Note Title

Point Estimation

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Let Y be a random variable with p.d.f $f_Y(y|\theta)$ where $\theta \in \mathbb{R}$ $(-\infty < \theta < \infty)$.

- If θ is known, we can compute, in principle, all probabilities related to Y.
- In practice, θ is unknown.
- But, θ can be estimated by taking a sample from $f_Y(y|\theta)$.
- How to estimate θ?
- How "good" the estimator of θ to use it as a "proxy" to θ?

Let $Y_1, Y_2, \ldots Y_n$ be a random sample from $f_Y(y|\theta)$

<u>Estimator</u>:

Any function of $Y_1, Y_2, \ldots Y_n$ which is used for estimating θ is called an estimator of θ, denoted by $\hat{\theta}$

That is, $\hat{\theta} = U(Y_1, Y_2, \ldots, Y_n)$

<u>Unbiased Estimator</u>:

Let $\hat{\theta}$ be an estimator of θ.

If $E(\hat{\theta}) = \theta$ Then $\hat{\theta}$ is said to be an unbiased estimator of θ. Otherwise, That is when $E(\hat{\theta}) \neq \theta$, $\hat{\theta}$ is said to be a biased estimator of θ.

The bias of $\hat{\theta}$ to estimate θ is given by

$$B(\hat{\theta}) = E[\hat{\theta}] - \theta$$

<u>Mean Square Error of $\hat{\theta}$</u>

$$MSE(\hat{\theta}) = E\left[(\hat{\theta} - \theta)^2\right]$$
$$= V(\hat{\theta}) + \left[B(\hat{\theta})\right]^2$$