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EXTREME VALUES OF DERIVATIVES OF SMOOTHED FRACTIONAL BROWNIAN MOTIONS

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Abstract: Let $B_H(\cdot)$ be a fractional Brownian motion on R with parameter $1/2 < H < 1$, and consider its smoothed version $b_n^{-H} \int K((t-s)/b_n) B_H(s) ds$, $t \in R$, where the kernel $K(\cdot)$ is a density function and the $b_n > 0$ are some bandwidths. The derivative of this process arises naturally as a heuristic approximation of a nonparametric kernel regression estimator when the normal errors are long-range dependent. We show that, with suitable centering and norming, the distribution of the supremum and absolute supremum of this derivative over the interval $[0, 1]$ converges, as $n \to \infty$, to the Gumbel extreme-value distribution and its square, respectively. A version of the problem for finite differences is also considered, along with higher-order derivatives.

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