Multinomial-Poisson Homogeneous Models: A Practitioner's Guide

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Multinomial-Poisson homogeneous (MPH) models make up a broadly-applicable class of contingency table models, a class that includes both log-linear and non log-linear models. For example, any model that places smooth constraints on the table probabilities can be formulated as an MPH model. Other examples of MPH models include loglinear and generalized loglinear models, and the multinomial linear predictor models of Grizzle et al. (f969). The impetus behind the introduction of MPH models was to free researchers to think outside, or inside, the loglinear model box when faced with contingency table data. Specifically, with MPH models, researchers can more directly formulate hypotheses of interest and carry out the corresponding likelihood-based inferences.

Whereas previous research focused on the derivation of theoretical results, this presentation is more of a practitioner's guide to MPH modeling. We give a simplified description of the models and explain the utility of using homogeneous constraints. In addition, we explain how to use the R program mph.fit to carry out maximum likelihood estimation of MPH models and the special sub-class of Homogeneous Linear Predictor (HLP) models. Several examples illustrate the MPH/HLP implementation. Along the way, the examples will touch on other topics including improved interval estimation, estimability of contingency table parameters, and graphical displays of model goodness of fit.

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