Seminar für Finanzökonometrie
Institut für Statistik
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http://www.finmetrics.statistik.uni-muenchen.de/studium_lehre
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Based on exercises from Steffen Unkel

Statistical Geophysics
Exercise Sheet 3

Exercise 1 The following table gives the amount of rain (in litres per square metre), measured at the volcano Merapi (Indonesia) between January 1st and January 20th, 1995.

Rain	Date	Rain	Date
2	01.01.1995	15	11.01.1995
9	02.01.1995	20	12.01.1995
18	03.01.1995	0	13.01.1995
2	04.01.1995	0	14.01.1995
23	05.01.1995	0	15.01.1995
42	06.01.1995	0	16.01.1995
11	07.01.1995	3	17.01.1995
13	08.01.1995	3	18.01.1995
40	09.01.1995	40	19.01.1995
12	10.01.1995	48	20.01.1995

a) Determine the type of scale of the variable rain.

b) Draw a histogram using the intervals $[0, 10), [10, 20), [20, 30), [30, 40), [40, 50]$.

c) Read the data into R and do the histogram again with R.

d) Now plot the empirical cumulative distribution function (with R) and determine graphically how large the percentage of days is on which it rained more than 35 litres per square meter?

e) Calculate (by hand!) the values for the following measures of location and dispersion for the variable rain: mode, median, arithmetic mean, lower quartile, upper quartile, variance, standard deviation, and coefficient of variation.

f) Use the results obtained in (e) to draw a boxplot of the empirical distribution of rain. Do the boxplot again in R.

g) Calculate a 95% confdence interval for the expected value of rainfall, μ.

Exercise 2 Let $x_1, ..., x_n$ be realizations from $X_i \overset{i.i.d.}{\sim} N(\mu, \sigma^2)(i = 1, ..., n)$ with unknown parameters μ and σ^2. Derive maximum likelihood estimators for μ and σ^2.

Exercise 3 Let T be an estimator of an unknown parameter θ. Show that the mean-squared error (MSE) of T, $MSE(T) = E((T - \theta)^2)$, can be written as $MSE(T) = Var(T) + (E(T) - \theta)^2$.
