Christian-Albrechts-Universität zu Kiel **WS 2017/18**
Mathematisches Seminar
Prof. Dr. Jan Kallsen
Dr. Giso Jahncke Sheet 09

Risk Management

Exercises for participants of the programme **Quantitative Finance**

C-Exercise 16

(a) Write a *scilab*-function

```
e= MEF(x, u),
```

that evaluates the empirical mean excess function e_n at $u < \max\{x_i : i = 1,\dots,n\}$ for $n \in \mathbb{N}$ observations $x = (x_1,\dots,x_n)$.

(b) Write a *scilab*-function

```
MEP(x),
```

that draws the mean excess plot for observations $x = (x_1,\dots,x_n)$.

(c) Generate $n = 500$ simulations for

- the t-distribution with $\nu = 3$ degrees of freedom,
- the t-distribution with $\nu = 6$ degrees of freedom,
- the exponential distribution with parameter $\lambda = 1$,

and draw the corresponding mean excess plot.

(d) Write a *scilab*-function

```
[beta,gamma]=PoT_Est(x,u)
```

that estimates the parameters β, γ via maximum likelihood according to section 3.3.2

(e) Write a *scilab*-function

```
[VaR,ES]=VaR_ES_PoT(x,p,u)
```

that computes the VaR and ES estimates from section 3.3.5 and 3.3.6 for $n \in \mathbb{N}$ independent observations $x = (x_1,\dots,x_n)$, $u \in (0,\infty)$ and level $p \in (0,1)$.

(f) Take the data set from C-Exercise 15 and use a mean excess plot for a reasonable choice of u. Compute the estimates for VaR and ES at level $p = 0.99$.

Submit until: Thursday, 18.01.2018, 08:30 (before the lecture)