

STATISTICAL ANALYSIS AND DATA MINING

Original Article

Fast robust SUR with economical and actuarial applications

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Abstract

The seemingly unrelated regression (SUR) model is a generalization of a linear regression model consisting of more than one equation, where the error terms of these equations are contemporaneously correlated. The standard feasible generalized linear squares (FGLS) estimator is efficient as it takes into account the covariance structure of the errors, but it is also very sensitive to outliers. The robust SUR estimator of Bilodeau and Duchesne (Canadian Journal of Statistics, 28:277–288, 2000) can accommodate outliers, but it is hard to compute. First, we propose a fast algorithm, FastSUR, for its computation and show its good performance in a simulation study. We then provide diagnostics for outlier detection and illustrate them on a real dataset from economics. Next, we apply our FastSUR algorithm in the framework of stochastic loss reserving for general insurance. We focus on the general multivariate chain ladder (GMCL) model that employs SUR to estimate its parameters. Consequently, this multivariate stochastic reserving method takes into account the contemporaneous correlations among run - off triangles and allows structural connections between these triangles. We plug in our FastSUR algorithm into the GMCL model to obtain a robust version. © 2016 Wiley Periodicals, Inc. Statistical Analysis and Data Mining: The ASA Data Science Journal, 2016

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