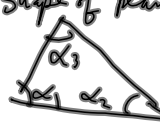


lecture 2 Mathematical model

- functional model
 - equations (algebraic)
- stochastic model
 - constant $\sigma = 0, \pi, e, 360^\circ$
 - observations $\sigma = \text{finite value}$
 - unknown $\sigma = \infty$

Counting exercise 2-1

shape of plane triangle



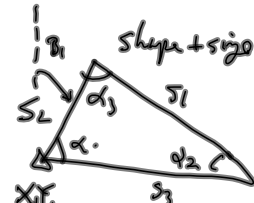
$n = 3$
 $n_0 = 2$
 $r = 1$

observations only (0 params)
↓ general LS, mixed model
★ indirect observations
#params = n_0

observations only:

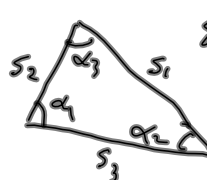
of condition equations = r
 $\hat{\alpha}_1 + \hat{\alpha}_2 + \hat{\alpha}_3 = 180^\circ$
 π rel.

shape + size + pos + orient



$n = 9$
 $n_0 = 6$
 $r = 3$

shape & size of plane Δ



$n = 6$
 $n_0 = 3$
 $r = 3$

$\hat{\alpha}_1 + \hat{\alpha}_2 + \hat{\alpha}_3 = 180^\circ = \pi$ rel.
 $\frac{s_1}{\sin \alpha_1} = \frac{s_2}{\sin \alpha_2} = \frac{s_3}{\sin \alpha_3}$
 $s_1^2 = s_2^2 + s_3^2 - 2s_2s_3 \cos \alpha_1$

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shape of Δ ~~$n=3$
 $n_0=2$
 $r=1$~~

given obs. must define the model
obs. must contribute to knowledge of model

stochastic: weight $w \sim \frac{1}{\sigma^2}$
we estimate $S^2 = \frac{\sum (x_i - \bar{x})^2}{n-1}$

$\sigma = .0001 = 10^{-4}$
 $\sigma^2 = 10^{-8}$
 $w = \frac{1}{\sigma^2} = 10^8$

$k = \sigma_i^2$
 σ_i^2
variance of unit weight
reference variance

$w_i \sim \frac{1}{\sigma_i^2}$ your choice
 $w_i = \frac{k}{\sigma_i^2}$ 2-2

2 approaches to pick k

- choose a commonly occurring observation, take its variance to be k $w_i = \frac{\sigma^2}{\sigma_i^2} = 1$
- choose $k=1$

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