Variable selection for functional index coefficient models and its application in finance and engineering

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Abstract

Variable selection with a non-concave penalty function has become popular in recent years, since it has ability to select significant variables and to estimate unknown regression coefficients simultaneously. In this dissertation, I consider variable selection in a functional index coefficient model under strong mixing context. My selection procedures with smoothly clipped absolute deviation penalty function consist of two steps. The first is to select significant covariates with functional coefficients and it is then to do variable selection for local significant variables with parametric coefficients. The asymptotic properties such as consistency, sparsity and the oracle property of these two step estimators are established, whereas easy computational algorithms are suggested to highlight the implementation of the proposed procedures. Monte Carlo simulation studies are conducted to examine the finite sample performance of the proposed estimators and selection procedures. Meanwhile, two financial examples including functional index coefficient autoregressive models and functional index coefficient models for the stock return predictability are presented. Finally, two engineering applications of local annual average daily traffic (AADT) estimation and seasonal factors calculation are extensively studied in two chapters respectively.

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