

# New estimators of the Pickands dependence function and a test for extreme-value dependence

Holger Dette  
Ruhr-Universität Bochum  
Fakultät für Mathematik  
44780 Bochum, Germany  
e-mail: holger.dette@ruhr-uni-bochum.de

April 4, 2012

## Abstract

Pickands dependence function  $A$  is convex and satisfies the boundary conditions

$$\max\{t, 1 - t\} \leq A(t) \leq 1$$

for  $t \in [0, 1]$ . We propose a new class of estimators for Pickands dependence function which is based on the best  $L^2$ -approximation of the logarithm of the copula by logarithms of extreme-value copulas. The estimators  $\hat{A}(t)$  are obtained by replacing the unknown copula by its empirical counterpart and weak convergence of the process  $\sqrt{n}\{\hat{A}(t) - A(t)\}_{t \in [0, 1]}$  is shown. A comparison with the commonly used estimators is performed from a theoretical point of view and by means of a simulation study. Our asymptotic and numerical results indicate that some of the new estimators outperform the rank-based versions of Pickands estimator and an estimator which was recently proposed by Genest and Seegers (2009). As a by-product of our results we obtain a simple test for the hypothesis of an extreme-value copula, which is consistent against all alternatives with continuous partial derivatives of first order satisfying  $C(u, v) \geq uv$ .