The Annals of Applied Statistics
2013, Vol. 7, No. 4, 1895–1897
DOI: 10.1214/13-AOAS614R
Main article DOI: 10.1214/12-AOAS614

REJOINDER OF "ESTIMATING THE HISTORICAL AND FUTURE PROBABILITIES OF LARGE TERRORIST EVENTS" BY AARON CLAUSET AND RYAN WOODARD

BY AARON CLAUSET AND RYAN WOODARD

University of Colorado, Boulder and ETH Zürich

We are pleased that our article has stimulated such thoughtful discussion, and we appreciate the discussants' interest in exploring the methodological and practical points of our study. The discussants make a number of excellent points worthy of future investigation and highlight the difficulty of making accurate statistical estimates of the likelihood of rare events in general, and of large terrorist events in particular. Our study is certainly not the final word on these topics and we look forward to future developments in these areas. In our rejoinder, we focus on selected points that will clarify the context of our study and open questions, including the choice of statistical models that are consistent with reasonable mechanistic models for the data under study, and the value of simple models in controlling uncertainty in complex social systems.

Not all tail models are equal. Two key motivations in our use of the power-law or simple Pareto tail model were (i) its previous use in modeling terrorist event severities, and (ii) its status as the only tail model with published mechanisms for the frequencies of large terrorist events. Although the debate is ongoing as to which mechanism, if any, is the correct explanation for the observed heavy-tailed pattern in event severities [see Clauset and Gleditsch (2012) for discussion], these mechanisms provide an important theoretical grounding for any statistical modeling of terrorism's upper tail. *Without such mechanisms, there is little theoretical justification for favoring one particular tail model over another to estimate extreme event probabilities.* Thus, we believe some amount of priority should be given to estimates derived from distributions like the power law, which have articulated and plausible underlying mechanisms for terrorist event severities. However, the surest way to reduce our ultimate uncertainty as to the likelihood of future large events is to identify and test alternative mechanisms for the heavy-tailed pattern in terrorist event severities, and we look forward to new work in that direction.

Disagreement among tail models. The statistical framework we presented is entirely general and can thus be used in conjunction with (i) any well-defined, automatic method for identifying the upper tail region, and (ii) any well-defined probabilistic model of an upper tail. (Although we modeled severities as i.i.d. random variables, this is not a requirement, and a clear understanding of the statistical

Received September 2013.