



TITLE Generalized linear mixed models (GLMMs) for dependent compound risk models

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Key words: Dependent frequency and severity models, random effects models, ratemaking

Purpose of your paper: The purpose of this paper is to introduce the merits and use of generalized linear mixed models (GLMMs) in developing dependent frequency-severity models that are quite often used for general insurance ratemaking.

Synopsis:

The calculation of a pure premium in general insurance ratemaking has traditionally been based on modeling both frequency and severity in an aggregated claims model. It has been a standard practice to assume the independence of claim frequency and claim severity, but there has been a sporadic interest in the actuarial literature exploring models that depart from this independence. We extend the work of Garrido, et al. (2016) which uses generalized linear models (GLMs) that accounted for dependence between claim frequency and severity and simultaneously incorporated rating factors to capture policyholder heterogeneity. In addition to rating factors, we quantify and explain the contribution of the variability of claims among policyholders through the use of random effects using generalized linear mixed models (GLMMs). We calibrated our proposed GLMM model using a portfolio of auto insurance contracts from a Singapore insurer where we observed claim counts and amounts from individual policyholders for a period of nine years. We compared our results with the dependent GLM model considered by Garrido, et al. (2016), Tweedie models, and the case of independence. Using out-of-sample validation procedures, we find that the statistical results demonstrate a more superior model when random effects are considered within a GLMM framework. This is joint work with H. Jeong (U of Connecticut), J. Ahn (Ewha Womans U), and S. Park (Seoul National U).

Note: If you are not presenting a paper for this Colloquium, please include as much detail as possible in your Synopsis (maximum three pages) to enable delegates to prepare for your session.