Estimation.

→ Estimator / Statistic.
→ Properties of estimators.
  → unbiased estimator.
  → asymptotically unbiased estimator.
  → consistency of an estimator.
  → MSE.

Methods of estimation.

(1) Method of moment estimator.

Observation $(X_1 = x_1, X_2 = x_2 \cdots X_n = x_n)$ from a population with say, pdf. $f_{\underline{\theta}}(\ )$
We are interested to estimate $(\theta_1\ \theta_2 \cdots \theta_k)$.

→ Compute
  (I) Theoritical moments from pdf.
  (II) emperical moment from data.
  (III) Construct k equations if you have k unknown parameters.
  (IV) Sove for k parameter values.

$E(x) = \mu_1' = 1$st order raw moment.

~~$E(x-\mu_1) = 0$~~:
$E(x^2) = \mu_2'$ or $Var(x) = E(x-\mu)^2 = \mu_2$.

$$\mu_1' = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$\mu_2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

$$\mu_3 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2 \quad \text{or.} \quad \mu_3' = \frac{1}{n}\sum x_i^3.$$

k many equations for k many parameter values.

Gamma (α, λ).

$$\mu_1' = \frac{\alpha}{\lambda} = \bar{X} \quad \text{——— (1)}$$

$$\mu_2 = \frac{\alpha}{\lambda^2} = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

solve for α and λ.

Ex. $x_1 \ldots x_n$ i.i.d (any (μ, σ^2)).

We cannot use methods of moment estimation for those cases where theoritical moments does not exists.

eg. $E(|x|)$ $E(x^2)$ as not finite.