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*Location and scale functionals based on  $t$  distributions.*

For laws on the real line, joint maximum likelihood estimation of location  $\mu$  and scale  $\sigma$  for the  $t$  distribution with  $\nu$  degrees of freedom for  $1 < \nu < \infty$  extends uniquely from empirical measures concentrated in  $n$  distinct points,  $n \geq 2$ , to a weakly continuous functional  $(\mu_\nu, \sigma_\nu)$  defined on all laws. On the set of laws whose largest atom is of size  $< \nu/(\nu + 1)$ , or equivalently  $\sigma_\nu > 0$ , the functional is Fréchet  $C^\infty$  with respect to the dual-bounded-Lipschitz norm. Other norms, adapted to just the functions needed, give in addition locally uniform Donsker properties. Surprisingly, for any  $\nu$ , there are laws concentrated in three points for which  $\mu_\nu$  is at an arbitrarily extreme quantile. Uniformly over all laws, for  $0 < \gamma < 1/(\nu + 1)$ , if  $\mu_\nu(P)$  is not in  $J$  for an interval  $J$  with  $P(J) \geq 1 - \gamma$ ,  $\mu_\nu$  must be within  $\delta(\gamma)\lambda(J)$  of  $J$ , where  $\lambda =$  length and  $\delta(\gamma) \rightarrow 0$  as  $\gamma \rightarrow 0$ . (Received February 03, 2005)