BIAStatistika (2009)
Vol. 3, *No. 1, hal.* 41-60

Penduga Maksimum Likelihood untuk Parameter Dispersi Model Poisson-Gamma dalam Konteks Pendugaan Area Kecil

The Maximum Likelihood of Estimating Dispersion Parameter for Poisson-Gamma Model in Small Area Estimation Context

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Abstract

The Poisson-Gamma (Negative Binomial) distribution is considered to be able to handle overdispersion better than other distributions. Estimation of the dispersion parameter, ϕ, is thus important in refining the predicted mean when the Empirical Bayes (EB) is used. In GLM's sense dispersion parameter (ϕ) have effects at least in two ways, (i) for Exponential Dispersion Family, a good estimator of ϕ gives a good reflection of the variance of Y, (ii) although, the estimated β doesnt depend on ϕ, estimating β by maximizing log-likelihood bring us to Fisher's information matrix that depends on its value. Thus, ϕ does affect the precision of β, (iii) a precise estimate of ϕ is important to get a good confidence interval for β. Several estimators have been proposed to estimate the dispersion parameter (or its inverse). The simplest method to estimate ϕ is the Method of Moments Estimate (MME). The Maximum Likelihood Estimate (MLE) method, first proposed by Fisher and later developed by Lawless with the introduction of gradient elements, is also commonly used. This paper will discuss the use of those above methods estimating ϕ in Empircal Bayes and GLM's of Poisson-Gamma model that is applied on Small Area Estimation.

Keywords: Small Area Estimation, Empirical Bayes, Poisson-Gamma, Negative binomial, dispersion parameter, MLE, MME.

PENDAHULUAN

Latar Belakang

Dalam pendugaan area kecil (*small area estimation*), berbagai metode telah dikembangkan khususnya menyangkut metode yang berbasis model (*model-based area estimation*). Metode tersebut adalah penduga prediksi tak bias linier terbaik empirik atau *empirical best linear unbiased prediction* selanjutnya disebut *EBLUP*, Bayes empirik atau *empirical Bayes* disingkat *EB*, dan Bayes hierarkhi atau *Hierarchical*