SSE = Sum. Sq. Err.

(RSS)

$x \xrightarrow{\text{model}} \hat{y}$ predictions

$$\sum_{i=1}^{n} (\hat{y}_i - y_i)^2 = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

$$\hat{y}_i = \hat{\beta}_0 + x_i \hat{\beta}_1$$

$$SSE = \sum_{i=1}^{n} (y_i - (\hat{\beta}_0 + \hat{\beta}_1 x_i))^2$$

$$SST = \sum_{i=1}^{n} (y_i - \bar{y})^2 = \sum_{i=1}^{n} (\bar{y} - y_i)^2$$

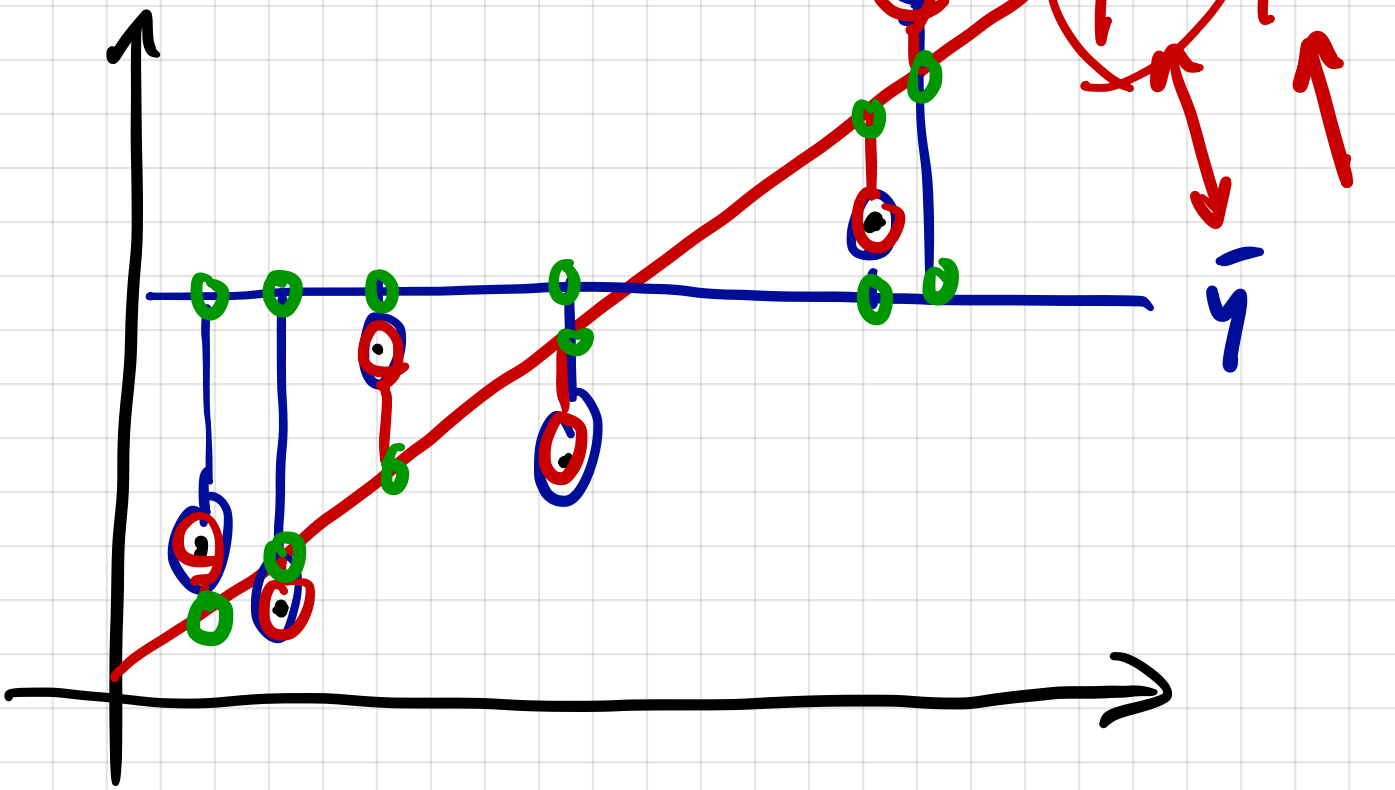
simplest model

$$SSR = \sum_{i=1}^{n} (\bar{y} - \hat{y}_i)^2$$

simple model

modeled value

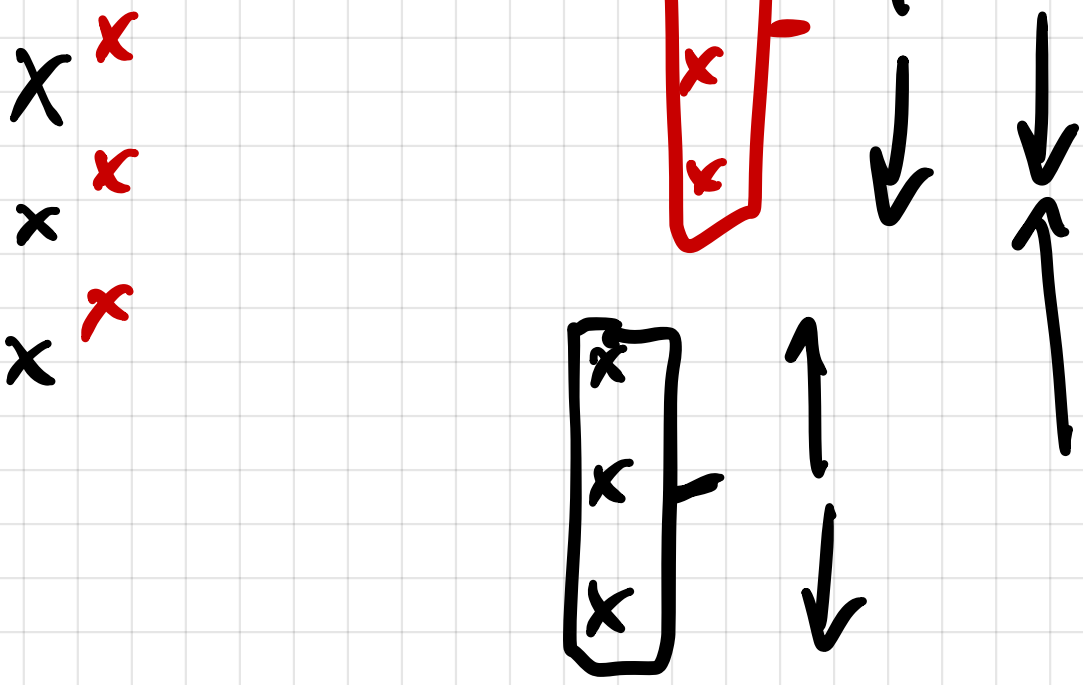
Amt of variation



ANOVA

Analysis of Variance

Are means different?



2 groups

① compute means for each group separately.

Control	B	Intervention A
2	10	10
4	12	6
6	14	8
↓	↓	↓
$\bar{y}_C = 4$	$\bar{y}_B = 12$	$\bar{y}_A = 8$

② Compute Le Grand Mean

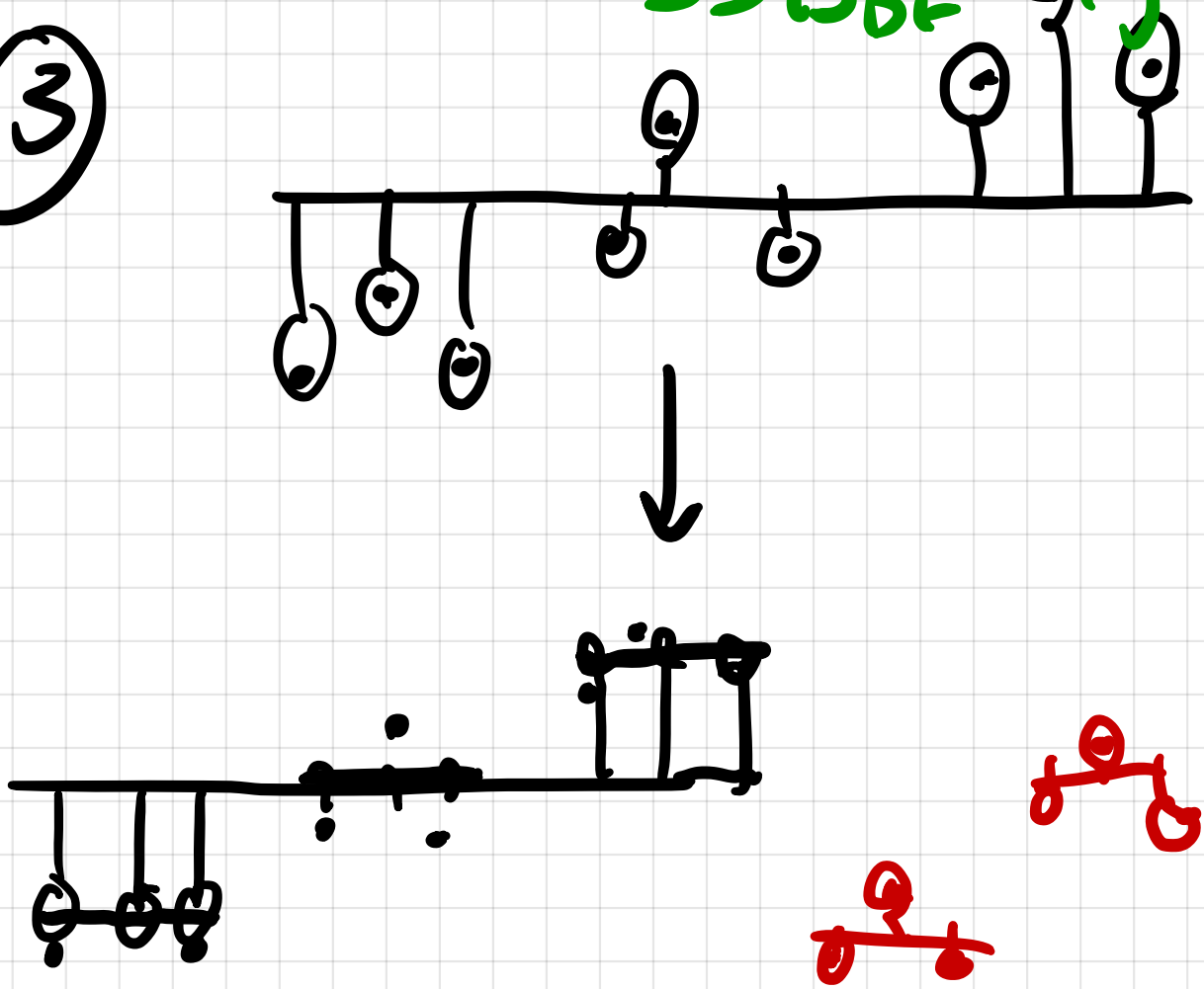
$$\bar{\bar{y}} = \frac{3 \cdot 4 + 3 \cdot 12 + 3 \cdot 8}{9} = 8$$

~~3~~ DF (4)

$SSW_{DF} = n - \#groups$

$SSB_{DF} = \#groups - 1$

(3)



$$\sum_{groups} \sum_{i=1}^{n_{group}} (\bar{y}_{group} - \bar{\bar{y}})^2 \quad SSB$$

$\bar{y}_{group}$: 3 groups; $\bar{\bar{y}}$: 1 grand mean

$$\sum_{groups} \sum_{i=1}^{n_{group}} (\bar{y}_{group} - y_{i,group})^2 \quad SSW$$

$\bar{y}_{group}$: 3 groups; $y_{i,group}$: 9 data pts

Assumptions about ANOVA?

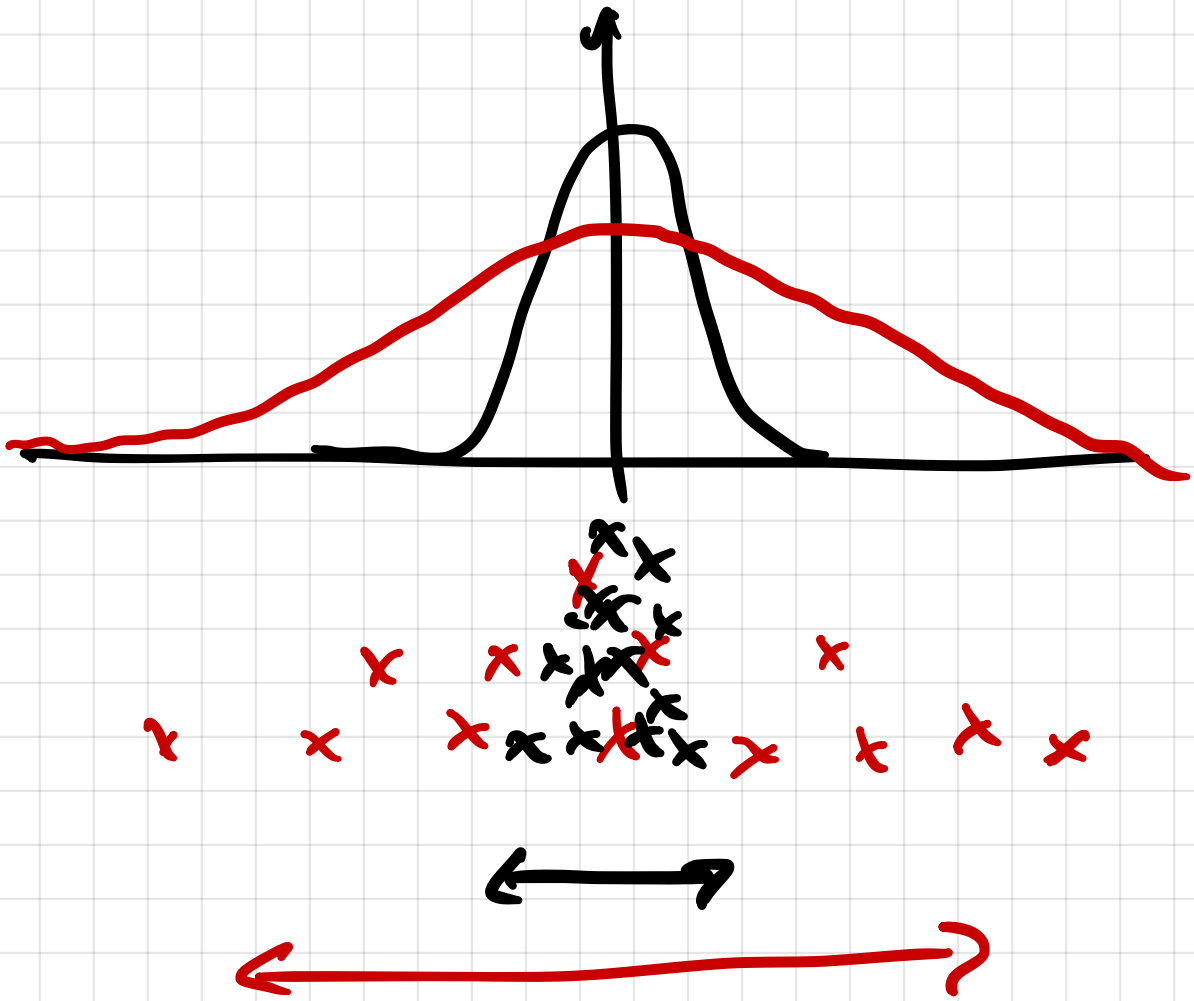
- Data drawn independently.
- "Schmorbably Schmeclibrated"
  - C. Ketelsen
- σ^2 same in each group.

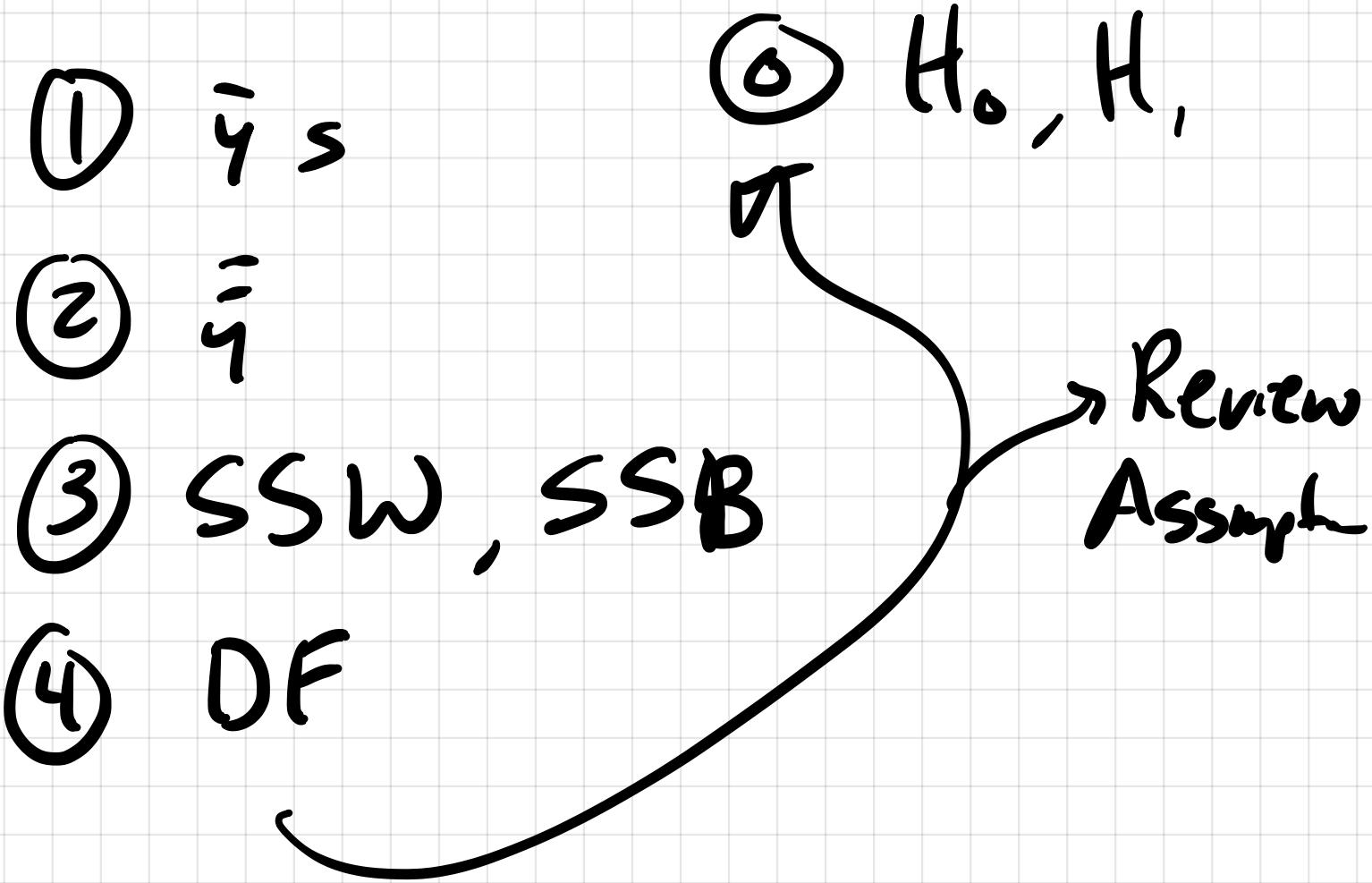
Homoskedasticity

Step ⓪:

H_0: $\mu_1 = \mu_2 = \ldots = \mu_{\#groups}$

H_1: One (or more) of these is not like the others.





F statistic ...?

$$\frac{SSB/DF_{SSB}}{SSW/DF_{SSW}}$$

$$F_{DF_{SSB}, DF_{SSW}} \quad \alpha$$

Z: NORMAL DATA
OR CLT APPLIES

t: NORMAL DATA
$n < 30$ (NO CLT)
UNKNOWN VARIANCE

χ^2: VARIANCES (DIRECTLY)

F: — MLR (SLR)
— ANOVA

VARIATION 1 / VARIATION 2