Christian-Albrechts-Universität zu Kiel **WS 2017/18**
Mathematisches Seminar
Prof. Dr. Jan Kallsen
Giso Jahncke Sheet 05

Risk Management

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

T-Exercise 9

Let L be the random loss of a portfolio of the form

$$L = -s\left(e^X - 1\right),$$

where $s > 0$ is a constant and X has a normal distribution with mean $\mu \in \mathbb{R}$ and standard deviation $\sigma > 0$. Compute $\mathrm{ES}_\alpha(L)$ for $\alpha \in (0,1)$.

C-Exercise 10

(a) Write a *scilab*-function

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[VaR, ES] = VaR_ES_var_covar (x_data, c, w, alpha),
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that computes the estimates $\widehat{VaR}_\alpha$ and $\widehat{ES}_\alpha$ of the variance covariance method for the one-dimensional linearized loss operator

$$l^\Delta(x) = -(c + w \cdot x),$$

$c, w \in \mathbb{R}$ and given historical risk factor changes $x\_data = (x_1, \ldots, x_n) \in \mathbb{R}^n$.

(b) Compute the logarithmic returns $x_2, \ldots, x_{6816}$ of the DAX time series, that we use as risk factor changes. Compute for each trading day $m = 254, \ldots, 6816$ the estimates for *value at risk* and *expected shortfall* at level $\alpha = 0.98$. Apply the function from (a) on the last $n = 252$ risk factor changes $(x_m, x_{m-1}, \ldots, x_{m-n+1})$. Plot your results.

Hint: You may use the function *RiskMan*_2017_18_*WS_VaR_log_normal.sci* from C-Exercise 3 as well as Example 1.13 from the lecture.

Submit until: Thursday, 30.11.2017, 08:30 (before the lecture)