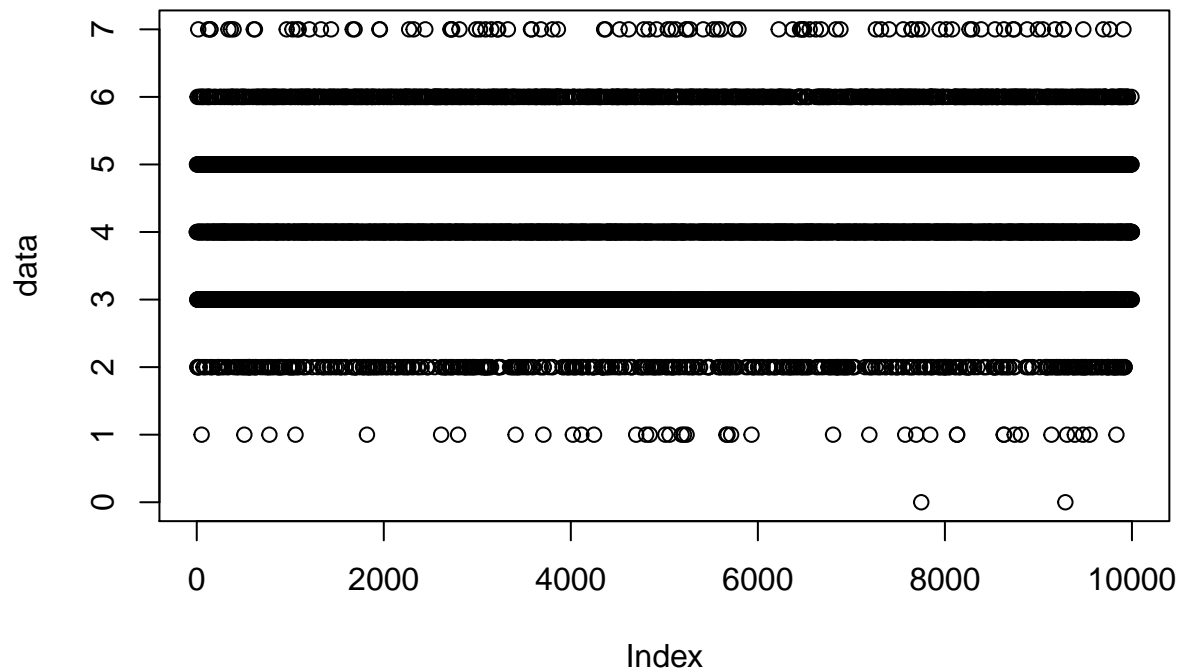
data =rhyper(nn=10000, m=M, n=N, k=K)
plot(data, breaks = 8)

## Warning in plot.window(...): "breaks" is not a graphical parameter
## Warning in plot.xy(xy, type, ...): "breaks" is not a graphical parameter
## Warning in axis(side = side, at = at, labels = labels, ...): "breaks" is not a
## graphical parameter

## Warning in axis(side = side, at = at, labels = labels, ...): "breaks" is not a
## graphical parameter

## Warning in box(...): "breaks" is not a graphical parameter
## Warning in title(...): "breaks" is not a graphical parameter

```



En Python

```
from scipy.stats import hypergeom
import matplotlib.pyplot as plt
import numpy as np

[M, n, N] = [20, 7, 12]
rv = hypergeom(M, n, N)
x = np.arange(0, n+1)
y = rv.pmf(x)

fig = plt.figure()
ax = fig.add_subplot(111)
ax.plot(x, y, "bo" )
ax.vlines(x, 0, y, lw= 2, alpha = 0.8)
ax.set_xlabel("Número de perros entre los doce elegidos")
ax.set_ylabel("Distribución de probabilidad hipergeométrica de (20,7,12)")
plt.show()
```

