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Title: Approximation of Heavy-tailed distributions via infinite dimensional phase--type distributions

Abstract:
Phase-type distributions are distributions of first passage times to an absorbing state of Markov jump processes with one absorbing state and a finite number of transient states. Phase-type distributions are often used as inputs in a wide variety of stochastic models because they are mathematically tractable and form a dense class in the non negative distributions. However, phase-type distributions are inherently light-tailed and cannot capture the characteristic features of heavy-tailed phenomena---a notorious example is the probability of ruin in classical risk models. Recently, Bladt, Nielsen and Samorodnitsky suggested a class of infinite mixtures of phase—type distributions. Such an extended class inherits the mathematical tractability and dense property of phase-type distributions but in contrast these can be heavy-tailed.

We investigate the tail properties of such a class of distributions and suggest a simple yet systematic methodology for constructing approximations within this class for any heavy—tailed distribution. Our approach is simple but provides an excellent adjustment in the tails. We complement our results with estimation procedures, applications in risk and bounds for the error of approximation.