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On Two Methods Based on Martingales and Simulation to Compute Infinite-Time Ruin Probabilities

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Ruin theory is a field of actuarial science centered around the modelisation of a compagny's surplus and the evaluation of the associated ruin probability on a finite or infinite time horizon. In ruin theory's classical models, independence between the interclaim time and the subsequent claim amount is assumed. Although this assumption greatly simplifies the calculations, it is often inadequate, as in the case of catastrophe insurance. Many papers suggested frameworks which consider dependence in ruin theory. For example, Albrecher and Teugels (2006) considered a model where dependence is set arbitrarily via a copula. In their work, the focus is however on the behavior of Lundberg's coefficient. Other examples include Boudreault et al (2006) and Cossette et al (2010) whose papers present explicit results, but are limited to certain models. In this paper, we present two methods for calculating the exact ruin probability (as opposed to bounds) on an infinite time horizon in a model containing dependence between the interclaim time and the subsequent claim amount. The first method is derived solely from martingale theory while the second one also uses exponential tilting. In both case, simulation is required to numerically evaluate the quantities of interest. Hence, some insight on the simulation process will be given. Numerical examples will be presented.