HW6

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February 17, 2016

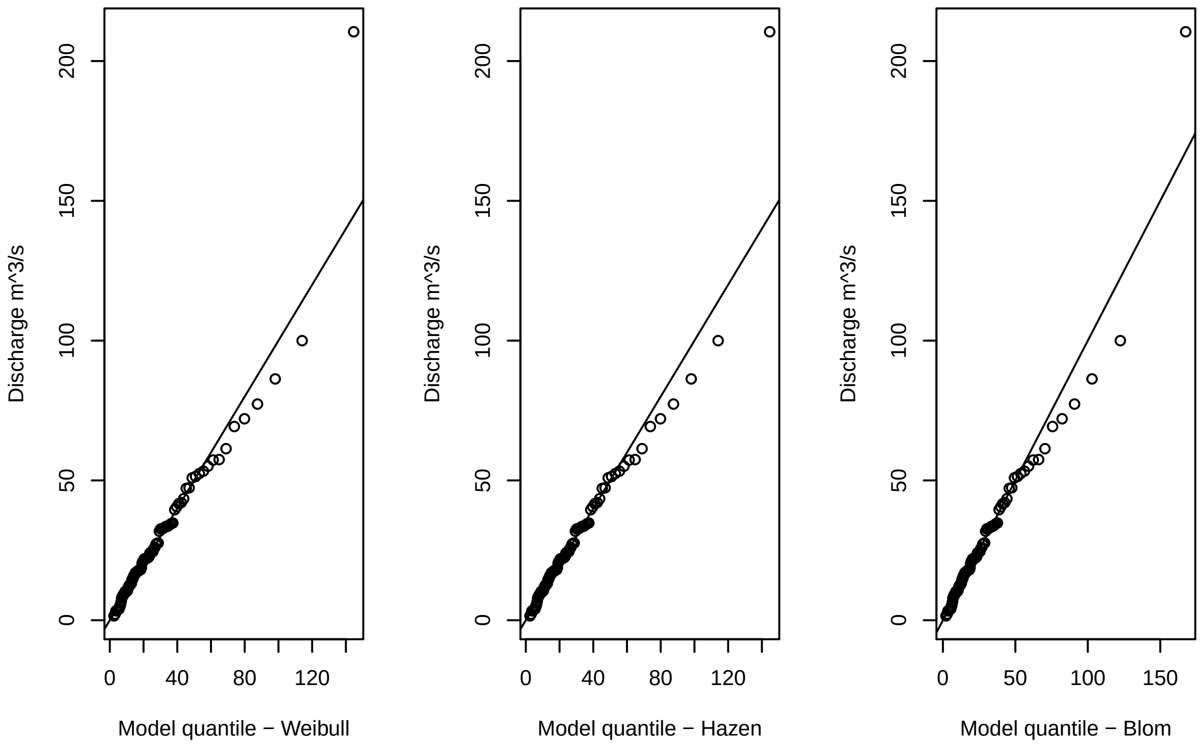
Q 7.16

Define functions to calculate Weibull, Hazen and Blom positions and the variance of the ith largest observation:

```
ppwei=function(i,n)  { i/(n+1) }
pphaz=function(i,n)  { (i-(0.5))/(n) }
ppblom=function(i,n) { (i-(3/8))/(n+(1/4)) }
varpi=function(i,n)  { (i*(n-i-1))/(((n+1)^2)*(n+2)) }
```

Generate a random lognormal with n=100 observations logmean=3 logsd=2; sort it from largest->smallest:

```
lll=rlnorm(n=100,meanlog=3,sdlog=1)
lll=sort(lll,decreasing=TRUE)
nn=length(lll)
wei=ppwei(seq(1,length(lll)),length(lll))
haz=pphaz(seq(1,length(lll)),length(lll))
blom=ppblom(seq(1,length(lll)),length(lll))
sddd=(varpi(seq(1,length(lll)),length(lll)))
pwei=ppwei(1:nn,nn)
phaz=pphaz(1:nn,nn)
pblom=ppblom(1:nn,nn)
qiwei=sort(qlnorm(pwei,meanlog=mean(log(lll)),sdlog=sd(log(lll))),decreasing=TRUE)
qihaz=sort(qlnorm(pwei,meanlog=mean(log(lll)),sdlog=sd(log(lll))),decreasing=TRUE)
qiblom=sort(qlnorm(pblom,meanlog=mean(log(lll)),sdlog=sd(log(lll))),decreasing=TRUE)
```




```
mqwei=max(qiwei)
mqhaz=max(qihaz)
mqblo=max(qiblom)
data.frame(Weibull=mqwei,Hazen=mqhaz,Blom=mqblo,Actual=max(lll))
```

```
##    Weibull    Hazen     Blom   Actual
## 1 144.6314 144.6314 167.5423 210.4745
```

Comparison of the expected value for the largest observation using the three plotting positions and the actual largest extreme value. In general, these plotting positions fail to predict the magnitude of the 100 year flood (largest of 100 values in dataset). The relative magnitude of the offset of the different plotting positions #In general, plotting positions do not differ greatly from one another. However, they are crude estimates of the exceedence probabilities of extreme values (e.g. smallest or largest obs).

```
data.frame(Min=0.29/100,Max=1.38/(100+2),Weibull=1-max(pwei),Hazen=1-max(phaz),Blom=1-max(pblom),StDev=s
```

```
##      Min        Max    Weibull Hazen        Blom        StDev
## 1 0.0029 0.01352941 0.00990099 0.005 0.006234414 9.418531e-05
```

The actual exceedance probability for the largest observation lies between the minimum and maximum values in the table above. The corresponding probabilities estimated by the different plotting positions and the standard deviation are shown to illustrate the range of different values that may be obtained. Note that the differences in plotting positions, though within the theoretical range, exceed the standard deviation for that point by two orders of magnitude.

Q 7.17

```r
sebou=read.csv("../HW1/sebou.csv")
sebou$maxQ=sort(sebou$maxQ)
n=length(sebou$maxQ)
i=1:n
iii=2:(n-1)
```

```r
ks.test(x=sebou$maxQ,"pnorm")
```

```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  sebou$maxQ
## D = 1, p-value < 2.2e-16
## alternative hypothesis: two-sided
```

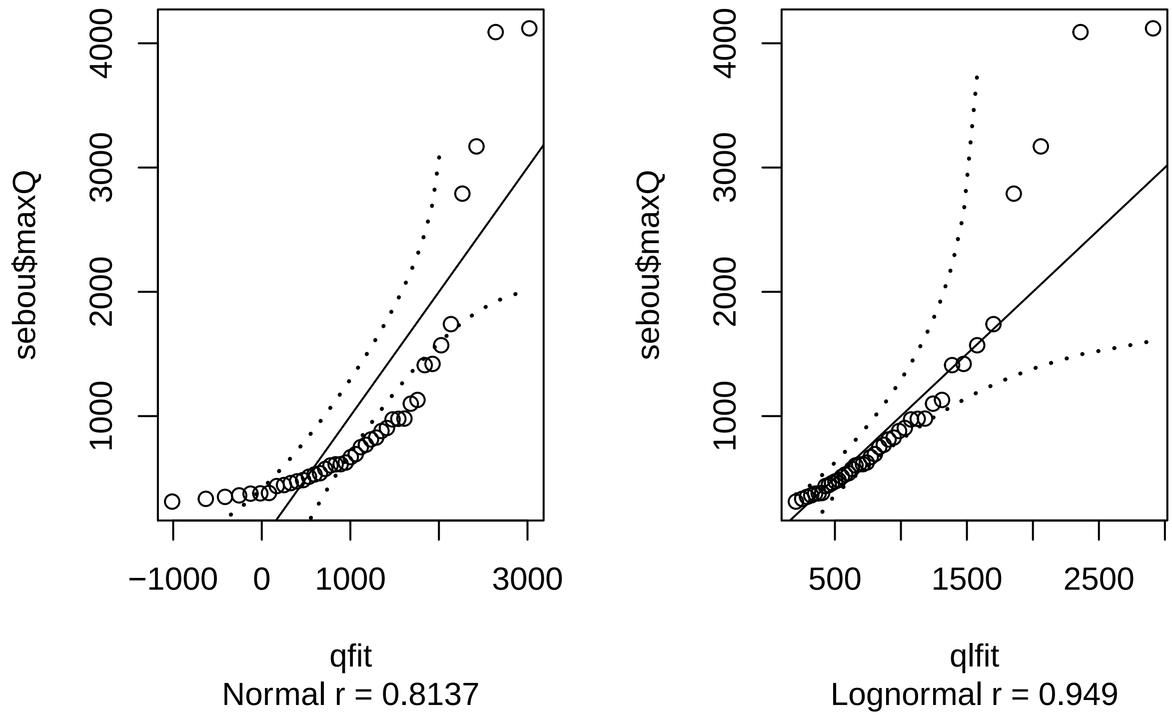
```r
calpha=0.895/(sqrt(n)-0.01+(0.85/sqrt(n))) #for alpha = 0.05
up=((i-1)/n)+calpha
down=(i/n)-calpha
up[which(up>1)]=1
down[which(down<0)]=0
ks.hi=qnorm(up,mean=mean(sebou$maxQ),sd=sd(sebou$maxQ))
ks.lo=qnorm(down,mean=mean(sebou$maxQ),sd=sd(sebou$maxQ))

ks.hi.l=qlnorm(up,meanlog=mean(log(sebou$maxQ)),sdlog=sd(log(sebou$maxQ)))
ks.lo.l=qlnorm(down,meanlog=mean(log(sebou$maxQ)),sdlog=sd(log(sebou$maxQ)))
```

```r
#7.17c - Normal
qfit=qnorm(ppblom(1:n,n),mean=mean(sebou$maxQ),sd=sd(sebou$maxQ))

#7.17d - Lognormal
qlfit=qlnorm(ppwei(1:n,n),meanlog=mean(log(sebou$maxQ)),sdlog=sd(log(sebou$maxQ)))

#7.17g
par(mfrow=c(1,2))
pi1=1-((0.5)^(1/n))
pi2n1=(iii-0.3175)/(n+0.365) #Filliben 1975 plotting position
piin=(0.5)^(1/n)
pii=c(pi1,pi2n1,piin)
cor1=cor(sebou$maxQ,qfit)
cor2=cor(sebou$maxQ,qlfit)
plot(qfit,sebou$maxQ,sub=paste("Normal r =",signif(cor1,digits=4)))
lines(qfit,ks.hi,lty=3,lwd=2)
lines(qfit,ks.lo,lty=3,lwd=2)
abline(0,1)
plot(qlfit,sebou$maxQ,sub=paste("Lognormal r =",signif(cor2,digits=4)))
lines(qlfit,ks.hi.l,lty=3,lwd=2)
lines(qlfit,ks.lo.l,lty=3,lwd=2)
abline(0,1)
```



After consulting the full table of percent points from Filliben (1975) for n=41, the value of r at the 5% level is 0.972. Niether of the correlation coefficients exceed this value. T The normal is generally not a good fit at all, especially due to the issues with symmetry and necessarily positive values for discharge. Lack of normality is confirmed using the Komolgorov-Smirnov test and visually by plotting the 95% confidence interval. he lognormal is likely adequate for the mid-range of flows, but becomes inaccurate at very low and very high flows. Further, the KS upper bounds are undefined for the high flows and the KS lower bounds undefined for the low flows which illustrates the uncertainty these models have in that range.