Stockholm University

Mathematical Statistics
Stockholm University
Master Thesis **2012:8**
http://www.math.su.se

Multiple Measurement Error Regression with autocorrelated errors in predictors as a prediction method

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September 2012

Abstract

The aim of this master thesis is to evaluate the performance of multiple linear functional measurement error (ME) regression with autocorrelated errors in predictors as a prediction method. Setting it in a climate context, the aim is to investigate whether this method can be used for predictions of past values of temperature over a large region. Using the primary data representing true values a large number of datasets were generated by the model of interest. Because multicollinearity was not detected all five given true predictors have been included in the model. To achieve independency in the errors an appropriate transformation has been applied. Based on Monte-Carlo methods, the results have indicated that data do not support consistent parameter estimation under ME model with no error in the equation independently of how strong autocorrelation is and how large the error variation is. The same problem was present even under the ME model with an error in the equation though not for data where the error variation accounted for 20% of the total variation in each observed predictor (which was the lowest level of the error variation analysed). Using this type of data the model has demonstrated an adequate prediction performance in terms of MSEP. However the long run analysis of confidence intervals (CI's) with the nominal confidence level 0.9 has indicated a large variability in possible values of the actual coverage probability, suggesting to use this model as a prediction method with great caution even if the error variation is modest. Further the thesis aims to illustrate the inappropriateness of the use of models, which either do not take into consideration autocorrelation in measurement errors or do not allow for errors in predictors at all, when data contain predictors with autocorrelated errors. Based on the same original datasets above, the analysis has indicated the high probability of obtaining of extremely large estimators under ME regression, assuming uncorrelated errors in each predictor, both with no error in the equation and with an error in the equation. The inappropriateness of ordinary multiple regression, whose estimators turned out to take reasonable values, has been detected under the long run analysis of 90% CI's: the estimated coverage probabilities turned out to be less than 0.45 for all magnitudes of the error variation.

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