“Nonparametric Probability Forecasting: Assessment and Application to Counts”

This paper investigates the problem of non-parametrically forecasting the probability distribution of a future observation from a stochastic process. Thus, the object of interest is a function; the distribution function of the future observation or, perhaps, the density or mass function if that is more convenient. Within a class of models it is desirable to estimate the future distribution in a manner that in non-parametrically efficient and to be able to assess the effect of sampling error on the function that has been forecasted.

In the context of a class of models for count data, a non-parametric MLE is developed for the forecast distribution and this estimator is shown to non-parametrically asymptotically efficient. Thus, within the model class the NPMLE forecast distribution is optimal. To assess the effect of sampling fluctuations on the estimated function a bootstrap method is suggested. This involves bootstrapping an infinite dimensional object in a metric space and some ideas and results are presented for constructing a "confidence representation" for the estimated forecast distribution. Outside of the model class, a more traditional MSE type approach is adopted to assess the performance of the (mis-specified) NPMLE and some Monte Carlo results are presented.