# The acer package

Even Haug

December 15, 2011

## 1 Usage

The code below provides a quick demonstration of the ACER package.

Let us test the package on simulated data drawn from an extreme value distribution, as described in ... We may for example assume that the simulated data approximates a series of daily maximum wind speed observations. We will generate 20 years of data consisting of 365 observations each, thus obtaining a matrix where each column corresponds to a year of observations.

```
> library (acer)
> N <- 365
> M <- 20
> q <- 10
> testdata <- matrix (nrow = N, ncol = M)
> for (i in 1:M)
+   {
+     u <- runif (N)
+     testdata [, i] <- sqrt (abs (2 * log (- log (u) / q)))
+   }
```

We may now estimate and plot the ACER functions by running

```
> estimates <- acer.prepare (testdata)
```

The estimated ACER functions will be similar to the ones plotted in figure 1, where we have plotted the estimated ACER functions with $k = 1, 2, \ldots 6$. Each value of $k$ has its own colour. The ACER functions are more or less identical, which is unsurprising, as the simulated data are independent. We may thus choose $k = 1$ and proceed with the analysis.

We may plot the estimated ACER function with $k = 1$ alone using

```
> k <- 1
> acer.plot_estimate (estimates, k)
```

The resulting plot is shown in figure 1. From the plot, we note that the estimated ACER function seems to behave regularly from about $\eta \approx 2.5$. We therefore try to use $\eta_1 = 2.5$ as our tail marker.

The final analysis is performed by running

```
> eta1 <- 2.5
> result <- acer.analysis (estimates, k, eta1)
```

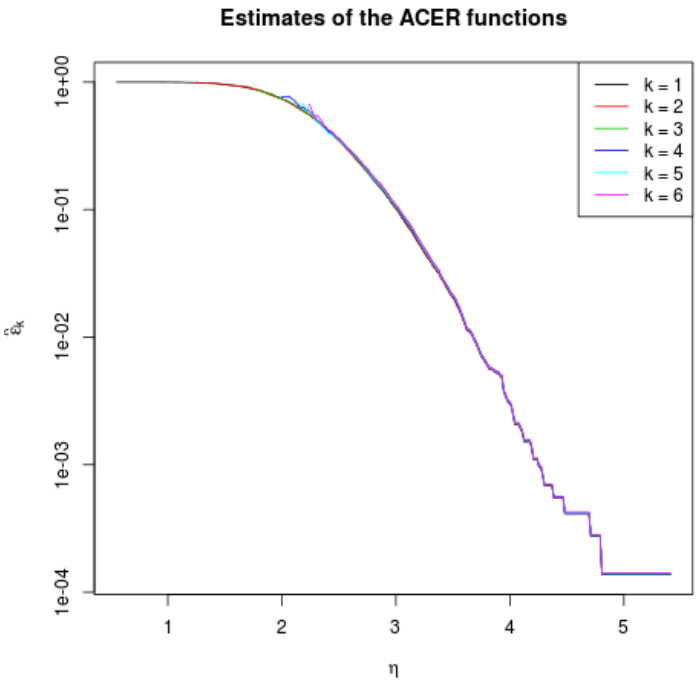


Figure 1: Estimates of the ACER function, with $k = 1, 2, \ldots, 6$.

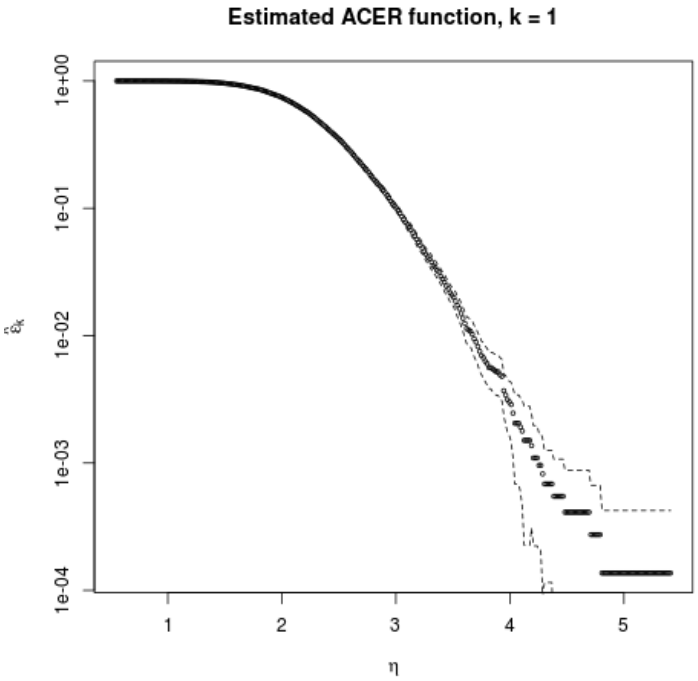


Figure 2: The estimated ACER function with $k = 1$, including 95% confidence intervals.

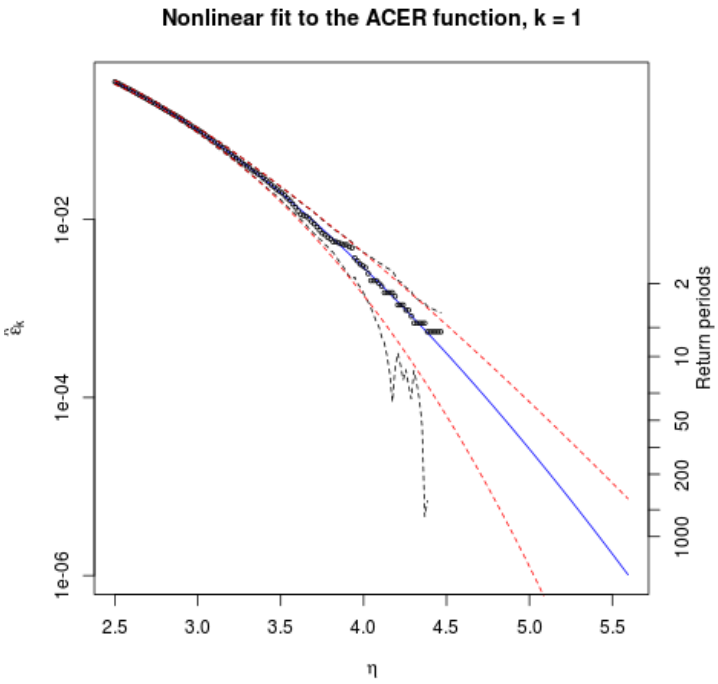


Figure 3: The fitted curve with 95% confidence intervals

.

```
[1] Result of nonlinear fit to the ACER function, k = 1
[1] Parameters: q = 0.5237, b = 2.2607, a = 2.3938, c = 1.2840
[1] 5 periods: 4.50; 95% CI: (4.30, 4.65)
[1] 10 periods: 4.70; 95% CI: (4.44, 4.87)
[1] 20 periods: 4.88; 95% CI: (4.58, 5.08)
[1] 100 periods: 5.27; 95% CI: (4.86, 5.54)
[1] 200 periods: 5.43; 95% CI: (4.98, 5.73)
```

The estimated return levels are printed to the screen, and a plot of the fitted curve together with 95% confidence levels is generated, as in figure 1.