Classwork

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2022-11-01

Draw a random sample from a BVN(0, 0, 1, 1, 0.5) of size n, compute b_{yx} and b_{xy}. Repeat the whole process for m Number of times. Plot the histogram and comment.

```
rm(list=ls())
library(MASS)
library(ggplot2)
library(patchwork)
```

```
##
## Attaching package: 'patchwork'

## The following object is masked from 'package:MASS':
##
##     area
```

```
n = 100
m = 1000

Mu = c(0,0)
Sigma = matrix(c(1,0.5,0.5,1), nrow=2)

byx = 0
bxy = 0

for(i in 1:m){
  samp = mvrnorm(n, Mu, Sigma)
  r = cor(samp[,1], samp[,2])
  sx = sd(samp[,1])
  sy = sd(samp[,2])

  byx[i] = r*sy/sx
  bxy[i] = r*sx/sy
}

gg1 = ggplot(NULL, aes(x=byx, y=..density..))+
      geom_histogram(fill="#9BA17B", color="#9BA17B")+
      geom_line(aes(x=byx, y=dnorm(byx, mean(byx), sd(byx))), color='red')+
      labs(title="Distribution of the byx",
           x="byx", y="Frequency Density")
```

```
gg2 = ggplot(NULL, aes(x=bxy, y=..density..))+
  geom_histogram(fill="#FAD6A5", color="#FAD6A5")+
  geom_line(aes(x=bxy, y=dnorm(bxy, mean(bxy), sd(bxy))), color='red')+
  labs(title="Distribution of the bxy",
       x="bxy", y="Frequency Density")

gg1 + gg2
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

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```