ST425 - Computer session 2

09/23/2020

Q2.1 & Q2.5

See the solutions to weekly exercise 2.

Additional exercise

Measuring skewness (a)-(b)

Skewness:

$$g_1 = \frac{m^3}{s^3} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^3/n}{s^3}$$

where m^3 is the third moment and s is the standard deviation.

```
skewness=function(x){
    m3=sum((x-mean(x))^3)/length(x)
    s3=sqrt(var(x))^3
    m3/s3
    }
```

Given a vector `x`, `length(x)` returns the length of the vector, (which is `n`) and `sqrt(var(x))` gives the standard deviation.

(c)-(g)

Let $X_i \sim N(0,1)$ for $i = 1, 2, ..., 6$. Generate $n = 50$ values from each X_i and then generate n values from $Y = \sum_{i=1}^{6} X_i^2$. First, we can write a function that generates Y given n and degree of freedom for chi square distribution.

```
chisq <- function(n, df){
    X <- matrix(nrow = n, ncol = df)
    for (i in 1:6){
      X[,i] <- rnorm(n=n, 0, 1)
      }
    return(rowSums(X^2))
    }
```

Set $n = 50$ and $df = 6$, and we can generate n random numbers,

```
n =50
Y <- chisq(n=n, df=6)
```

To generate n random numbers from $Y' \sim \chi^2(6)$ we can use `rchisq()` function.

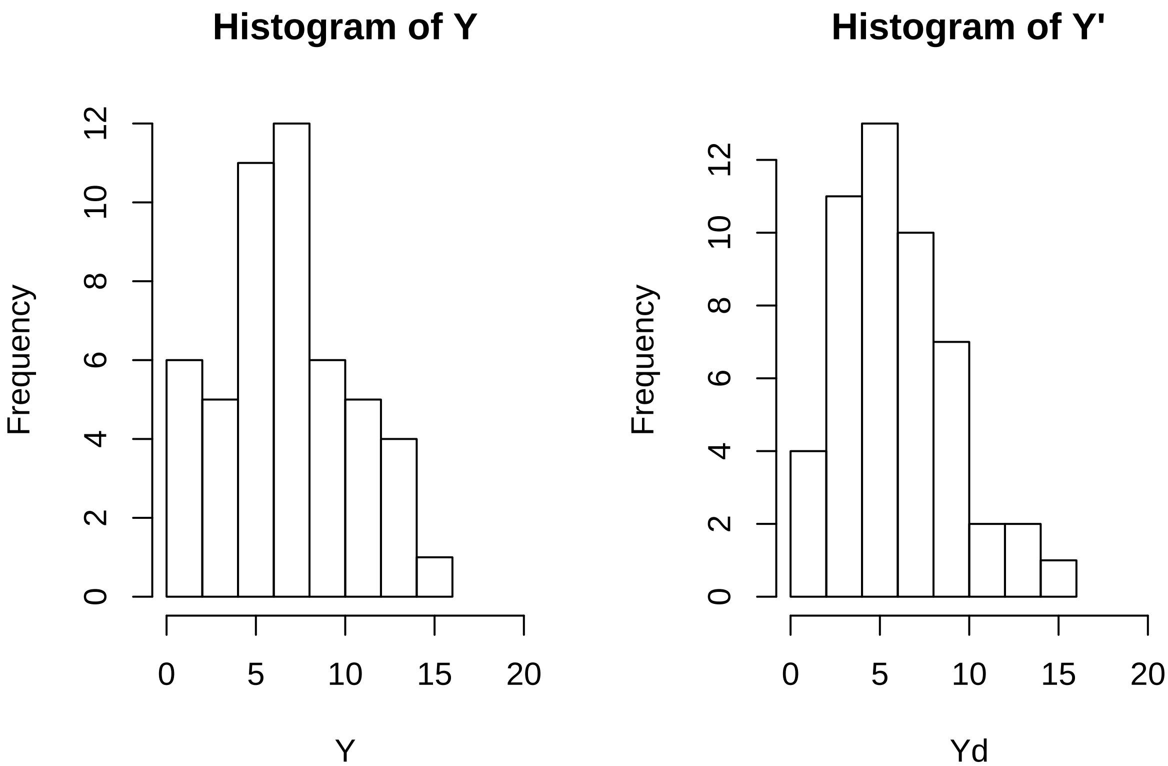
```
Yd <- rchisq(n=n, df=6)
```

We can compare the result by looking at mean, variance, skewness, and histogram.

```
result <- rbind(c(mean(Y), var(Y), skewness(Y)),
                c(mean(Yd), var(Yd), skewness(Yd)))
dimnames(result) <- list(c("Y","Y'"),
```

```r
                          c("Mean","Variance","Skewness"))
result
```

```
##        Mean Variance  Skewness
## Y  6.671695 12.95029 0.2357092
## Y' 5.968851 11.16642 0.8128748
```



Repeat with different values for n and d.f.!