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

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I congratulate Clauset and Woodard (2013) on a very interesting article. The authors analyze a global terrorism data set with the aim of quantifying the probability of historical and future catastrophic terrorism events. Using power law, stretched exponential and log-normal tail probability models for the severity of events (# deaths), the authors make a convincing argument that a 9/11-sized event is not an outlier among the catalog of terrorist events between 1968 and 2007. This study builds upon earlier work by Clauset, Young and Gleditsch (2007) that I also recommend for those interested in the statistical modeling of terrorism.

While there is consensus among the models employed by Clauset and Woodard that 9/11 is not an outlier ($p > 0.01$), the estimates are accompanied by large confidence intervals on how likely a 9/11-sized event is. In Table 2, where the authors forecast the probability of a 9/11-sized event in 2012–2021, forecasted probabilities range from 0.04 to 0.94 depending on the model and the frequency of events over the time window. Here the uncertainty has less to do with the model specification and more to do with uncertainty in the frequency of events over the next decade. Terrorist events do not follow a stationary Poisson process and the intensity can fluctuate greatly over a several year period of time.

The authors remark in their discussion that relaxing the stationarity assumptions and incorporating spatial and exogenous variables may help tighten the range of forecasted probabilities. I would add here that some progress has been made, in particular, on modeling terrorist event time series as nonstationary point processes [see Lewis et al. (2012), Mohler (2013), Porter and White (2012), Raghavan, Galstyan and Tartakovsky (2012), Zammit-Mangion et al. (2012)]. Terrorism event processes are history dependent and intensities exhibit correlations at timescales of weeks and months due to self-excitation [see Lewis et al. (2012), Porter and White (2012)] and exogenous effects [see Mohler (2013), Raghavan, Galstyan and Tartakovsky (2012)].

Log-Gaussian Cox processes (LGCPs) can be used to forecast the frequency of terrorist events over the next decade, allowing for mean reversion and some level of smoothness of the intensity. Here we fit the intensity of a LGCP to the time series of global terrorist attacks with 10 or more deaths from 1980 to 2011[1] using

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[1]Data source: Global Terrorism Database.