Extreme Value Theory: 
Introduction and Applications to Insurance

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Abstract

Catastrophic losses can break an insurance company. The insurance industry is increasingly facing more catastrophic losses, where the severities are close to the reserved fund and occasionally even more than the reserve. Hence modeling the occurrence of these large losses is of ultimate priority.

Extreme value theory (EVT) deals with asymptotic behavior of the extremes (maximum and minimum) of sequence of random variables. Though EVT essentially concentrates on maximum, the modeling of minimum follows easily by a simple transformation. Suppose $X_1, X_2, \ldots$ are i.i.d. random variables, we shall discuss the stochastic behavior of $M_n := \max\{X_1, \ldots, X_n\}$ when $n \to \infty$ under suitable normalization. The limiting distribution is the extreme value distribution. A brief discussion on the estimation of extreme value index will be followed by some examples of application of EVT in insurance related problems.