Discussion section, week of 4-8 Jun 2018

Disc. Sec 9 #1 | p. R. 7* | AMS 7 4 Jun 18

①

$$°F = \underbrace{\tfrac{9}{5}\,°C}_{x} + 32°$$

	y	x
	y_1	x_1
	$\vdots$	$\vdots$
	y_n	x_n
mean	$\bar{y}$	$\bar{x}$
SD	s_y	s_x

n

$$r = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_i - \bar{x}}{s_x^*}\right)\left(\frac{y_i - \bar{y}}{s_y^*}\right)$$

$$\left(s_x^* = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2} \right)$$

(& similarly for s_y^*)

inferential summary

unknown pop. qty. of main interest	ρ = pop. corr. between temp. & oxygen
estimate of ρ	$r = -.99$
give or take for r as est. of ρ	$\widehat{SE}(r) \doteq 0.0085$
95% CI for ρ approx.	$r \pm 1.96\,\widehat{SE}(r) = (-1, -0.97)$

②

pop.
all birds of same species, same temp. range

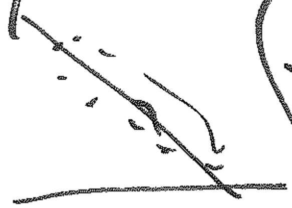
sample
the observed birds

imag. data
all possible r values

(x,y) pair

y	x
mean $\mu_y = ?$	$\mu_x = ?$
SD $\sigma_y = ?$	$\sigma_x = ?$

$\rho = ?$



like IID

y	x (temp)
mean $\bar{y}$ $= 3.625$	mean $\bar{x} =$ -1.75
SD s_y $\doteq 1.13$	SD $s_x \doteq$ 12.74

$n = 8$

$r = -0.99$

like IID

pop. scatter plot

sample scatter plot

⋮

$n = 8$

$r = ?$
(ex. -0.97)

-0.99
$-.97$
⋮

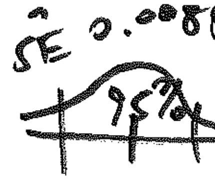
$M \to \infty$

long run mean $E_{IID}(r) \doteq \rho$

est. $\doteq 0.0085$

long run SD $\widehat{SE}_{IID}(r) = *$

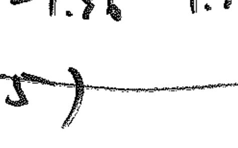
long run hist



-1

Approx. long run hist

$\widehat{SE}$ 0.0085



-1.96 1.96

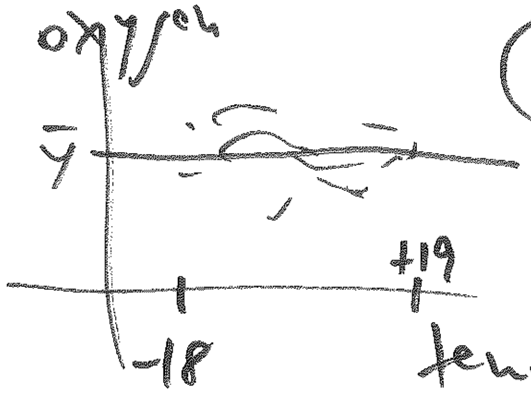
$*$

$$\widehat{SE}_{IID}(r) = \frac{1 - \cancel{\rho^2}\, r^2}{\sqrt{n-3}}$$

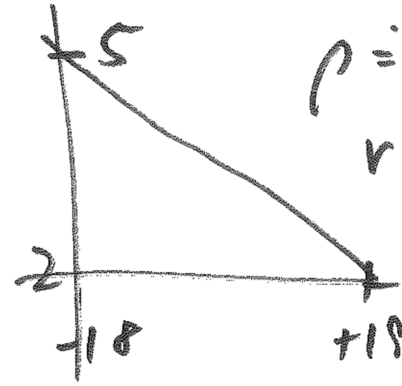
$\doteq 0.0085$

$-.9904 \pm (1.96)(.0085)$

$(\cancel{-1.01}\ {-1}, -0.97)$



$\rho = 0$ $(r \doteq 0)$



$\rho \doteq -1$

$r = -.99$

$x = -18 \rightarrow \hat{y} = 3.625$

$x = +19 \rightarrow \hat{y} = 3.625$

$r \doteq 0$ not practsig

$x = -18 \rightarrow \hat{y} \doteq 5$

$x = +19 \rightarrow \hat{y} \doteq 2$

(massively practsig)

use exact same argument to judge if slope $\hat{\beta}_1$ is practsig

$\underbrace{\hat{y}}_{\text{oxy.}} = \hat{\beta}_0 + \hat{\beta}_1 \underbrace{x}_{\text{temp.}}$

$\hat{\beta}_1 = -0.0877587$

$\doteq -0.088$

$\hat{\beta}_0 = 3.4714223$

$\doteq 3.47 \doteq 3.5$

$\hat{SE}(\hat{\beta}_1) = 0.004993$

$\doteq 0.0050$

$\hat{SE}(\hat{\beta}_0) = 0.060123 \doteq 0.060$

95% CI for β_1 : $\hat{\beta}_1 \pm \left(t^{0.95}_{n-2}\right) \widehat{SE}(\hat{\beta}_1)$

$\doteq$

$-.088 \pm (2)(.005)$

statsig