STAT:5400 Midterm 1, 2017

Solutions

September 25, 2017

1 LaTeX

For p a non-zero real number and $x_1, \ldots, x_n$ positive real numbers, the *generalized mean* (also called the *power mean*) of the x_i, $i = 1 \ldots n$ is (Bullen, 2003)[3]:

$$M_p(x_1, \ldots, x_n) = \left(\frac{1}{n} \sum_{i=1}^{n} x_i^p \right)^{\frac{1}{p}} \tag{1}$$

The generalized mean with $p = 0$ is defined as the geometric mean:

$$M_0(x_1, \ldots, x_n) = \left(\prod_{i=1}^{n} x_i \right)^{\frac{1}{n}} \tag{2}$$

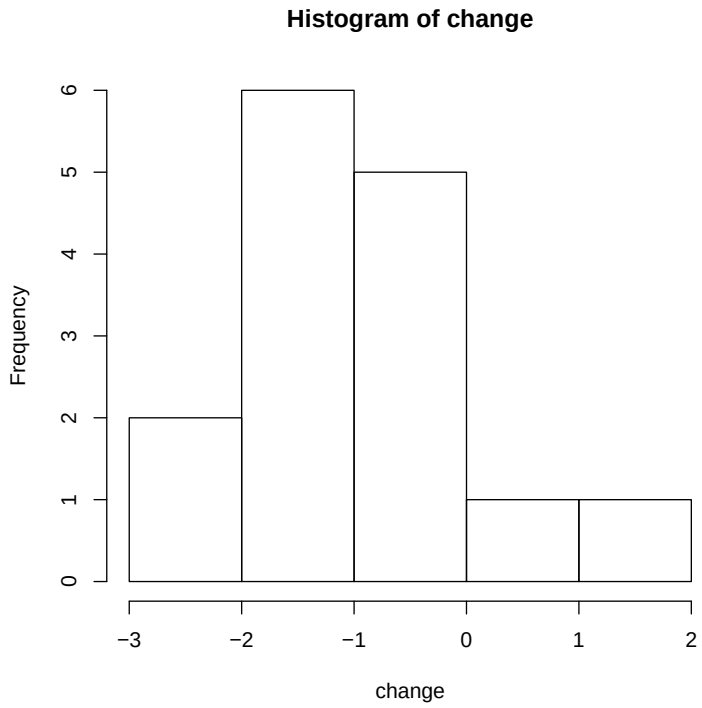
2 R

1.
```
> genlmeans <- function( p, x)
+ {
+         if( !(is.numeric(p)) || length(p) > 1 || !(is.numeric(x))
+                  || any(x <= 0) )
+         {
+                 print("Invalid input.")
+         } else
+         {
+                 n <- length(x)
+                 if(p)
+                 {
+
+                         gmean <- ( sum(x^p) /n) ^ (1/p)
```

```
+                 } else
+                 {
+                         gmean <- prod(x) ^ (1/n)
+                 }
+                 gmean
+         }
+ }
>
```

2. (a)
```
> genlmeans( p = -5,  x = c( 31, 15,84))
[1] 18.58773
```
(b)
```
> genlmeans(p = 0,  x = c( 31, 15,84))
[1] 33.9295
```
(c)
```
> genlmeans(p = 5,  x = c( -31, 15,84))
[1] "Invalid input."
```
(d)
```
> genlmeans(p = 5, x = c("Charlie", "Yuan", "Sue"))
[1] "Invalid input."
```

3.
```
> albutrl <-
+ read.table("http://homepage.divms.uiowa.edu/~kcowles/Datasets/albuterl.txt",
+ header = TRUE)
> attach(albutrl)
> change = after - before
> hist(change)
```



References

Bullen, P. (2003). *Handbook of Means and Their Inequalities*. Kluwer, Dordrecht, Netherlands.