Chapter 20

- If we only have one observation for each case $SSE = 0$ and factor interactions, $(\alpha\beta)_{ij} = 0$, we can use MSAB to estimate σ^2
- So all the tests from 19 are the same replacing MSE w/ MSAB

Tukey's Test for additivity when $n=1$ this tests that all interactions $(\alpha\beta)_{ij} = 0$

- Assume $(\alpha\beta)_{ij} = D\alpha_i\beta_j$
- Use $Y_{ij} = \mu_{..} + \alpha_i + \beta_j + D\alpha_i\beta_j + \epsilon_{ij}$
- $\hat{D} = \dfrac{\sum_i\sum_j \alpha_i\beta_j Y_{ij}}{\sum_i \alpha_i^2 \sum_j \beta_j^2} = \dfrac{\sum_i\sum_j(\bar{Y}_{i.}-\bar{Y}_{..})(\bar{Y}_{.j}-\bar{Y}_{..})Y_{ij}}{\sum_i(\bar{Y}_{i.}-\bar{Y}_{..})^2\sum_j(\bar{Y}_{.j}-\bar{Y}_{..})^2}$
- $F^* = SSAB \div \dfrac{SSTO - SSA - SSB - SSAB^*}{ab-a-b}$
- $H_0: D = 0$, $H_a: D \neq 0$
- Reject when $F^* > F(1-\alpha, 1, ab-a-b)$

SAS

```
proc glm data=___;
    class x1 x2;
    model y = x1 x2 /solution;
    output out=tukey p=p;
run;
proc glm data=tukey;
    class x1 x2;
    model y = x1 x2 p*p;   /* p-value for p*p term */
run;
```