COMPUTING THE B SPLINES WITH S-ESTIMATORS FOR VARYING COEFFICIENT MODELS

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Abstract. The B splines with S-estimation method is used to study the varying coefficient models and obtain a simple estimation form of the coefficient functions. A generalized cross validation (GCV) criterion is derived for the S-estimation, which is an extension of the generalized cross validation criterion concerned with the least squares estimation. In addition, an iterative algorithm is given to determine the optimal S-estimation. Monte Carol simulation is performed to investigate the fitting and finite sample properties. Furthermore, percentile bootstrap confidence intervals are established for the B splines with S-estimation by means of the bootstrap method.

Keywords. B splines with S-estimators, bootstrap confidence intervals, iterative algorithm, optimal estimators, varying coefficient models.

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1 Introduction

Recently, with the development of computers and statistical methods, it was established that results obtained from models with constant coefficients cannot fully satisfy the needs of actual application (see e.g. [6] and [9]). Therefore, it is necessary to investigate some models with varying coefficients. One of the important models with varying coefficients is the model ([9]) given by

$$Y_i = \sum_{l=0}^{L} X_{il}\alpha_l(t_i) + u_i, \quad i = 1\ldots, n, \qquad (1)$$

where X_{il} and t_i are covariates, Y_i is the response variable, $\{\alpha_l(\cdot)\}_{l=0}^{L}$ are unknown smoothing functions and u_i is a random error with zero expectation and finite variance σ^2. Generally, model (1) allows varying intercepts by selecting $X_{i0} = 1$. In fact, we can see that the varying coefficient model (1) is a useful extension of constant coefficient models. Namely, the coefficients depend on some covariate t_i.

In the past few decades, the study of varying coefficient models has been carried out in terms of theory and application. In theory, the methods of