# Hw8

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## 1 a-7-3

### 1.1 (a)

Table 1: Maximum likelihood estimates of the extreme value distrubution for daily log returns of Apple stock

| Length of Subperiod | Shape parameter $\xi$ | Scale $\sigma$ | Location $\mu$ |
|---|---|---|---|
| | Maximal negative returns | | |
| n=21 | 0.135(0.058) | 1.719(0.126) | 3.380(0.168) |
| n=42 | 0.349(0.117) | 1.595(0.198) | 4.068(0.228) |

### 1.2 (b)

Since we get the $\xi, \sigma and \mu$,using the formula to get the VaR and VaR(10)

$$VaR = \mu - \frac{\sigma}{\xi}\{1 - [-n\ln(1-p)]^{-\xi}\} \tag{1.1}$$

$$VaR(l) = l^{\xi} VaR \tag{1.2}$$

Table 2: VaR

| Length of Subperiod | $\mathrm{VaR}_{0.95}$ | $\mathrm{VaR}_{0.99}$ | $\mathrm{VaR}_{0.95}(10)$ | $\mathrm{VaR}_{0.99}(10)$ |
|---|---|---|---|---|
| | Maximal negative returns | | | |
| n=21 | 32528 | 63568 | 44425 | 86818 |
| n=42 | 29938 | 56735 | 66849 | 126685 |

```
> da=read.table("http://faculty.chicagobooth.edu/ruey.tsay/teaching/introTS/d-aapl-0111.txt",header=T)
> pr=log(da$rtn+1)*100
> nr=-pr
> library(evir)
> options(digit=5)
> m3=gev(nr,block=21)
> m3$par.ests

       xi     sigma        mu
0.1353716 1.7191777 3.3799362
```

```
> m3$par.ses

        xi      sigma         mu
0.05754035 0.12641780 0.16752348

> t1=as.numeric(m3$par.ests)
> VaR1=t1[3]-t1[2]/t1[1]*(1-(-21*log(1-0.05))^{-t1[1]})
> VaR1=10000*VaR1
> VaR2=t1[3]-t1[2]/t1[1]*(1-(-21*log(1-0.01))^{-t1[1]})
> VaR2=10000*VaR2
> VaR3=10^{t1[1]}*VaR1
> VaR4=10^{t1[1]}*VaR2
> options(digits =5)
> VaR1

[1] 32528

> VaR2

[1] 63568

> VaR3

[1] 44425

> VaR4

[1] 86818

> m4=gev(nr,block=42)
> m4$par.ests

     xi   sigma      mu
0.34887 1.59546 4.06803

> m4$par.ses

     xi   sigma      mu
0.11726 0.19753 0.22756

> t1=as.numeric(m4$par.ests)
> VaR1=t1[3]-t1[2]/t1[1]*(1-(-42*log(1-0.05))^{-t1[1]})
> VaR1=10000*VaR1
> VaR2=t1[3]-t1[2]/t1[1]*(1-(-42*log(1-0.01))^{-t1[1]})
> VaR2=10000*VaR2
> VaR3=10^{t1[1]}*VaR1
> VaR4=10^{t1[1]}*VaR2
> VaR1

[1] 29938
```

```
> VaR2

[1] 56735

> VaR3

[1] 66849

> VaR4

[1] 126685

> VaR4

[1] 126685

>
>
>
```

# 2 a-7-4

## 2.1 (a,b)

Table 3: POT method to calculate risk measures

| Threshold | $\xi$ | $\sigma$ | $\mu$ | $VaR_{0.99}$ | $ES_{0.99}$ |
|---|---|---|---|---|---|
| $\eta = 0.025$ | 0.102(0.044) | 0.013(0.002) | -0.0047(0.003) | 69839 | 92434 |
| $\eta = 0.02$ | 0.089(0.040) | 0.013(0.001) | -0.0057(0.002) | 70008 | 92008 |

```
> da=read.table("http://faculty.chicagobooth.edu/ruey.tsay/teaching/introTS/d-aapl-0111.txt",header=T)
> pr=log(da$rtn+1)
> nr=-pr
> m1=pot(nr,threshold=0.025)
> m1$par.ests

        xi      sigma          mu       beta
 0.1021107  0.0126775 -0.0046924  0.0157094

> m1$par.ses

       xi     sigma        mu
0.0441910 0.0016861 0.0028285

> riskmeasures(m1,c(0.99))

        p quantile    sfall
[1,] 0.99 0.069839 0.092434
```

```
> m1=pot(nr,threshold=0.02)
> m1$par.ests

       xi     sigma         mu      beta
 0.088901  0.013311 -0.005734  0.015598

> m1$par.ses

       xi     sigma         mu
0.0395793 0.0014617 0.0021359

> riskmeasures(m1,c(0.99))

        p quantile    sfall
[1,] 0.99 0.070008 0.092008
```

## 2.2 (c)

From these results,we see that the risk measures are not too sensitive to the choices of threshold. The reason is that it is a stable return series.

*>plot(m1)*

*section:6*

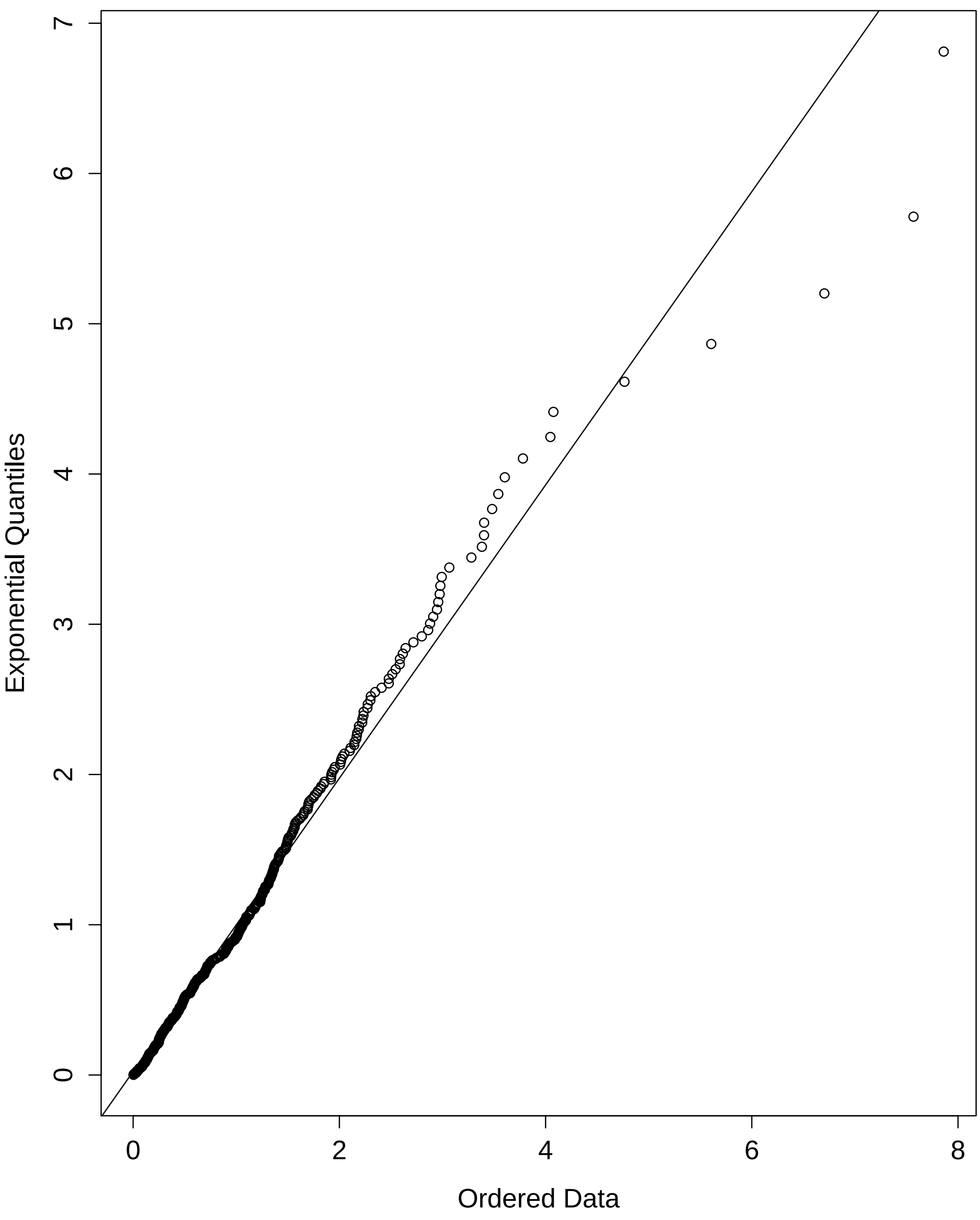


Figure 1: QQ-plot of the data versus exponential equantiles