Double shot noise process and its application in insurance

Abstract: We consider a compound Cox model of insurance risk with the additional economic assumption of a positive interest rate. To accommodate both stochastic claim intensity and the time value of claims within the aggregate loss, we use a double shot noise process. Using its generator, we derive the moments of aggregate accumulated/discounted claims where the claim arrival process follows a Cox process with shot noise intensity. Removing the parameters in a double shot noise process gradually, we show that it becomes a compound Cox process with shot noise intensity, a single shot noise process and a compound Poisson process, respectively. Numerical comparisons are shown between the moments (i.e. means and variances) of a compound Poisson model and their counterparts of a compound Cox model with/without considering a positive interest rate. For that purpose, we assume that claim sizes and primary event sizes follow an exponential distribution respectively.