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Modelling bivariate count series with excess zeros. (English) Zbl 1071.62079
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Summary: Bivariate time series of counts with excess zeros relative to the Poisson process are common in many bioscience applications. Failure to account for the extra zeros in the analysis may result in biased parameter estimates and misleading inferences. A class of bivariate zero-inflated Poisson autoregression models is presented to accommodate the zero-inflation and the inherent serial dependency between successive observations. An autoregressive correlation structure is assumed in the random component of the compound regression model. Parameter estimation is achieved via an EM algorithm, by maximizing an appropriate log-likelihood function to obtain residual maximum likelihood estimates.

The proposed method is applied to analyze a bivariate series from an occupational health study, in which the zero-inflated injury count events are classified as either musculoskeletal or non-musculoskeletal in nature. The approach enables the evaluation of the effectiveness of a participatory ergonomics intervention at the population level, in terms of reducing the overall incidence of lost-time injury and a simultaneous decline in the two mean injury rates.

MSC:

62M10 Time series, auto-correlation, regression, etc. in statistics (GARCH)
62P10 Applications of statistics to biology and medical sciences; meta analysis

Cited in 4 Documents

Keywords:

autoregression; bivariate Poisson; EM algorithm; random effects; zero-inflated Poisson model; zero-inflation

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