**Christian-Albrechts-Universität zu Kiel** **WS 2017/18**
Mathematisches Seminar
Prof. Dr. Jan Kallsen
Giso Jahncke Sheet 06

# Risk Management

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

**T-Exercise 11**
Let

$$\begin{array}{lllll} x_1 = 2{,}5, & x_2 = 0, & x_3 = -1{,}5, & x_4 = 3, & x_5 = 2, \\ x_6 = 1{,}5, & x_7 = 4, & x_8 = 3{,}5, & x_9 = 1, & x_{10} = -2 \end{array}$$

be a sample.

(a) Draw the empirical distribution function $F_{10}$ and the generalized inverse $F_{10}^{\leftarrow}$.

(b) Calculate $\mathrm{VaR}_{0.75}(F_{10})$ and $\mathrm{ES}_{0.75}(F_{10})$.

**C-Exercise 12**

(a) Write a *scilab*-Funktion

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[VaR, ES] = VaR_ES_historic (x_data, l, alpha),
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that computes the estimates $\widehat{VaR}_\alpha(L_{n+1})$ and $\widehat{ES}_\alpha(L_{n+1})$ for the one-dimensional loss operator $l : \mathbb{R} \to \mathbb{R}$, level $\alpha \in (0,1)$ and given historical risk factor changes $x\_data = (x_1, \ldots, x_n) \in \mathbb{R}^n$ using the method of historical simulation.

(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 and compare them with the results of C-Exercise 10.

**Submit until:** Thursday, 07.12.2017, 08:30 (before the lecture)