

Regularized Nonlinear Regression with Dependent Errors and its Application to a Biomechanical Model

Wei-Ying Wu

Department of Applied Mathematics, National Dong Hwa University, Taiwan

Abstract

A biomechanical model often requires parameter estimation and selection in a known but complicated nonlinear function. Motivated by observing that data from a head-neck position tracking system, one of biomechanical models, show multiplicative time dependent errors, we develop a modified penalized weighted least squares estimator. The proposed method can be also applied to a model with non-zero mean time dependent additive errors. Asymptotic properties of the proposed estimator are investigated under mild conditions on a weight matrix and the error process. A simulation study demonstrates that the proposed estimation works well in both parameter estimation and selection with time dependent error. The analysis and comparison with an existing method for head-neck position tracking data show better performance of the proposed method in terms of the variance accounted for (VAF).

Key words and phrases: nonlinear regression; temporal dependence; multiplicative error; local consistency and oracle property