Inference and Computational Methods for Regression Modelling in Multiple Time Series of Counts with Random Effects.

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Abstract

This talk is concerned with regression modelling of multiple independent time series of counts in which there is serial dependence and random effects terms. Given covariates the observed response follows a discrete distribution such as Poisson, binomial or negative binomial. Application is made to assessing the impact on single vehicle nighttime fatalities of lowering the legal BAC limit for drivers in 17 US states. This example is typical of many others that are encountered particularly in public health and epidemiology applications. In examples such as these there are multiple time series in which shared regression effects need to be tested for equality and there is the potential for serial dependence. The paper presents a simple and easily implementable fixed effects model approach based on prior work for univariate discrete valued time series. Random effects alternative to these models are also developed and applied to the above example. This is the main innovation of the work reported as it allows extension of existing mixed model procedures for count data to incorporate serial dependence. The structure of the model has some similarities to longitudinal data transition models with random effects. However, in contrast to that setting where there are many cases and few to moderate observations per case, the time series setting has many observations per series and a few to moderate number of series.

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