509HW3

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```
library(fBasics)
```

```
## Warning: package 'fBasics' was built under R version 3.4.3
```

```
## Loading required package: timeDate
```

```
## Warning: package 'timeDate' was built under R version 3.4.3
```

```
## Loading required package: timeSeries
```

```
## Warning: package 'timeSeries' was built under R version 3.4.3
```

```
XX=read.csv("SP100_daily_03-13.csv",header=TRUE)
SP100_dl<-rev(XX$AdjClose)
SP100_dl_lreturn<-diff(log(SP100_dl))
median(SP100_dl_lreturn)
```

```
## [1] 0.0007256152
```

```
mean(SP100_dl_lreturn)
```

```
## [1] 0.0001549442
```

```
(sd(SP100_dl_lreturn))^2
```

```
## [1] 0.0001544697
```

```
skewness(SP100_dl_lreturn)
```

```
## [1] -0.2717636
## attr(,"method")
## [1] "moment"
```

```
kurtosis(SP100_dl_lreturn)
```

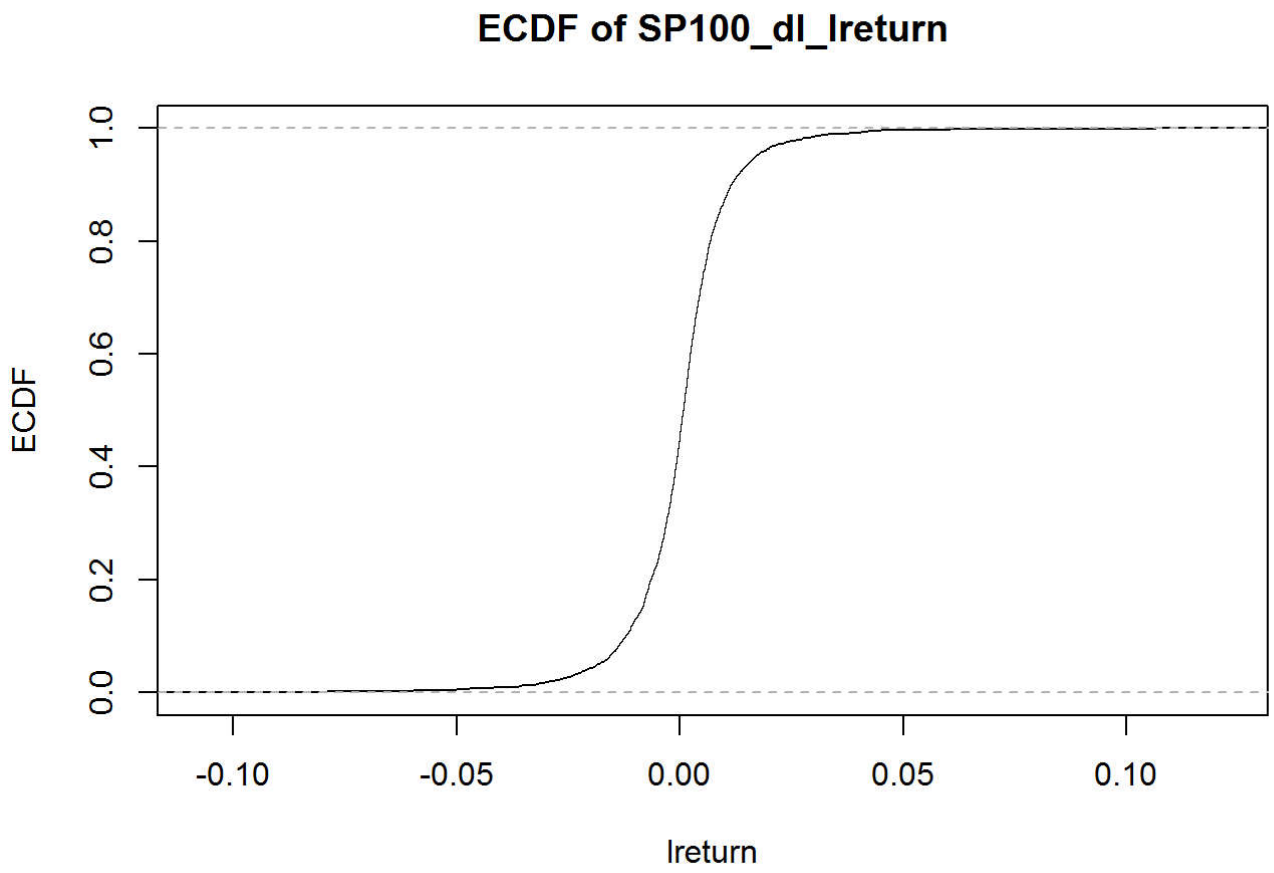
```
## [1] 11.37748
## attr(,"method")
## [1] "excess"
```

<>Median:0.0007256152 Mean:0.0001549442 Variance: 0.0001544697 Skewness:-0.2717636 Kurtosis:11.37748

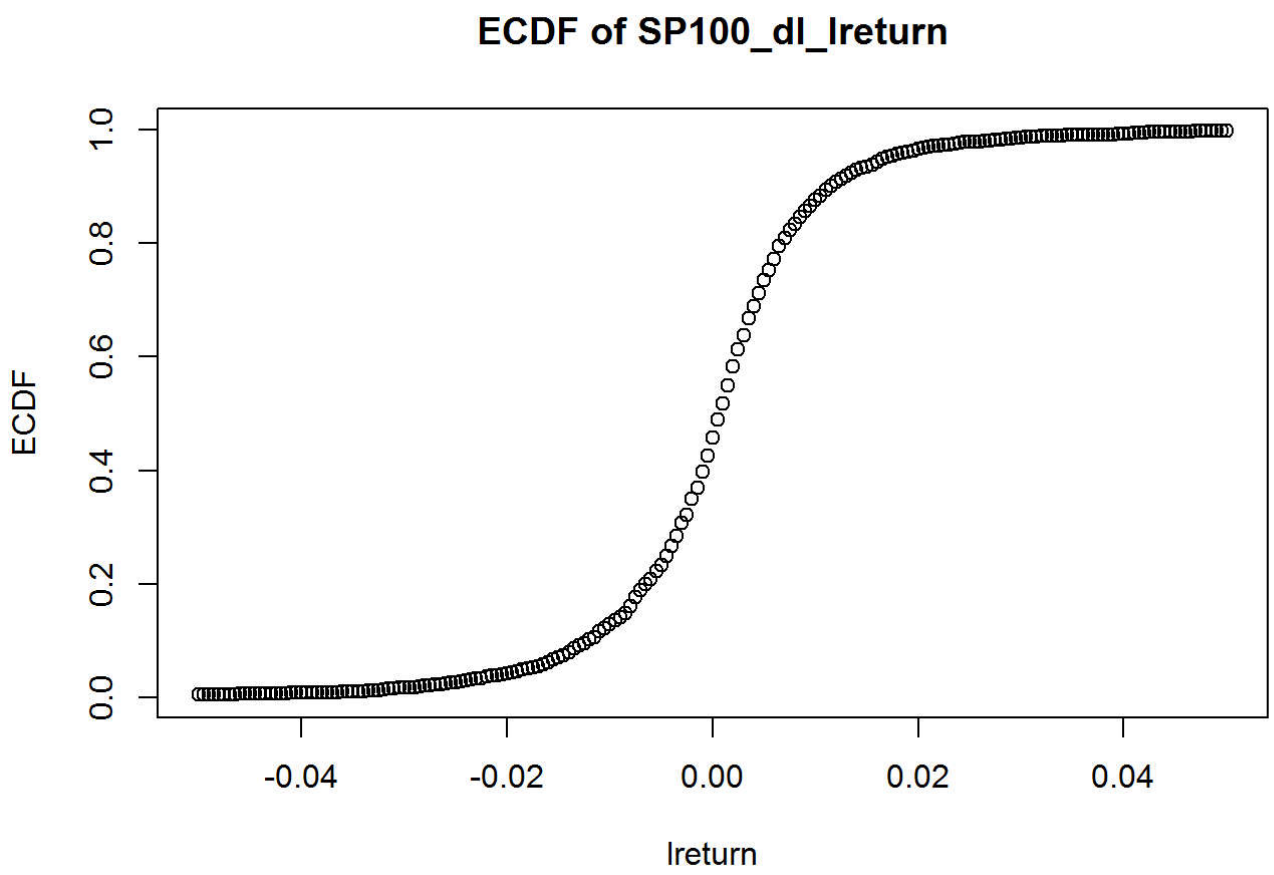
The median is greater than the mean and both of them are colose to zero. The variance is also quite small and almost 0. The skenwess means that the log-returns are negative skewed. The excess kurtosis is significantly greater than 0 which means the distribution has significantly heavier tails than the normal distribution has.

b)

```
library(POT)
eecdf = ecdf(SP100_dl_lreturn)
plot(eecdf,main='ECDF of SP100_dl_lreturn',xlab='lreturn',ylab='ECDF')
```

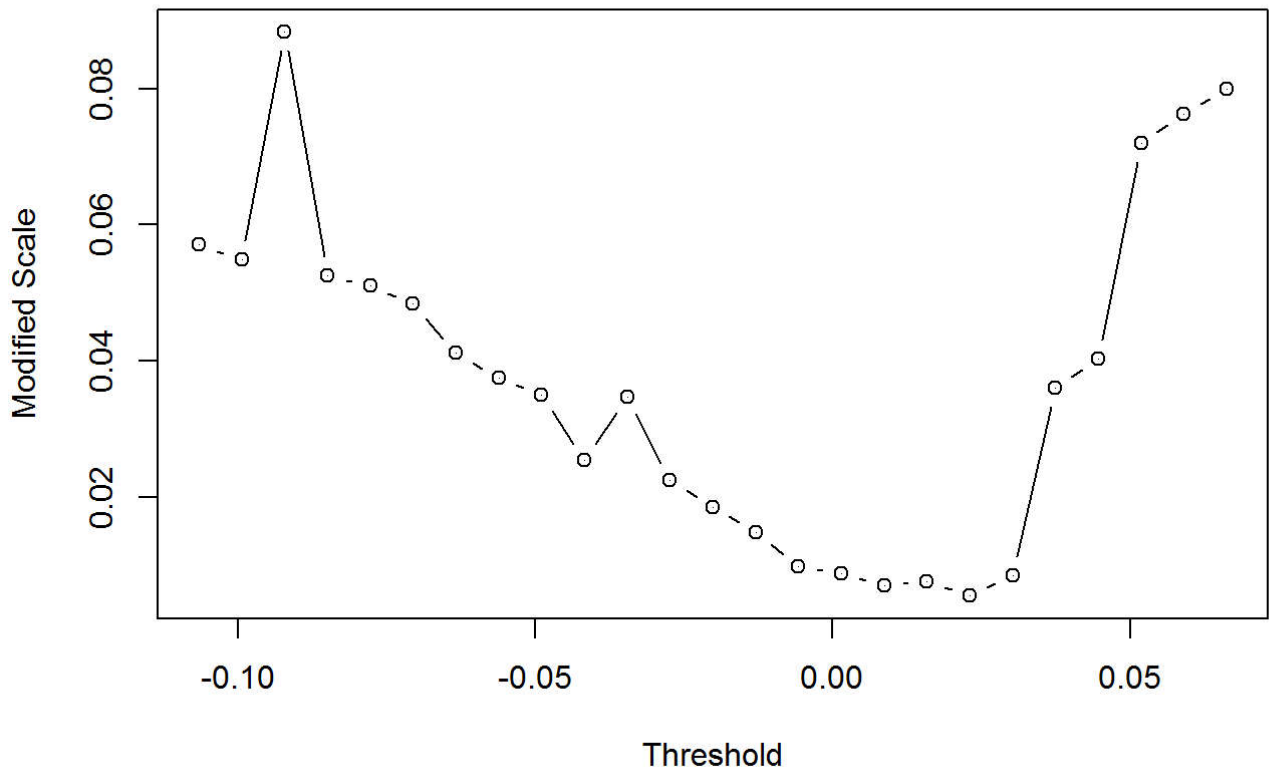


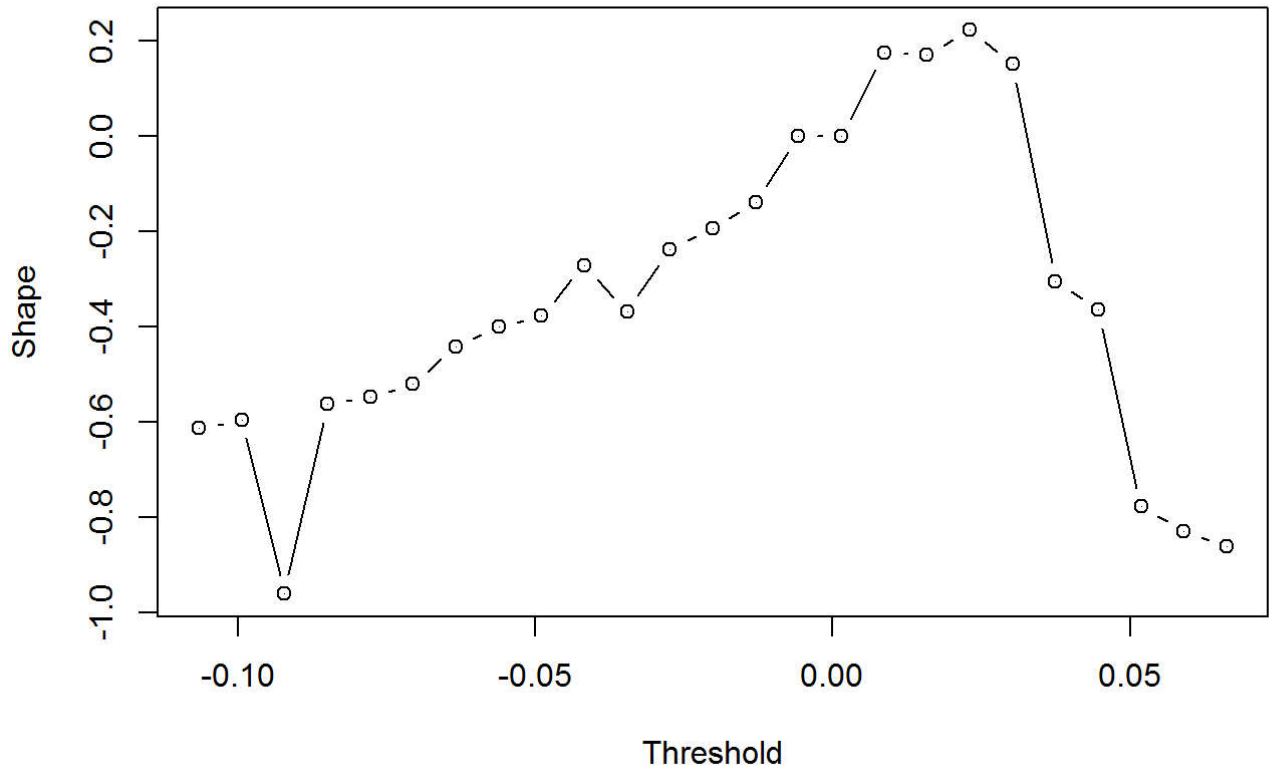

```
uv = seq(from = -0.05,to = 0.05, by = .0005)
plot(uv,eecdf(uv),main='ECDF of SP100_dl_lreturn',xlab='lreturn',ylab='ECDF')
```



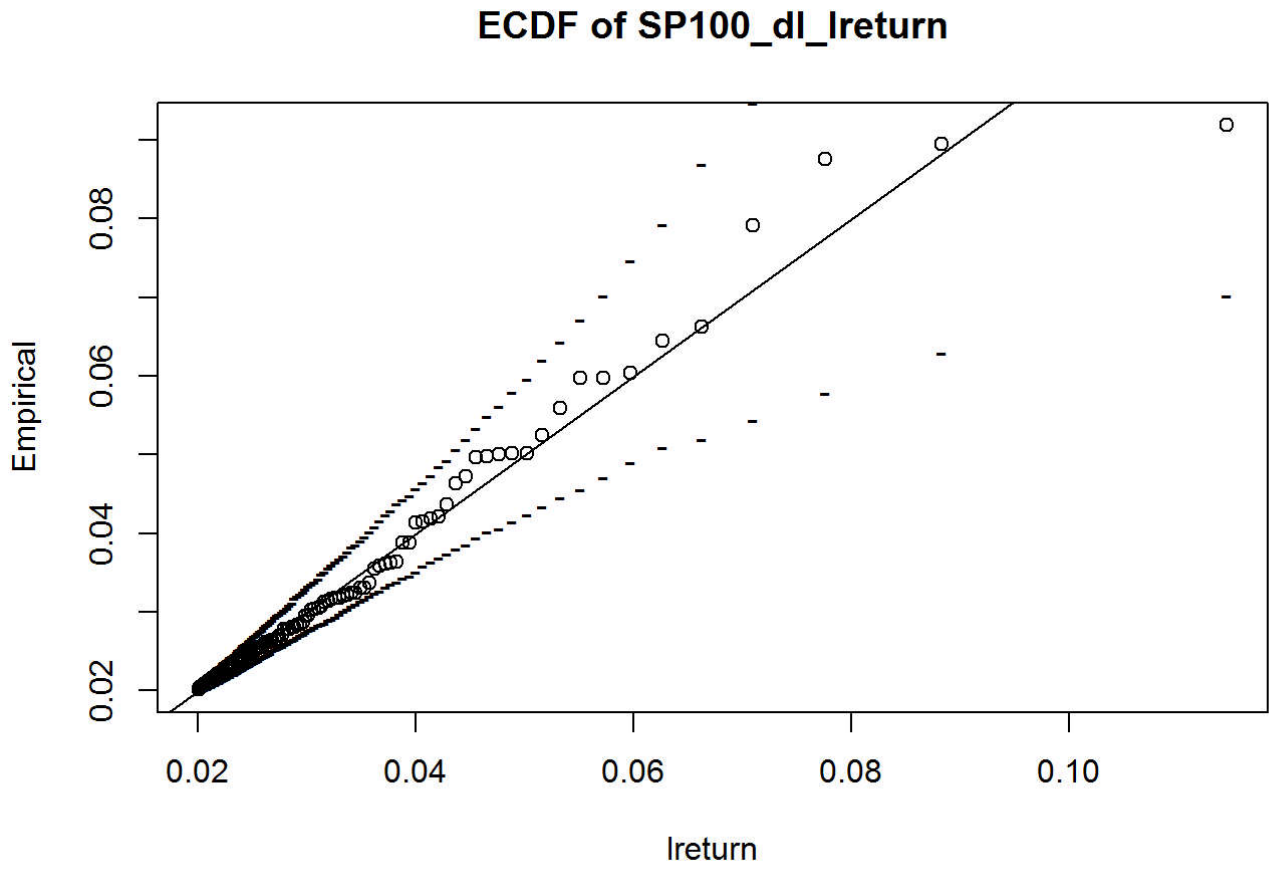

```
tcplot(-SP100_dl_lreturn,nt=25,conf=0)
```

```
## Warning in gpdmle(data, u[i], corr = TRUE, ...): observed information
## matrix is singular; passing std.err.type to ``expected''
```


Modified Scale
0.02
0.04
0.06
0.08
-0.10
-0.05
0.00
0.05
Threshold


Shape
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
-0.10
-0.05
0.00
0.05
Threshold

```
gpd_fit = fitgpd(-SP100_dl_lreturn,0.02)
qq(gpd_fit, main='ECDF of SP100_dl_lreturn', xlab='lreturn', ylab='Empirical',ci=TRUE)
```




```
gpd_fit
```

```
## Estimator: MLE
##  Deviance: -720.356
##       AIC: -716.356
##
## Varying Threshold: FALSE
##
##   Threshold Call: 0.02
##     Number Above: 108
## Proportion Above: 0.0429
##
## Estimates
##   scale    shape
## 0.01126  0.15466
##
## Standard Error Type: observed
##
## Standard Errors
##    scale     shape
## 0.001688  0.119104
##
## Asymptotic Variance Covariance
##        scale       shape
## scale   2.851e-06  -1.387e-04
## shape  -1.387e-04   1.419e-02
##
## Optimization Information
##   Convergence: successful
##   Function Evaluations: 41
##   Gradient Evaluations: 6
```