zbMATH Open
THE FIRST RESOURCE FOR MATHEMATICS

Amemiya, Yasuo; **Fuller, Wayne A.**

Estimation for the nonlinear functional relationship. (English) Zbl 0669.62046

Ann. Stat. 16, No. 1, 147-160 (1988).

Let $\{b_n\}_{n=1}^{\infty}$ and $\{a_n\}_{n=1}^{\infty}$ be sequences of positive real numbers such that $a_n \cdot b_n = n$. Let

$$f(z_t^0, \beta^0) = 0, \quad t = 1, 2, ..., b_n$$

be a functional relationship, where z_t^0 are unobservable fixed vectors belonging to a parameter space $\Gamma \subset R^p$, $\beta^0 \in \Omega \subset R^k$ is a $1 \times k$ vector of unknown parameters,

$$f(z, \beta): \quad \Gamma \times \Omega \to R^1.$$

The observations are the p-dimensional vectors

$$Z_{nt} = z_t^0 + \epsilon_{nt}, \quad t = 1, ..., b_n,$$

where ϵ_{nt} are i.i.d. r.v. with mean zero and covariance matrix $\Sigma_n = a_n^{-1}\Phi$, where $\Phi > 0$ is a fixed matrix. The maximum likelihood estimators $\hat{\beta}$ and $\hat{z}_t$ are the values of β in Ω and z_t in Γ that minimize

$$\sum_{t=1}^{b_n}(Z_{nt} - z_t)\Sigma_n^{-1}(Z_{nt} - z_t)'$$

subject to $f(z_t, \beta) = 0$, $t = 1, ..., b_n$. Conditions for consistency and asymptotic normality of $\hat{\beta}$ and $\hat{z}_t$ are investigated. Modifications of the maximum likelihood estimators (bias-adjusted estimators) are also considered.

Reviewer: N.Leonenko

MSC:

62J02 General nonlinear regression
62F12 Asymptotic properties of parametric estimators
62H12 Estimation in multivariate analysis

Keywords:

nonlinear implicit relationship; measurement errors; asymptotic bias; maximum likelihood estimators; consistency; asymptotic normality; bias- adjusted estimators

Full Text: DOI