NB10

STAT 206
27 Feb 20

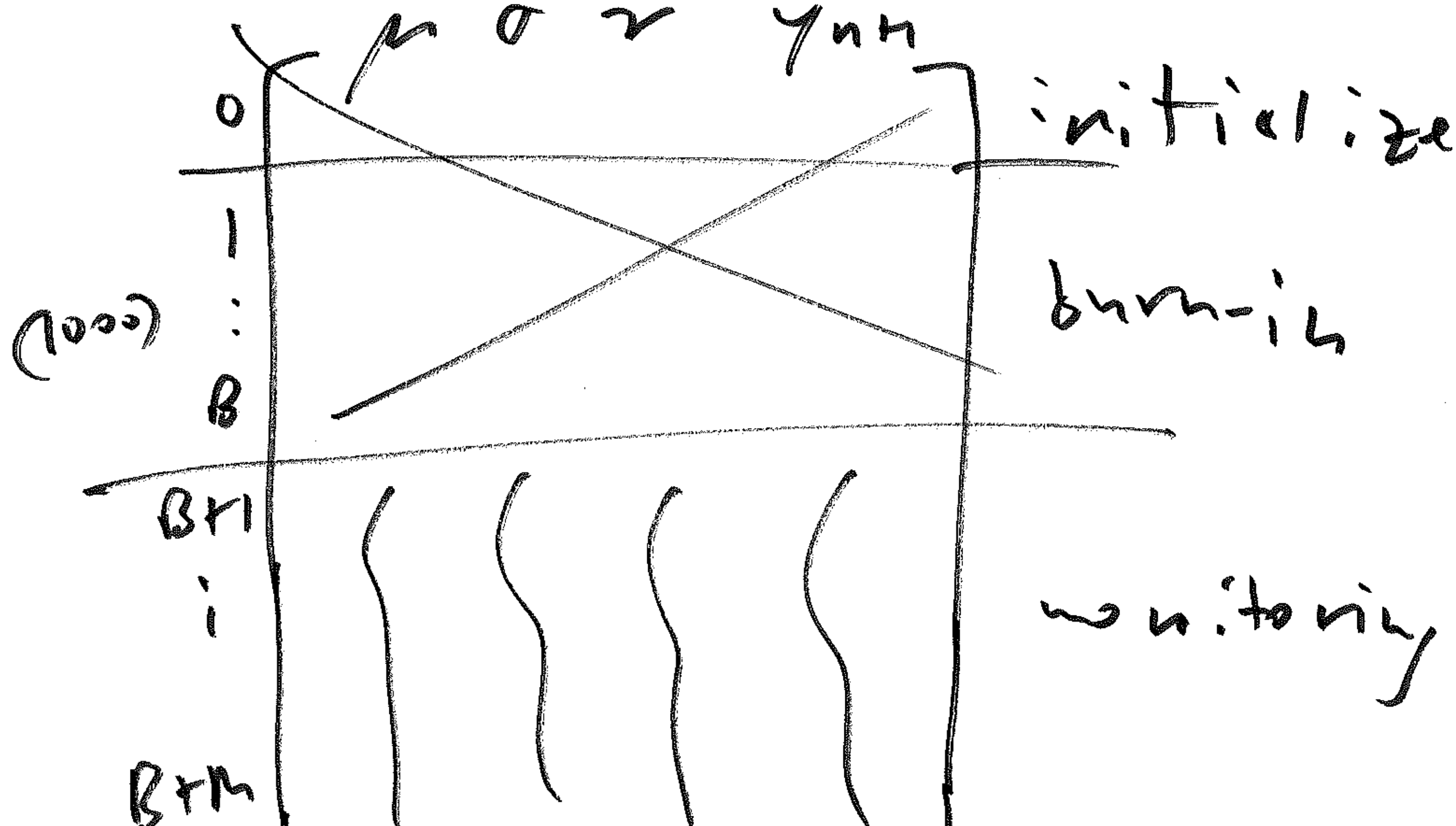
1

$(\mu\ \sigma\ \nu \mid \mathcal{B}) \sim LI$

$(Y_i \mid \mu\ \sigma\ \nu\ T\ \mathcal{B}) \overset{IID}{\sim} t_\nu(\mu, \sigma^2)$

$y = (y_1, \dots, y_n)$ $(i = 1, \dots, n)$

$p(\mu\ \sigma\ \nu \mid y\ (LI)\ T\ \mathcal{B}) = ?$ MCMC



$$\theta^*_{t+1} = \theta_0 + \rho\,\theta^*_t + e_i \leftarrow \text{IID } N(0,\sigma^2)$$

(k = 1)

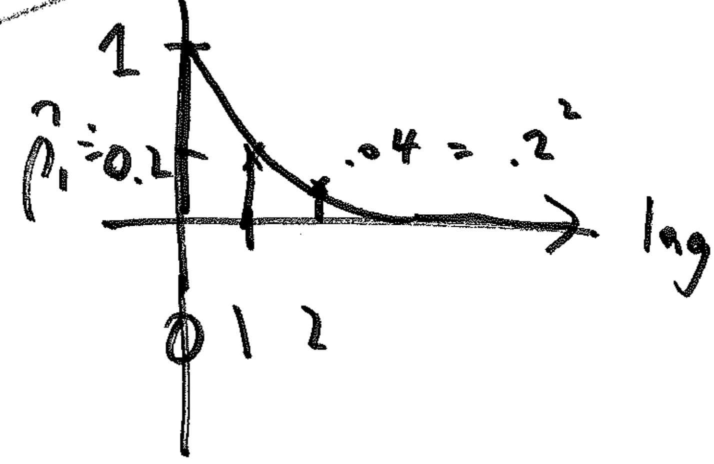
linear regression model

$Y_i = \beta_0 + \beta_1 x_i + e_i$ ← IID $N(0,\sigma_e^2)$

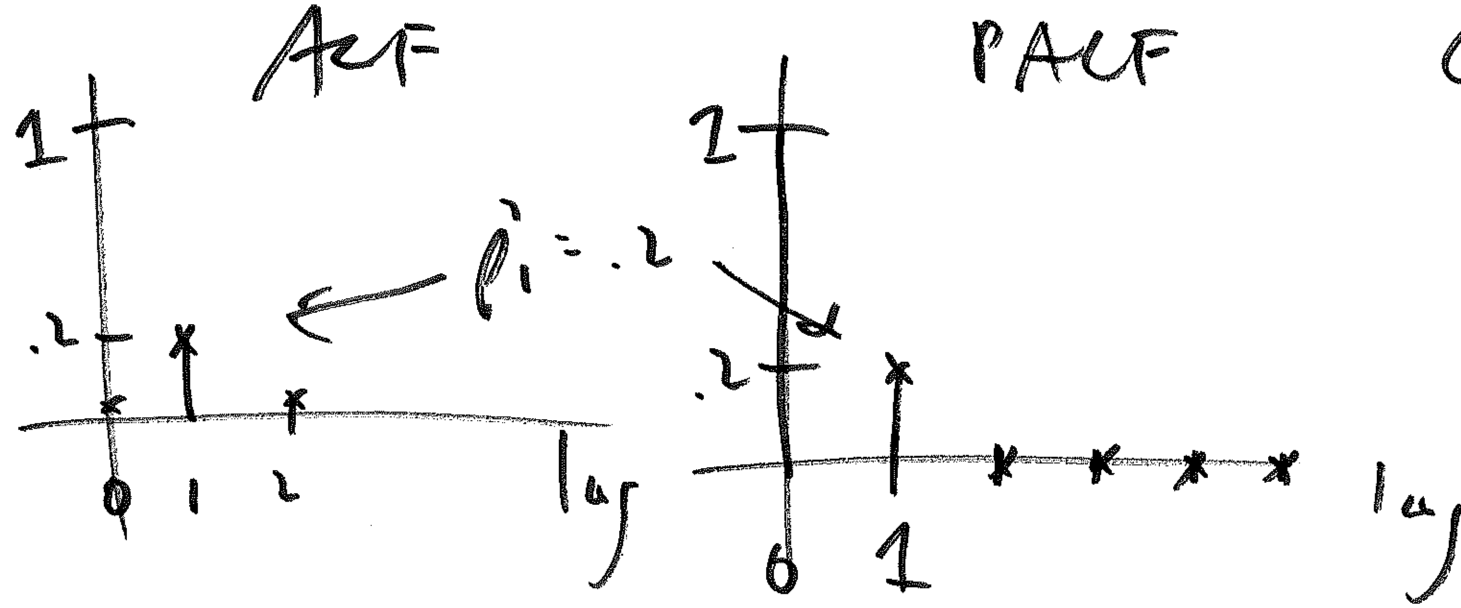
autoregressive model of order 1 $\boxed{AR_1(\rho_1)}$

with first-order autocorrelation ρ_1

ACF



$$\begin{bmatrix} \theta^*_1 & \times \\ \theta^*_2 & \bar{\theta}^*_1 \\ \theta^*_3 & \theta^*_2 \\ \vdots & \\ \theta^*_m & \theta^*_{m-1} \\ \times & \theta^*_m \end{bmatrix}$$



$$\widehat{MCSE}(\bar{\mu}^*) = \overset{\text{IID}}{\frac{s_\mu}{\sqrt{m}}} \cdot \boxed{\sqrt{\frac{1+\hat\rho_1}{1-\hat\rho_1}}}$$

$$\bar{\mu}^* = \frac{1}{m}\sum_{j=1}^{m} \mu_j^*$$

if $0 \le \hat\rho_1 \le +1$, this ≥ 1

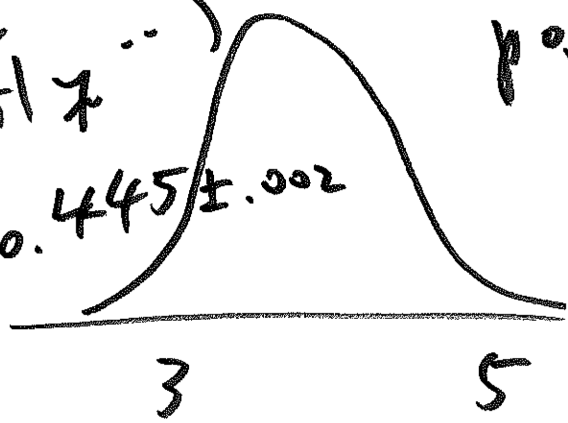
$\bar{\mu}^* = 404.29713$ est.

0.0018 MCSE

$= (404.30 \pm 0.0018)$ MC summary

$p(\sigma \mid y \ldots)$

(5) 0.445 ± .002



post. mean → 3.911 ± .002 (4)

$\boxed{3.91}$ 1 5 128 ± .0024

.002

post. SD (3)

0.4445896

.002

LN pt 10 pp. 49 →

Bayesian hierarchical modeling

(N) pop. (P)

All elderly non-inst. Danish people in 1980

(E) IHCA → (N)

hosp.

$$\begin{bmatrix} 1 \\ 0 \\ 1 \\ \vdots \end{bmatrix}$$

mean μ_E = ?

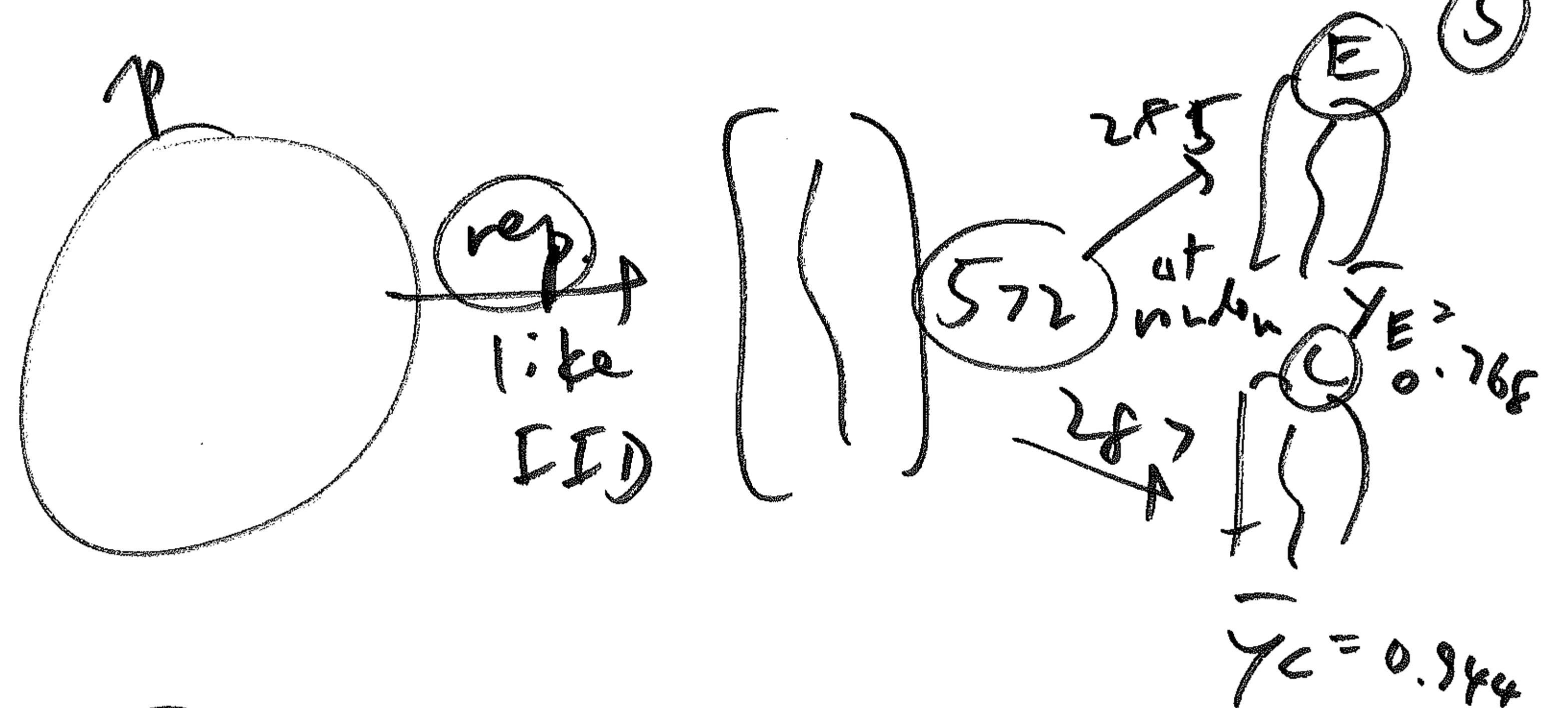
(C) control

hosp.

N

$$\begin{bmatrix} \\ \\ \\ \end{bmatrix}$$

mean μ_C = ?



$\bar{y}_E$ = good est. of μ_E

$\bar{y}_C$ = ______________ μ_C

$\left(\frac{\bar{y}_E - \bar{y}_C}{\bar{y}_C} \right) \leftarrow -0.19 = 19\%$ reduction

good est of $\left(\frac{\mu_E - \mu_C}{\mu_C} \right)$

devil's advocate (DA): $\mu_E = \mu_C$ i.e. $(\mu_E - \mu_C)$

null hypothesis $= \frac{\mu_E - \mu_C}{\mu_C} = 0$

positive conclusion

IHGA works

false positive (bad) worse

claiming IHGA works when it doesn't

false negative (bad)

claiming IHGA doesn't work when it does

null:

$(\mu_E - \mu_C) = 0$

(DA)

99.9% CI for $(\mu_E - \mu_C)$

$0 \quad (\quad)$

$(\bar{y}_E - \bar{y}_C)$

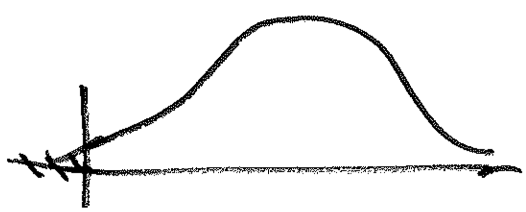
if 0 not in (99.9%) CI, declare that diff. between $(\bar{y}_E - \bar{y}_C)$ & 0 is stat. sig.

if statistically significant (stat. sig.), we do <u>not</u> support DA null story; instead we draw a positive conclusion

(false ⊕ is possible) but unlikely (99.9%)

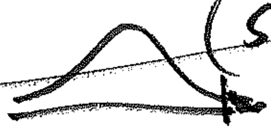
$\Delta = \mu_E - \mu_C$

$p(\Delta \mid D \ldots B)$



0

(stat. sig.)



1

$p\left(\frac{\mu_E}{\mu_C} \middle| D \ldots B\right)$ $p\left(\frac{\mu_E - \mu_C}{\mu_C} \middle| D \ldots B\right)$