1. Estimation

Statistic

Let:

- $(\Omega, \mathcal{A}, \mathcal{P})$ m-D statistical model parametrized by Θ
- (M, Σ) measurable space
- $X : \Omega \to M$ random variable
- $f : M \to \mathbb{R}^m$

Then, f is a statistic if:

- f measurable

We denote:

- $f : T$

Sufficiency

Let:

$\cdot$ $(\Omega, \mathcal{A}, \mathcal{P})$ m-D statistical model parametrized by Θ

$\cdot$ (M, Σ) measurable space

$\cdot$ $X : \Omega \to M$ random variable

$\cdot$ $T : M \to \mathbb{R}^m$ statistic

Then, T is sufficient if:

$\cdot$ $\forall\ \theta_1, \theta_2 \in \Theta$:

$\forall\ x \in M$:

$\forall\ t \in \mathbb{R}^m$:

$$P_{\theta_1}(X = x \mid T \circ X = t) = P_{\theta_2}(X = x \mid T \circ X = t)$$

Estimator

Let:

$\cdot\, (\Omega, \mathcal{A}, \mathcal{P})$ statistical model parametrized by Θ

$\cdot\, (M, \Sigma)$ measurable space

$\cdot\, X : \Omega \to M$ random variable

$\cdot\, T : M \to \mathbb{R}^k$ statistic

$\cdot\, \theta \in \Theta$

Then, T is an estimator of θif:

$\cdot\, T$ approaches θ

Loss function

Let:

$\cdot\, (\Omega, \mathcal{A}, \mathcal{P})$ statistical model parametrized by Θ

$\cdot\, (M, \Sigma)$ measurable space

$\cdot\, X : \Omega \to M$ random variable

$\cdot\, T : M \to \mathbb{R}^k$ estimator

$\cdot\, W : \mathbb{R}^k \times \Theta \to \mathbb{R}^+$

Then, W is a loss function if:

$\cdot\, W(\theta, \theta) = 0$

Risk function

Let:

· $(\Omega, \mathcal{A}, \mathcal{P})$ statistical model parametrized by Θ

· (M, Σ) measurable space

· $X : \Omega \to M$ random variable

· $T : M \to \mathbb{R}^k$ estimator

· $W : \mathbb{R}^k \times \Theta \to \mathbb{R}^+$ loss function

We name risk function to:

$$\cdot \begin{array}{rcl} R_T : \Theta & \longrightarrow & \mathbb{R}^+ \\ \theta & \longmapsto & E_\theta(W(T, \theta)) \end{array}$$

UMV

Let:

$\cdot$ *statements*

$\cdot$

Then, *item* is a/an entity if:

$\cdot$ *conditions*

$\cdot$

We denote:

$\cdot$ *property* : *notation*

$\cdot$

Same conditions

Let:

- $(\Omega, \mathcal{A}, \mathcal{P})$ parametric statistical model
- $X : \Omega \to \mathbb{R}$ random variable
- $\Theta \subset \mathbb{R}$ interval
- χ_F real estimator with integrable quadratic
-

Then, *item* is a/an entity if:

- $\forall\ \theta \in \Theta$:

  $\exists\ h : \mathbb{R} \to \mathbb{R}$:

    $h \geq 0$

    h integrable

    $\exists\ \mathcal{U} \subset \mathbb{R}$:

      $\theta \in \mathcal{U}$

      $|T(x)\partial_\theta L(x, \theta)| \leq h$

Efficient

Let:

· mismas condiciones

Then, T is efficient if:

· $Var_\theta T = \frac{g'(\theta)^2}{I(\theta)}$