

Title: Dependent Multi-Peril Ratemaking Models

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Abstract:

This paper considers insurance claims that are available by cause of loss, or peril. Using this multi-peril information, we investigate multivariate frequency and severity models, emphasizing alternative dependency structures. Although dependency models may be used for many risk management strategies, we focus on ratemaking.

Motivation for this research comes from homeowners insurance and so, for the frequency portion, we consider binary response models. Specifically, we examine several multivariate binary regression models that have appeared in the biomedical literature, focusing on a dependence ratio model. For multivariate severity, we use Gaussian copulas to represent dependencies among gamma regressions. We also explore connections among perils using instrumental variable estimation, a commonly used technique in econometrics.

We calibrate competing models based on a representative sample of over 400,000 policy-years and validate them using a held-out sample of over 350,000 policy-years. We find that instrumental variable methods that allow for cross-dependencies among perils provide important economic value in pricing.