

Location as risk factor Spatial analysis of an insurance data-set

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Abstract

Our aim was to examine the territorial dependence of risk for household insurances. We assumed that the counts of claims of each contracter are Poisson distributed with the appropriate parameter. Besides the classical risk factors such as type of wall, building, etc., we considered the location associated to each contract. In our first approach we used Markov random field model to describe the spatial effect. Basically there are two ways of fitting the model; we fit a GLM to the counts of claims with the classical risk factors and regarding their effects as fixed we fit the spatial model. Alternatively we can estimate the effects of all covariates jointly. Although this latter may seem to be a more accurate approach, its high complexity and computational demands makes it no feasible in our case. To overcome the disadvantages of the separate estimation of the classical and the spatial risk factors we proceeded as follows: first we used a GLM for the non-spatial covariates, and then fitted the spatial model by MCMC. Then we refitted the GLM and the spatial model again, and we iterated this procedure several times. We achieved a much better fit by performing these two steps eight times. Another approach was that instead of using hierarchical Bayes model we estimated the value of the spatial parameters by a maximum likelihood estimate. In this model we assumed Potts model for the relative risk of the regions. As result we achieved analytically insolvable equations, so we used Expectation Maximization (EM) algorithm to get the estimates. In case of high dimension we also used Monte Carlo EM algorithm.

References

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