PShaji_Assignment5

Priya Shaji

9/27/2019

Question 1

Choose independently two numbers B and C at random from the interval [0, 1] with uniform density. Prove that B and C are proper probability distributions. Note that the point (B,C) is then chosen at random in the unit square.

Find the probability that

    a. B + C < 1/2

    b. BC < 1/2

    c. |B − C| < 1/2

    d. max{B,C} < 1/2

    e. min{B,C} < 1/2

Answer 1)

1. Choose independently two numbers B and C at random from the interval [0, 1] with uniform density

```
## Generating numbers at random from the interval [0, 1]

B <- runif(100000,min=0,max=1)

C<- runif(100000,min=0,max=1)
```

2. Prove that B and C are proper probability distributions.

```
## Minimum value of B

min(B)
```
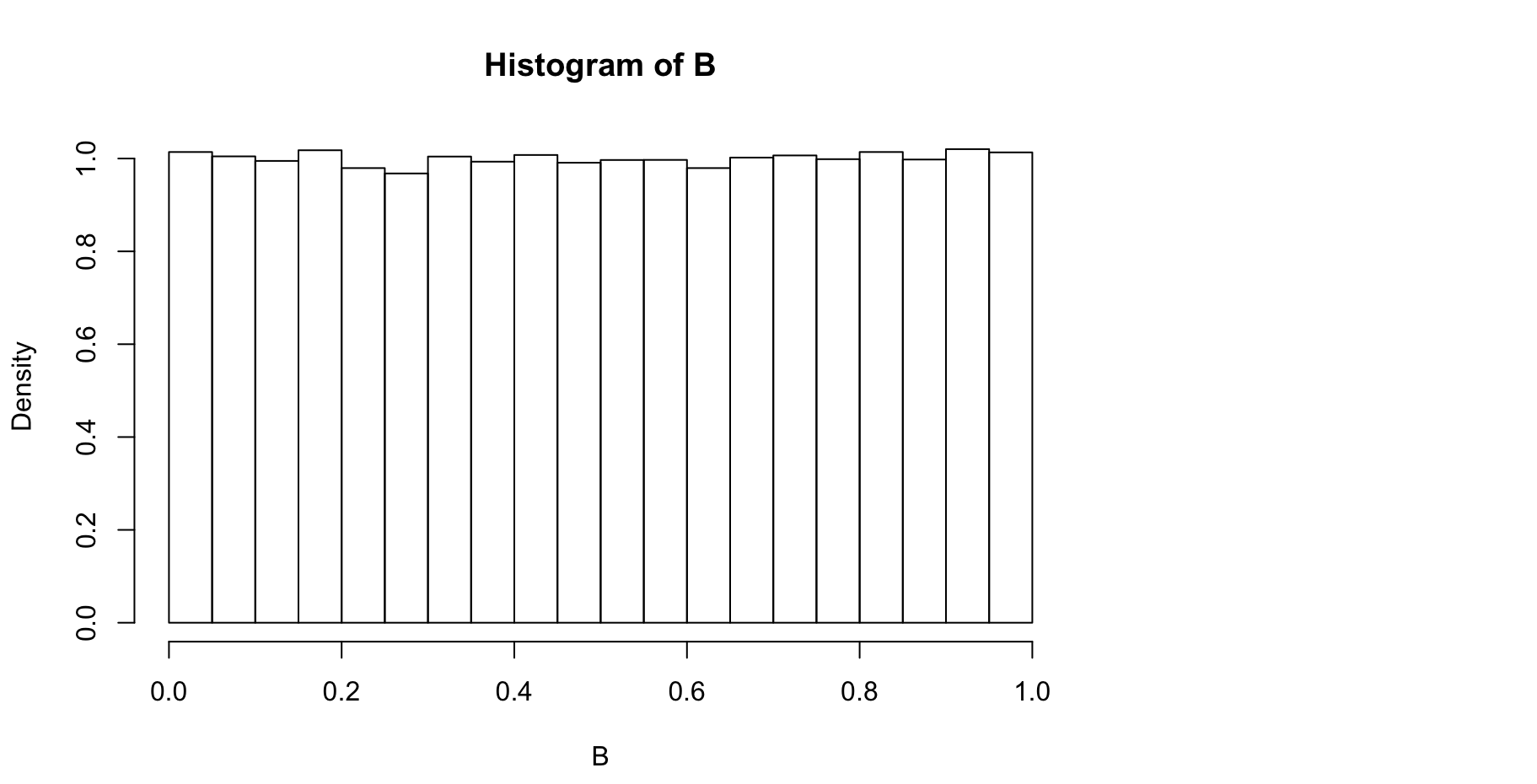
```
## [1] 9.712065e-06
```

```
## Maximum value of B

max(B)
```

```
## [1] 0.9999935
```

```
## Histogram of B

hist(B,probability = TRUE)
```

Histogram of B


```
## Minimum value of C

min(C)
```
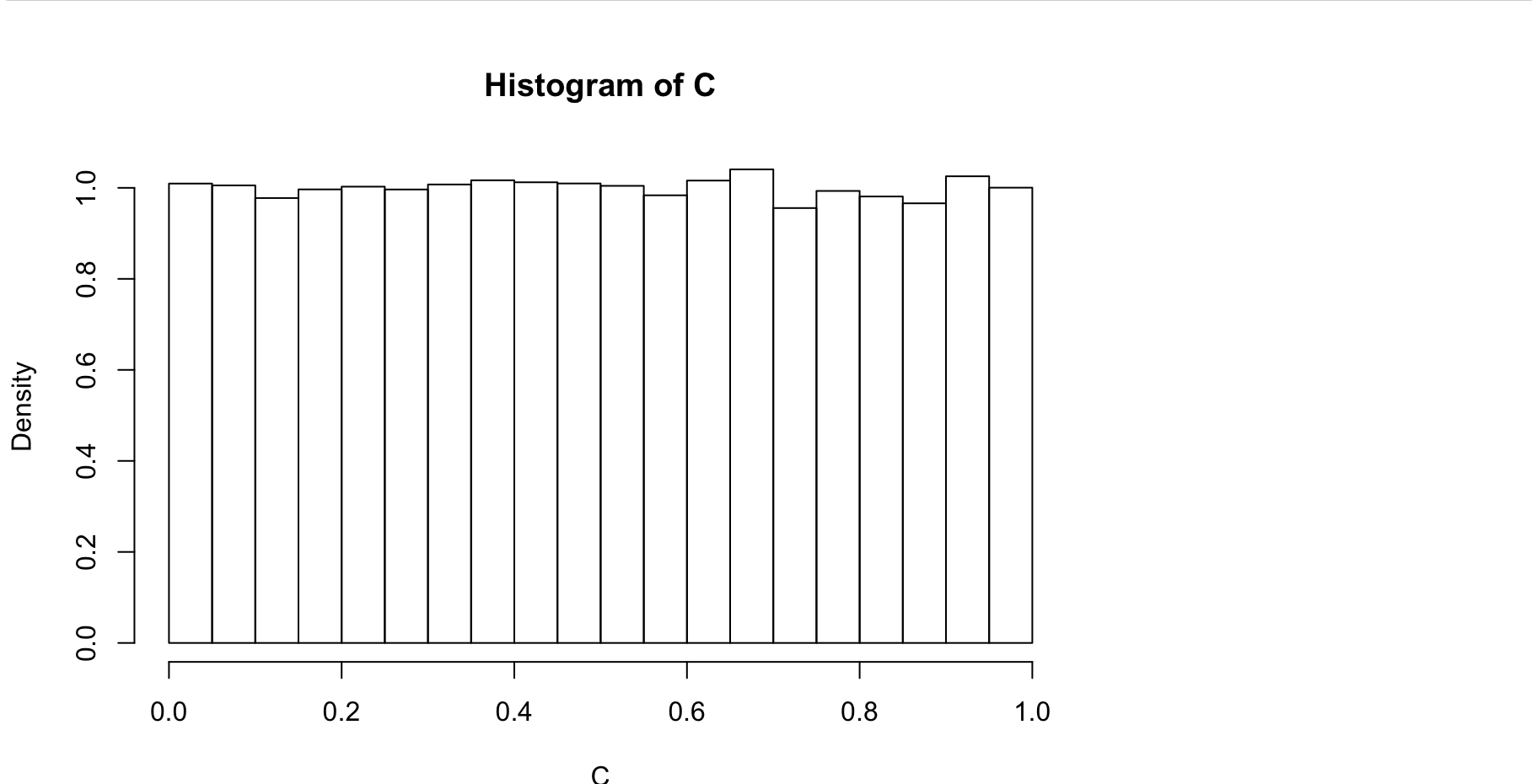
```
## [1] 1.428626e-05
```

```
## Maximum value of C

max(C)
```

```
## [1] 0.9999924
```

```
## Histogram of C

hist(C,probability = TRUE)
```

Histogram of C

By analyzing above graphs and simulaitons, we prove that B and C are proper probability distributions.

Frequency of B and Frequency of C are positive and also area under curve is 1.

    a. B + C < 1/2

Answer a)

```
BC_a<- sum((B+C)< 0.5)/100000
BC_a
```

```
## [1] 0.12444
```

    b. BC < 1/2

Answer b)

```
BC_b<- sum((B*C)<0.5)/100000
BC_b
```

```
## [1] 0.84626
```

    c. |B − C| < 1/2

Answer c)

```
BC_c<- sum(abs(B-C)< 0.5)/100000
BC_c
```

```
## [1] 0.7495
```

    d. max{B,C} < 1/2

Answer d)

```
BC_d<- sum(pmax(B,C)< 0.5)/100000
BC_d
```

```
## [1] 0.24968
```

    e. min{B,C} < 1/2

Answer e)

```
BC_e<- sum(pmin(B,C)< 0.5)/100000
BC_e
```

```
## [1] 0.75073
```