Hydrology and Earth System Sciences Discussions

Interactive comment on "On accuracy of upper quantiles estimation" *by* I. Markiewicz et al.

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The both Referees indicated that no general conclusions can be draw about the superiority one of estimation method over the other methods.

Referee 1: "The results in this paper are partial because, of course, only some cases of misspecification of the parent distribution are considered. Therefore general conclusions cannot be drawn."

Referee 2: "As anticipated, no simple conclusion can be drawn from the experiment except of that there is no universal method excelling in most of the cases."

Indeed this is true and we state in the paper "the properties of estimation methods can not be generalized in respect to distribution type or sample size, even if the hypothetical

C2502

distribution is true."

However, we would like to complete the conclusion of the paper:

Page 4772, lines 19-21:

"... or sample size, even if the hypothetical distribution is true. However, it is worth to note that for two-parameter distributions, in the case of model misspecification, the MLM yields the highest bias of quantile estimates regardless on the sample size, while the MOM the smallest one. The correct identification of the distribution on the basis of short data series is not possible in hydrological reality. This finding essentially diminishes the practical usefulness of MLM in hydrological extremes analysis, because its efficiency may not compensate for the (frequently) huge bias produced by the assumption of a false PDF in the region of high non-exceedance probability quantiles the user is often interested in. It marks a departure of hydrological extreme value analysis from the classical statistical theory of extremes whose core is maximum likelihood method. The person making the choice of the distribution and estimation (D/E) procedure, e.g., explorer, hydrologist, designer, should be aware ..."

The results of our studies concluded above are consistent with other researches. In paper by Strupczewski et al. (2000), several pairs of two-parameter distributions bounded at zero showed that in the case of model misspecification, the asymptotic relative absolute bias of large quantiles is an increasing function of the true value of the coefficient of variation (Cv), being smallest for the method of moments (MOM) and largest for the maximum likelihood method (MLM). The bias of LMM usually occupied an intermediate position. Moreover, the same concerns their mutual differences, e.g., approximating the log-logistic by the log-Gumbel, the asymptotic bias of the estimate of 1% quantile from MOM, LMM and MLM expressed in percentage equals 6.3, 10.4 and 49.0 for Cv=0.2, while -3.9, 14.8 and 294.9 for Cv=1.0. Therefore the same order of the methods is likely to be kept for the total sampling bias at least for large Cv values (i.e. a large skewness Cs at the same time) and large in hydrological meaning sample size.

References:

Strupczewski, W.G., Weglarczyk, S. and Singh, V.P.: Model error in flood frequency estimation, Acta Geophysica Polonica, 50(2), 279-319, 2002b.

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