

# Stat 135 Q55

Jiying Zou

March 14, 2017

Happy Pi  $\pi$  Day!

## 55

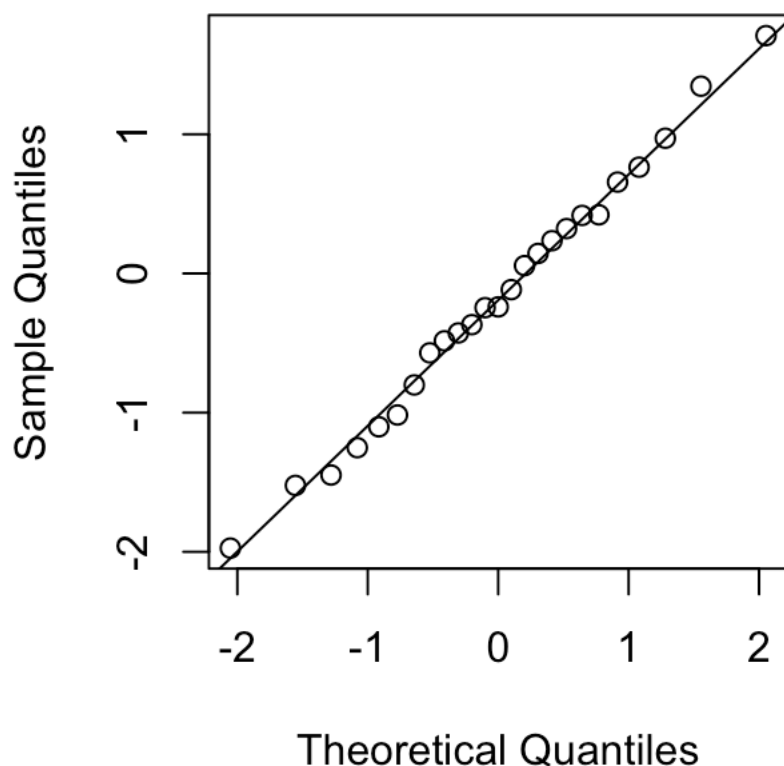
We generate QQ plots (which are analogous to probability plots, just with the y-axis on a different scale) for samples from several different distributions with a theoretical underlying normal distribution.

### a) Standard Normal Dist'n

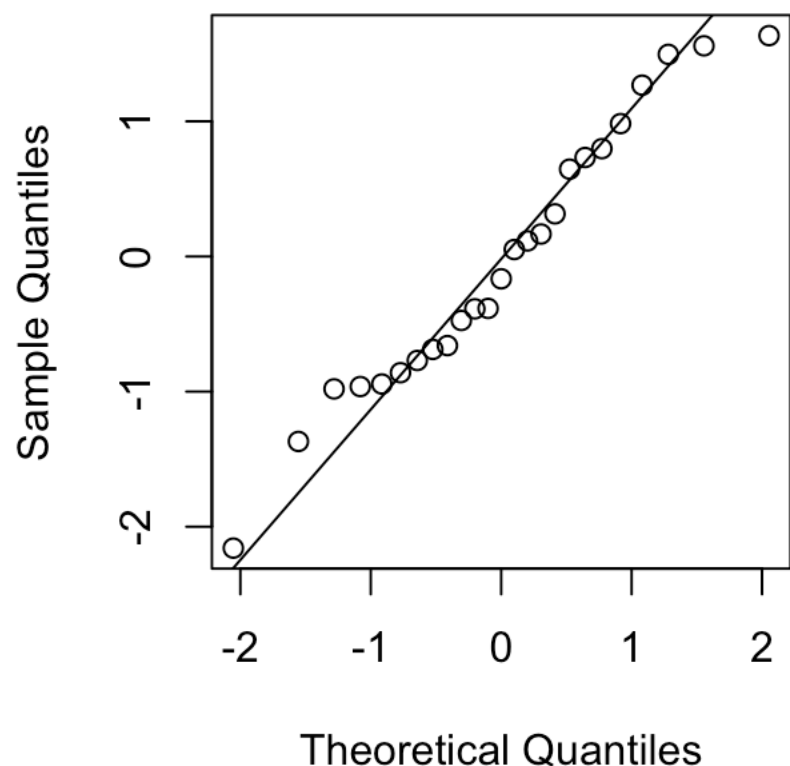
“Generate samples of size 25, 50, and 100 from a normal distribution. Construct probability plots.”

```
#Standard Normal Dist'n  
#sample size 25  
normsamp_25_1 <- rnorm(25)  
normsamp_25_2 <- rnorm(25)  
layout(matrix(c(1,2),1,2,byrow=TRUE))  
qqnorm(normsamp_25_1, main = "QQ Plot (n=25)")  
qqline(normsamp_25_1)  
qqnorm(normsamp_25_2, main = "QQ Plot (n=25)")  
qqline(normsamp_25_2)
```

QQ Plot (n=25)

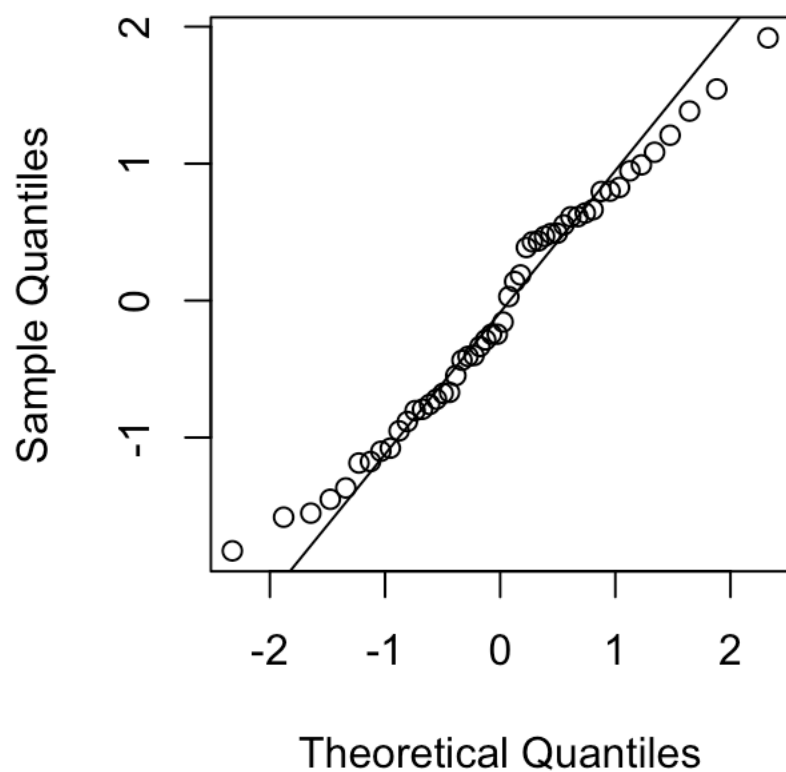


QQ Plot (n=25)

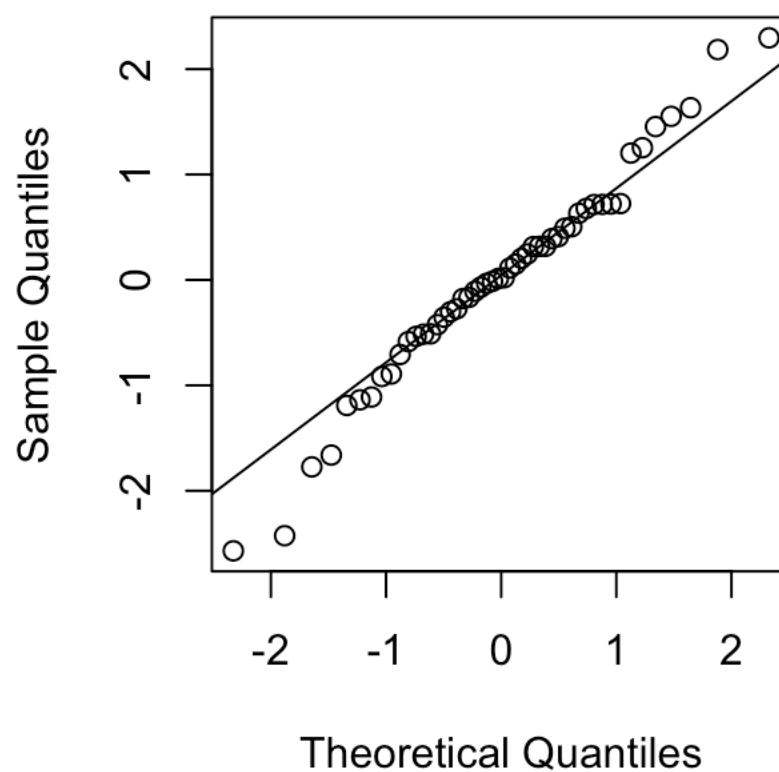


```
#sample size 50
normsamp_50_1 <- rnorm(50)
normsamp_50_2 <- rnorm(50)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(normsamp_50_1, main = "QQ Plot (n=50)")
qqline(normsamp_50_1)
qqnorm(normsamp_50_2, main = "QQ Plot (n=50)")
qqline(normsamp_50_2)
```

**QQ Plot (n=50)**

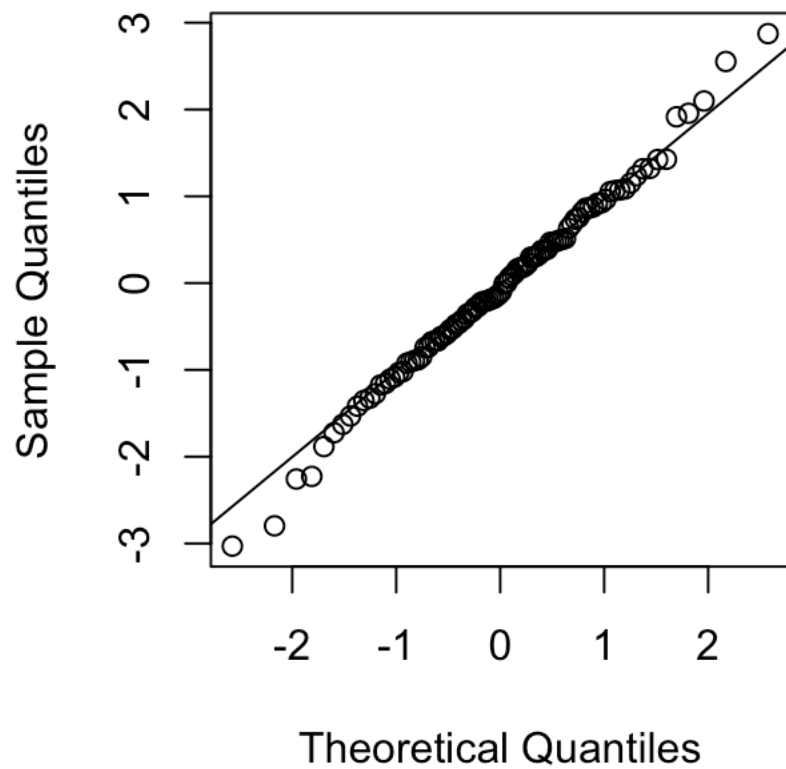


**QQ Plot (n=50)**

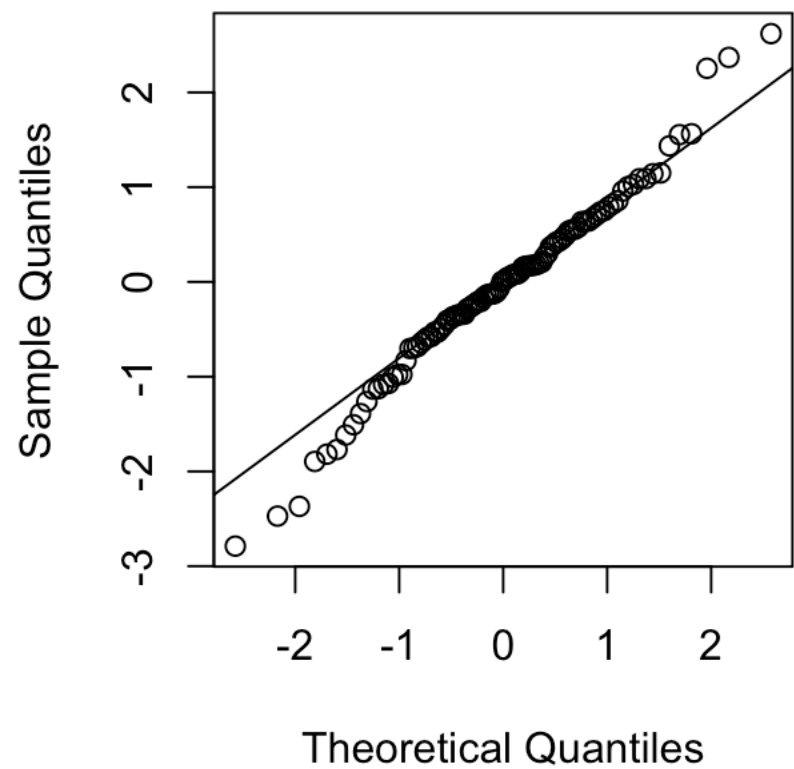


```
#sample size 100
normsamp_100_1 <- rnorm(100)
normsamp_100_2 <- rnorm(100)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(normsamp_100_1, main = "QQ Plot (n=100)")
qqline(normsamp_100_1)
qqnorm(normsamp_100_2, main = "QQ Plot (n=100)")
qqline(normsamp_100_2)
```

**QQ Plot (n=100)**



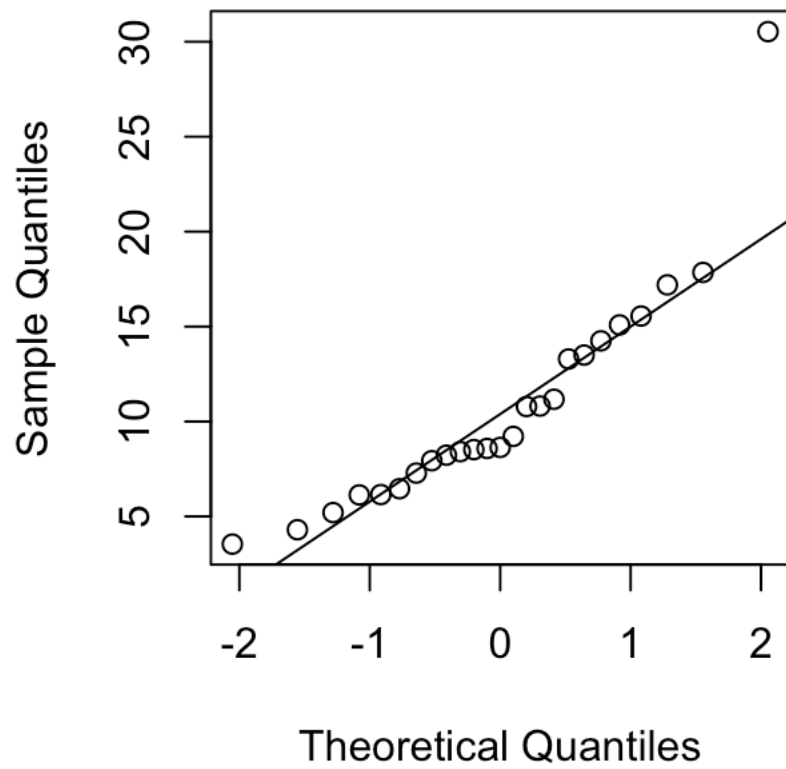
**QQ Plot (n=100)**



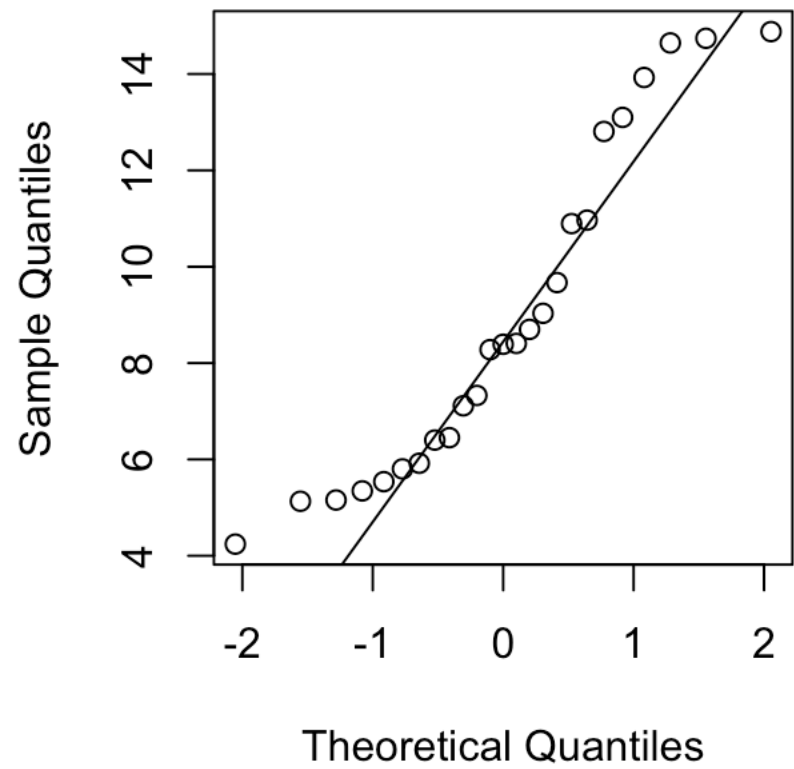
## b) Chi Square (DoF = 10) Dist'n

```
#Chi Squared Dist'n w/ 10 dof
#sample size 25
chisamp_25_1 <- rchisq(25,10)
chisamp_25_2 <- rchisq(25,10)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(chisamp_25_1, main = "QQ Plot (n=25)")
qqline(chisamp_25_1)
qqnorm(chisamp_25_2, main = "QQ Plot (n=25)")
qqline(chisamp_25_2)
```

**QQ Plot (n=25)**

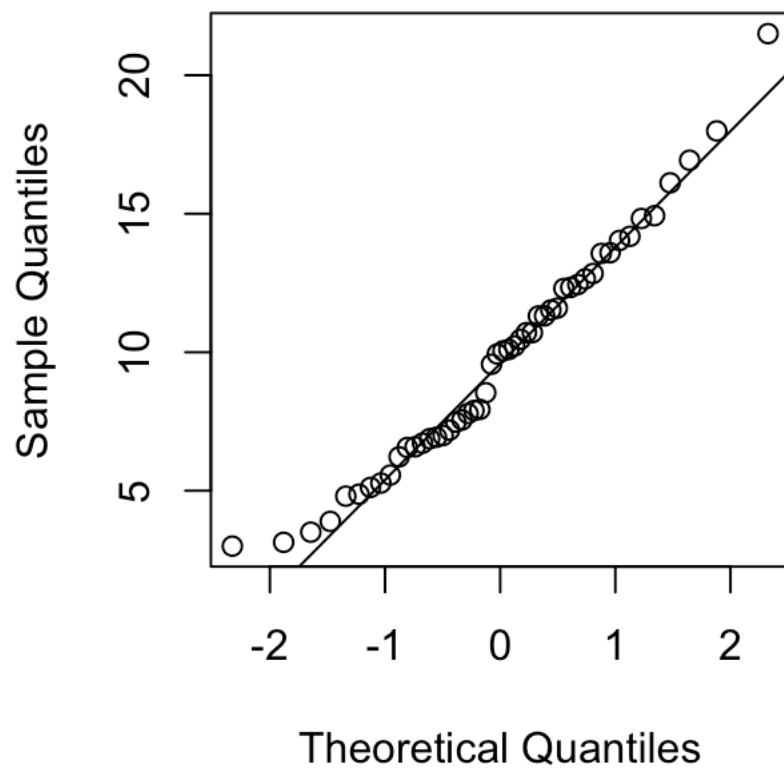


**QQ Plot (n=25)**

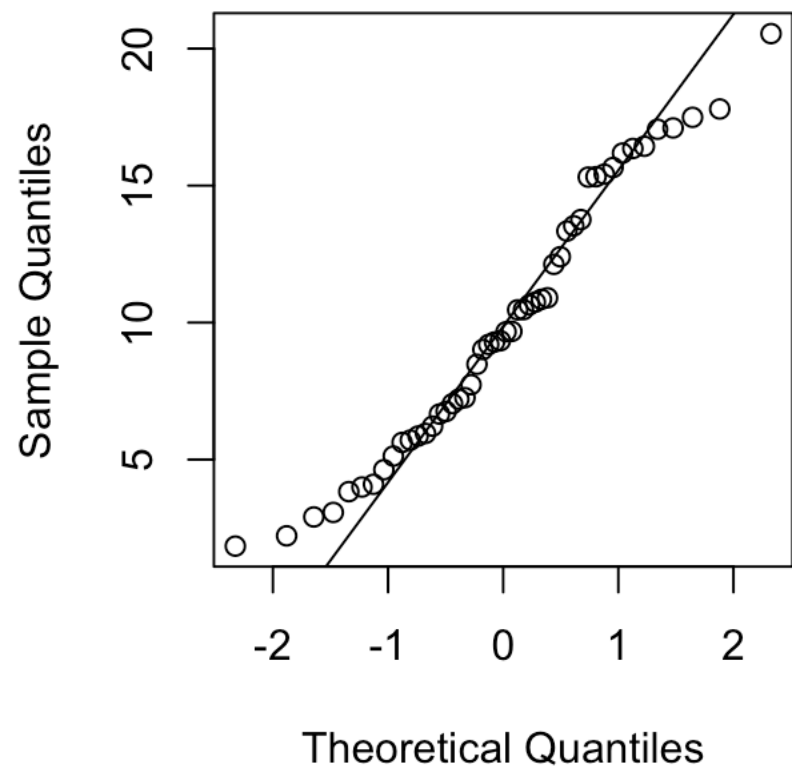


```
#sample size 50  
chisamp_50_1 <- rchisq(50,10)  
chisamp_50_2 <- rchisq(50,10)  
layout(matrix(c(1,2),1,2,byrow=TRUE))  
qqnorm(chisamp_50_1, main = "QQ Plot (n=50)")  
qqline(chisamp_50_1)  
qqnorm(chisamp_50_2, main = "QQ Plot (n=50)")  
qqline(chisamp_50_2)
```

**QQ Plot (n=50)**

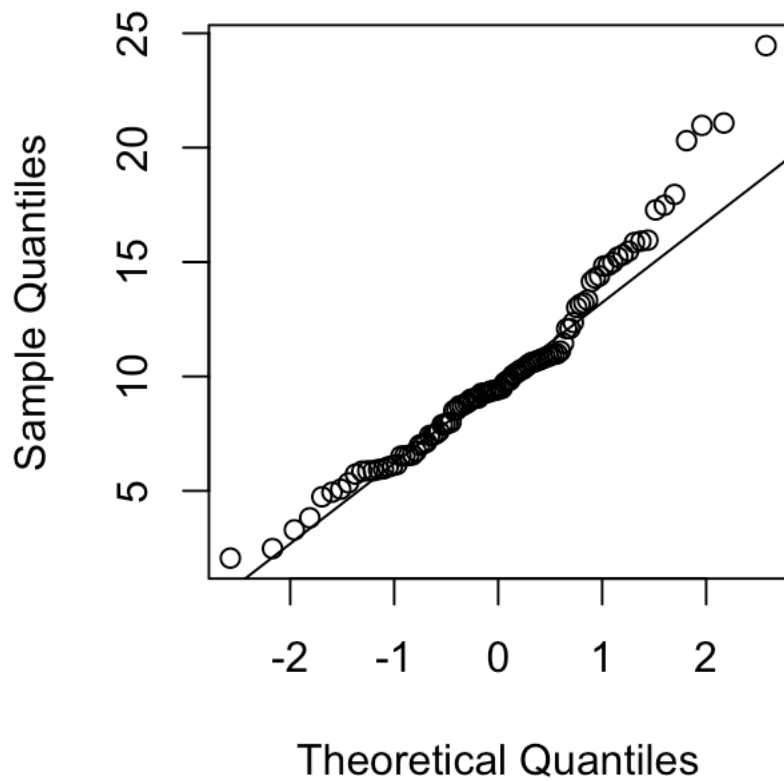


**QQ Plot (n=50)**

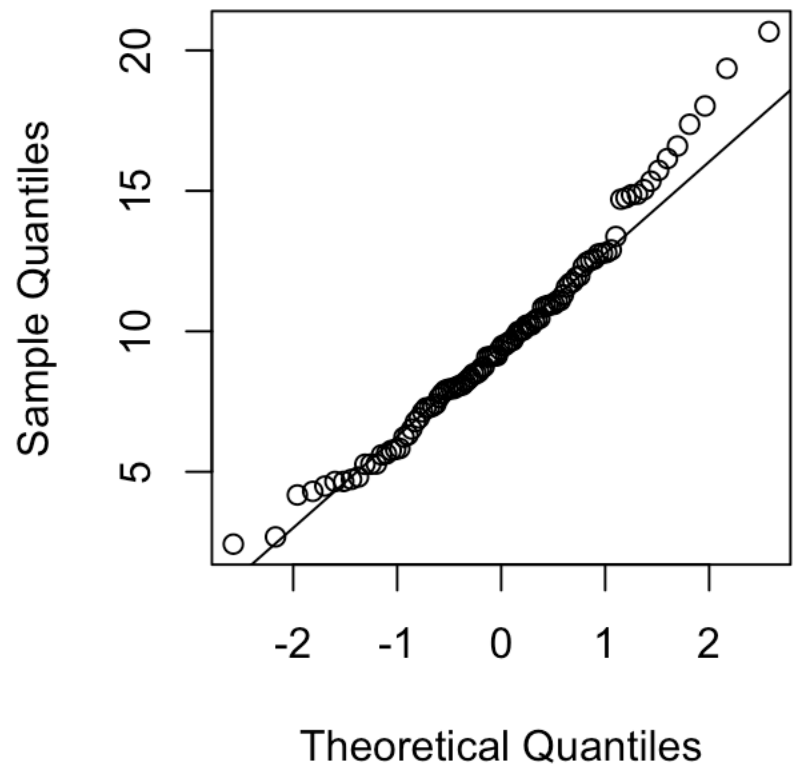


```
#sample size 100
chisamp_100_1 <- rchisq(100,10)
chisamp_100_2 <- rchisq(100,10)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(chisamp_100_1, main = "QQ Plot (n=100)")
qqline(chisamp_100_1)
qqnorm(chisamp_100_2, main = "QQ Plot (n=100)")
qqline(chisamp_100_2)
```

**QQ Plot (n=100)**



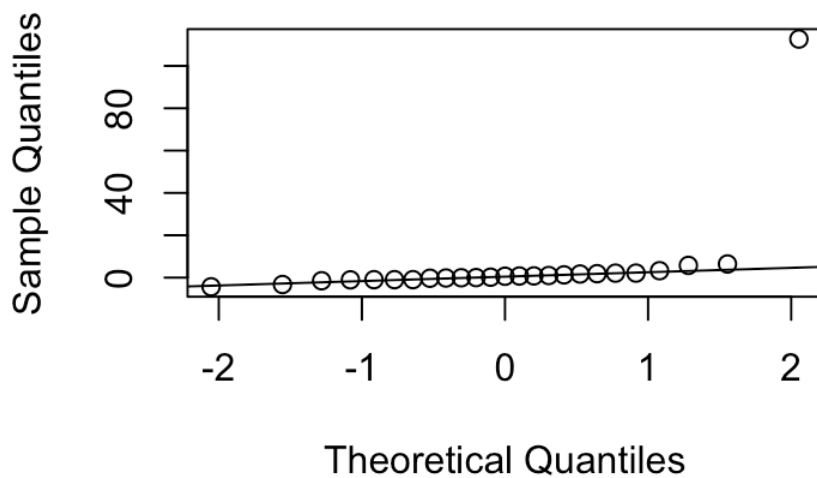
**QQ Plot (n=100)**



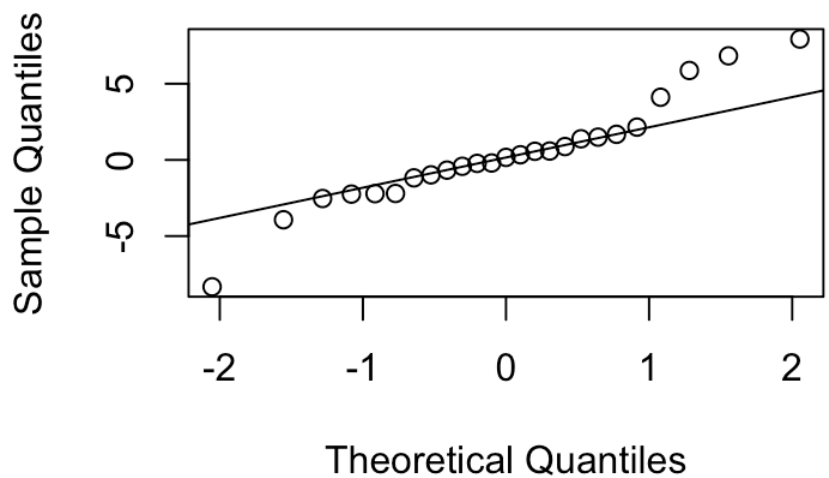
## c) Normal/Uniform Dist'n

```
#N(0,1) / U[0,1]
#sample size 25
weirdsamp_25_1 <- rnorm(25)/runif(25)
weirdsamp_25_2 <- rnorm(25)/runif(25)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(weirdsamp_25_1, main = "QQ Plot (n=25)")
qqline(weirdsamp_25_1)
qqnorm(weirdsamp_25_2, main = "QQ Plot (n=25)")
qqline(weirdsamp_25_2)
```

**QQ Plot (n=25)**

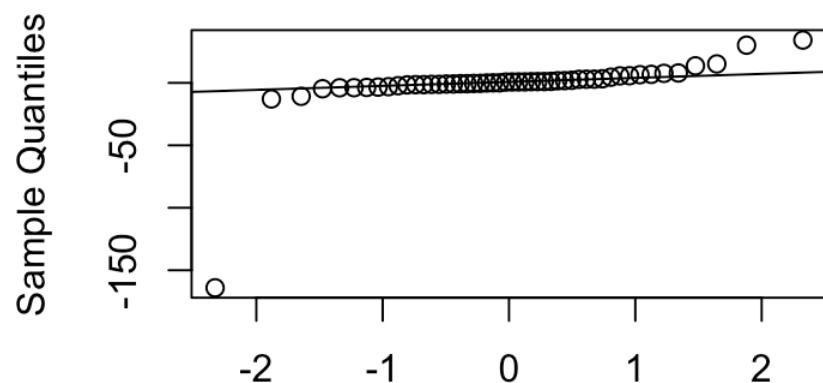


**QQ Plot (n=25)**

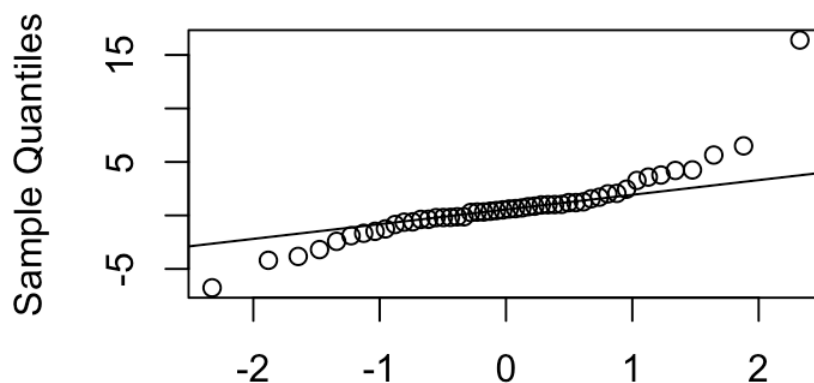


```
#sample size 50
weirdsamp_50_1 <- rnorm(50)/runif(50)
weirdsamp_50_2 <- rnorm(50)/runif(50)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(weirdsamp_50_1, main = "QQ Plot (n=50)")
qqline(weirdsamp_50_1)
qqnorm(weirdsamp_50_2, main = "QQ Plot (n=50)")
qqline(weirdsamp_50_2)
```

**QQ Plot (n=50)**

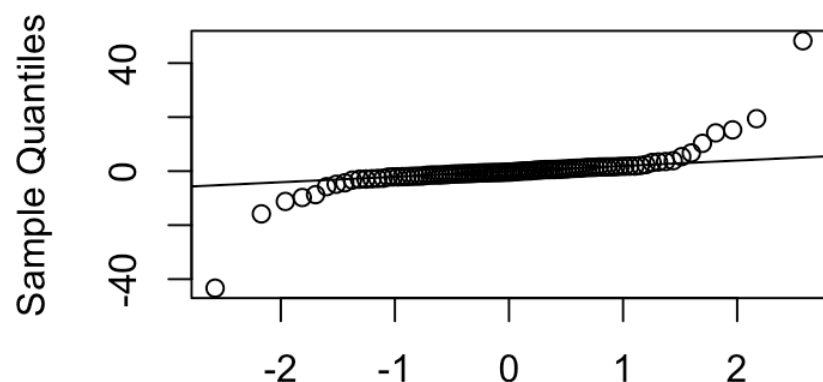


**QQ Plot (n=50)**

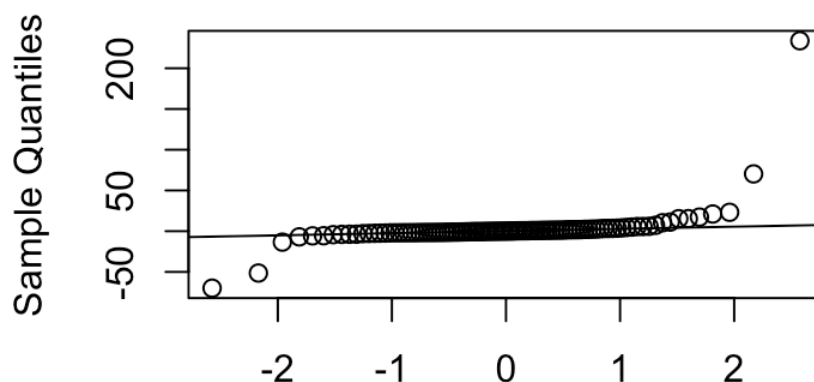


```
#sample size 100
weirdsamp_100_1 <- rnorm(100)/runif(100)
weirdsamp_100_2 <- rnorm(100)/runif(100)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(weirdsamp_100_1, main = "QQ Plot (n=100)")
qqline(weirdsamp_100_1)
qqnorm(weirdsamp_100_2, main = "QQ Plot (n=100)")
qqline(weirdsamp_100_2)
```

**QQ Plot (n=100)**



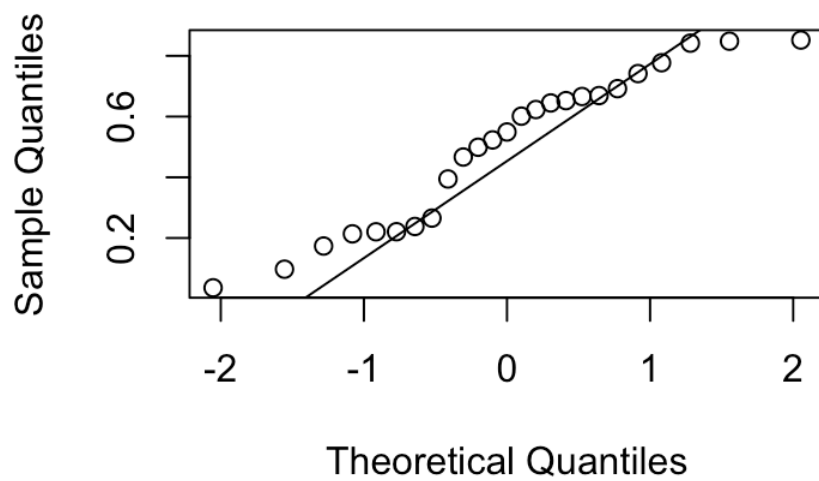
**QQ Plot (n=100)**



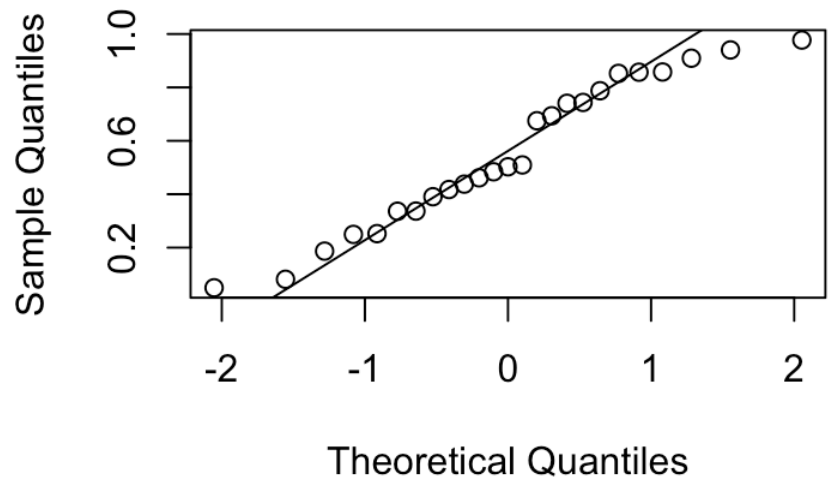
## d) Uniform[0,1] Dist'n

```
#U[0,1]
#sample size 25
unisamp_25_1 <- runif(25)
unisamp_25_2 <- runif(25)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(unisamp_25_1, main = "QQ Plot (n=25)")
qqline(unisamp_25_1)
qqnorm(unisamp_25_2, main = "QQ Plot (n=25)")
qqline(unisamp_25_2)
```

QQ Plot (n=25)



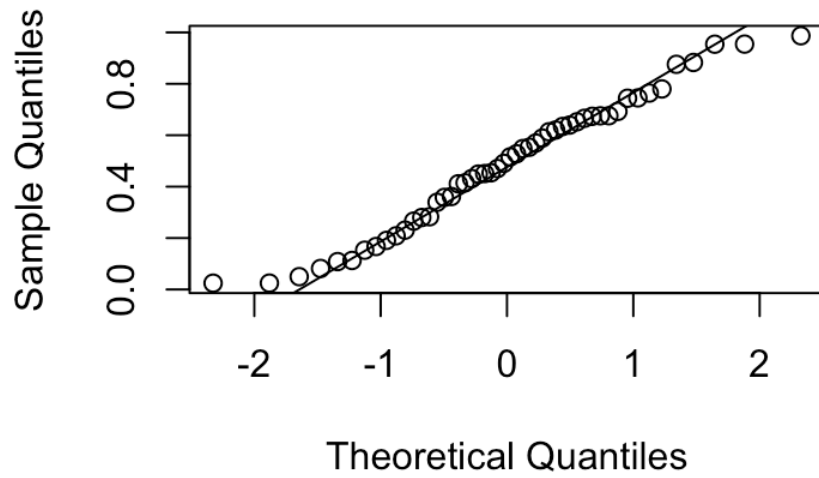
QQ Plot (n=25)



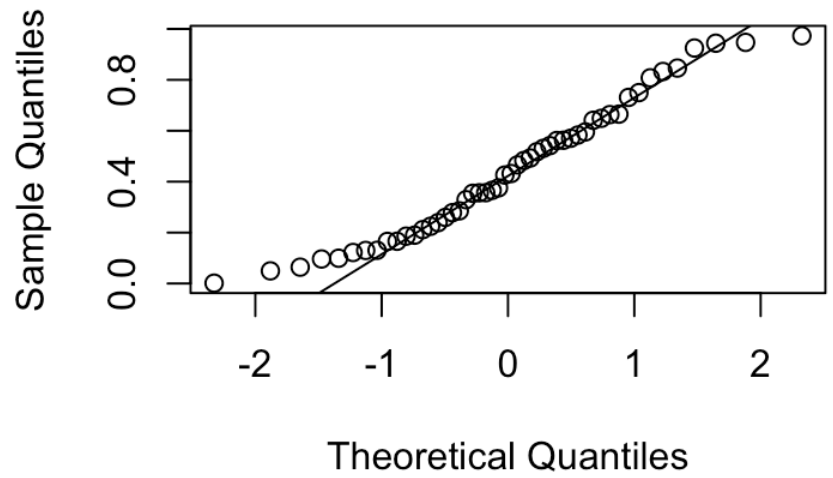
```
#sample size 50
unisamp_50_1 <- runif(50)
unisamp_50_2 <- runif(50)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(unisamp_50_1, main = "QQ Plot (n=50)")
qqline(unisamp_50_1)
qqnorm(unisamp_50_2, main = "QQ Plot (n=50)")
qqline(unisamp_50_2)
```



**QQ Plot (n=50)**

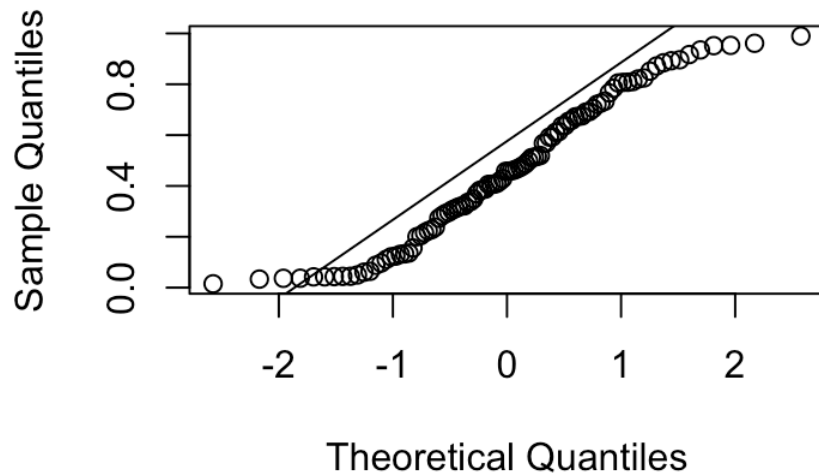


**QQ Plot (n=50)**

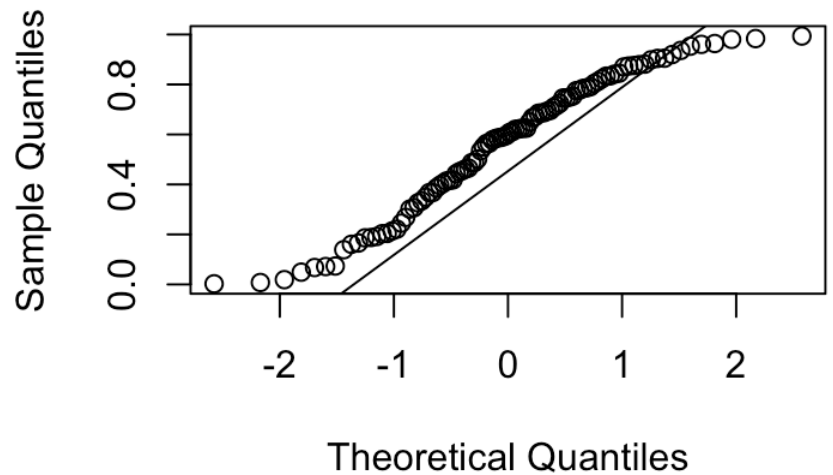


```
#sample size 100
unisamp_100_1 <- runif(100)
unisamp_100_2 <- runif(100)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(unisamp_100_1, main = "QQ Plot (n=100)")
qqline(unisamp_100_2)
qqnorm(unisamp_100_2, main = "QQ Plot (n=100)")
qqline(unisamp_100_1)
```

**QQ Plot (n=100)**



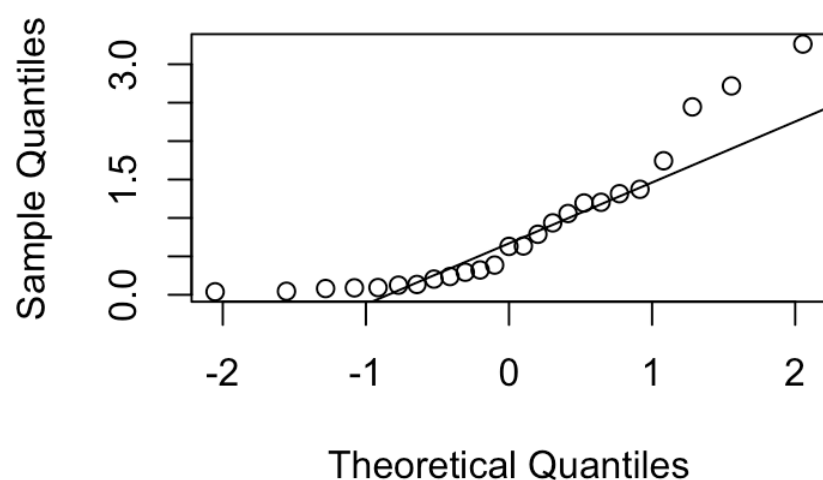
**QQ Plot (n=100)**



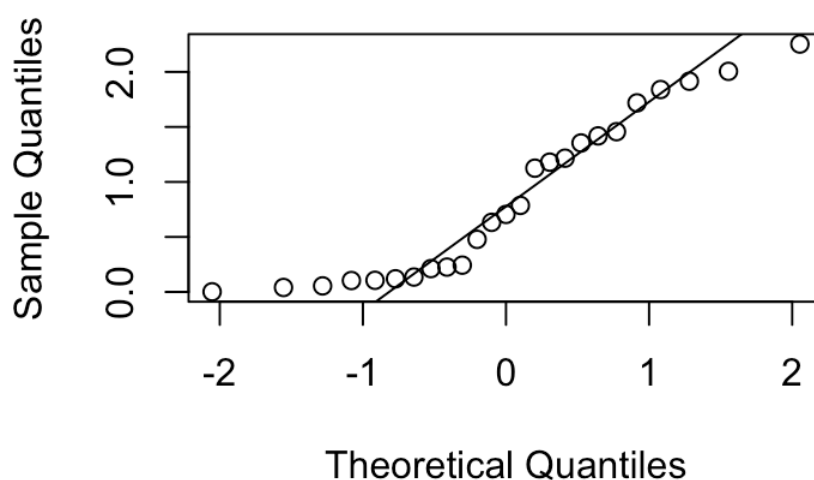
**e) Exponential Dist'n**

```
#Exp(1)
#sample size 25
expsamp_25_1 <- rexp(25)
expsamp_25_2 <- rexp(25)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(expsamp_25_1, main = "QQ Plot (n=25)")
qqline(expsamp_25_1)
qqnorm(expsamp_25_2, main = "QQ Plot (n=25)")
qqline(expsamp_25_2)
```

**QQ Plot (n=25)**

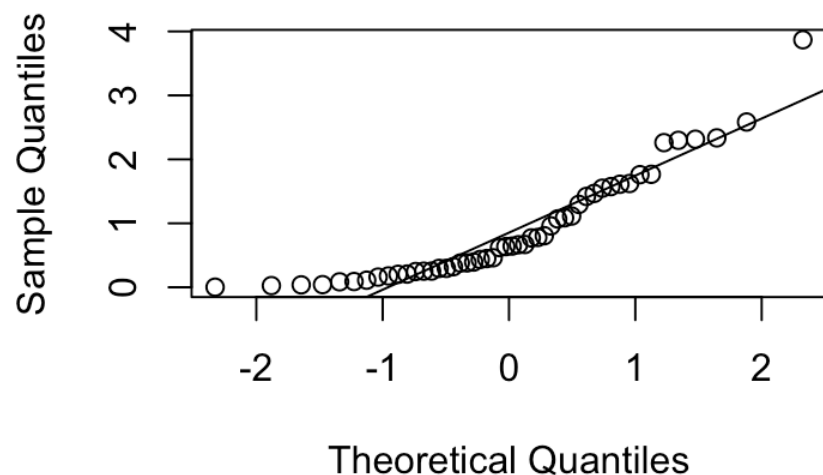


**QQ Plot (n=25)**

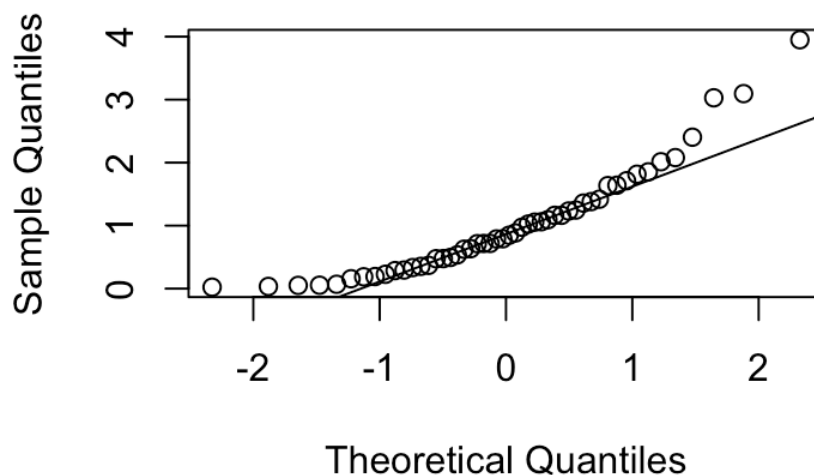


```
#sample size 50
expsamp_50_1 <- rexp(50)
expsamp_50_2 <- rexp(50)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(expsamp_50_1, main = "QQ Plot (n=50)")
qqline(expsamp_50_1)
qqnorm(expsamp_50_2, main = "QQ Plot (n=50)")
qqline(expsamp_50_2)
```

**QQ Plot (n=50)**

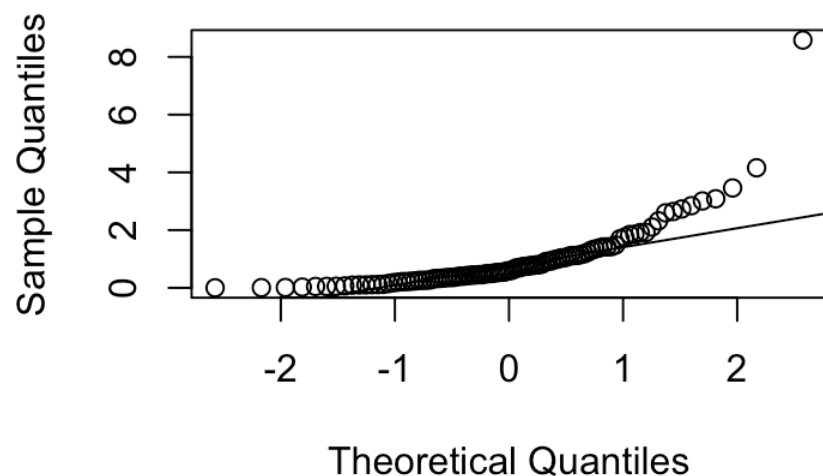


**QQ Plot (n=50)**

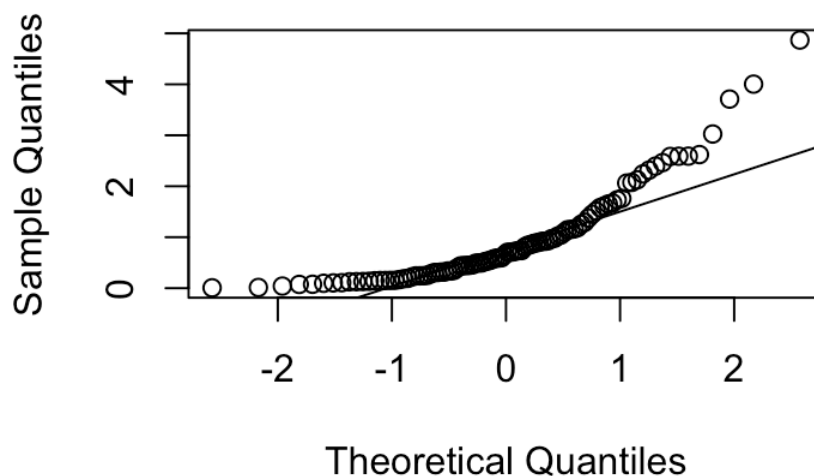


```
#sample size 100
expsamp_100_1 <- rexp(100)
expsamp_100_2 <- rexp(100)
layout(matrix(c(1,2),1,2,byrow=TRUE))
qqnorm(expsamp_100_1, main = "QQ Plot (n=100)")
qqline(expsamp_100_1)
qqnorm(expsamp_100_2, main = "QQ Plot (n=100)")
qqline(expsamp_100_2)
```

**QQ Plot (n=100)**



**QQ Plot (n=100)**



**f)**

As we increase our sample size, the graph becomes more and more smooth and representative of the true plot shape.

In the normal distribution of part (a), the QQ plot exhibits strong linearity. Subsequent plots, generated from various distributions but still compared to normal quantiles, are obviously different. In general, the tails tend to deviate away from the central line, indicating skew in the graph.