Large Sample Property of General Shock Model

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Abstract:

In this paper, we mainly study the statistical inference of the general shock model. Let $N = \min\{X_i \geq z\}$ be the shock times until the system fails.z is the threshold level,a non-negative constant.obviously, $T = \sum_{k=1}^{N} Y_k$ be the lifetime of the system.If the system is censored by a random variable U: $T_1 = U \wedge T$, T_1 is the lifetime of the system under the stochastic censoring data conditions.In section 2.1,we get the expression of $z = \bar{F}^{-1}(\frac{EY}{ET})$ Wald equation,and use sample distribution function,get the estimation of $\bar{F}^{-1}$. Y_i and T are censored by U,we use Kaplan-Meier method to estimate ET,then get the survival function of T and the estimation of mean lifetime ET,

$$\hat{E}T = \int_0^\infty \hat{S}^n(t)dt, \quad \hat{S}^n(t) = \prod_{s \leq t}(1 - \Delta\hat{A}(s)) = \prod_{s \leq t}\Big(1 - \frac{\Delta N(s)}{Y(s)}\Big)$$

EY can be calculated by it's distribution. so $\hat{E}T \xrightarrow{\text{p}} ET$, and $\frac{EY}{\hat{E}T} \xrightarrow{\text{p}} \frac{EY}{ET}$, then we get: $\hat{z} \xrightarrow{\text{p}} z$. At last,we give the simulations of ET and z.