



Hierarchical Bayesian approach for modelling flood losses in private households

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The complexity of flood loss estimation models have been increasing from stage-damage functions to multi-parametric data mining methods (Merz et al., 2013), contributing to better prediction of flood losses (Schröter et al., 2014). These models are based on empirical data derived from detailed interviews conducted on exposed households. The models with high complexity use a larger number of predictors comprising of hydrologic and hydraulic aspects, early warning and emergency measures, precaution, experience, building characteristics and socio-economic status of households. Moving forward towards developing an integrated systems approach for estimating flood risk, it is important to derive a flood loss model that measures uncertainty in loss estimation, minimizes selection bias and accounts for data uncertainties.

We implement a hierarchical Bayesian model to estimate flood losses incurred by private household buildings. The proposed model considers private precaution, flood experience and building characteristics as the attributes reflecting a households' vulnerability. The household units belonging to a particular vulnerability categorization are exchangeable. The partial pooling of the hierarchical approach help us balance bias and variance in the model, thus minimizing selection bias. Further, Bayesian methods inherently account for data uncertainty in accordance with the mathematical model (likelihood function) and also allow us to incorporate expert knowledge about the influence of flood risk predictors on building loss as priors at the top level of the hierarchy.

References

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