Method of Moment Estimator

Estimators

An *estimator* is an operation computing the value of an estimate, that targets the parameter, using measurements from a sample.

Data

Let $X_1, \ldots, X_n \overset{iid}{\sim} F(\theta)$ where $F(\cdot)$ is a known distribution function and θ is a vector of parameters. Let $X = (X_1, \ldots, X_n)^{\mathrm{T}}$, be the sample collected.

Method of Moments

Let the kth moment be defined as μ_k and the corresponding kth moment average $\frac{1}{n}\sum_{i=1}^{n} X_i^k$:

$$\mu_k = \frac{1}{n}\sum_{i=1}^{n} X_i^k.$$

The parameter estimates are for t parameters are the solutions for μ_k for $k = 1, \ldots, t$.

Bernoulli Distribution

Let $X_1, \ldots, X_n \overset{iid}{\sim} \text{Bin}(1, p)$, find the method of moments estimator for p.

Poisson Distribution

Let $X_1, \ldots, X_n \overset{iid}{\sim} \text{Pois}(\lambda)$, find the method of moments estimator for λ.

Uniform Distribution

Let $X_1, \ldots, X_n \overset{iid}{\sim} U(1, \theta)$, find the method of moments estimator for θ.

Gamma Distribution

Let $X_1, \ldots, X_n \overset{iid}{\sim} \text{Gamma}(\alpha, \beta)$, find the method of moments estimator for α and β.

Nomal Distribution

Let $X_1, \dots, X_n \overset{iid}{\sim} N(\mu, \sigma^2)$, find the method of moments estimator for μ and σ^2.