Chapter 12: Summary

1. One-way ANOVA Model: $Y_{ij} = \mu + \alpha_i + \epsilon_{ij}$, $j = 1, \cdots, J_i$, $i = 1, \cdots, I$, where μ is the general effect, α_i is the effect of the ith treatment, and the ϵ_{ij} are the errors. It is assumed that $\sum_{i=1}^{I} \alpha_i = 0$, and the ϵ_{ij} iid $\mathrm{N}(0, \sigma^2)$.

2. Let $\bar{Y}_{i0} = J_i^{-1} \sum_{j=1}^{J_i} Y_{ij}$, $i = 1, \cdots, I$ and $\bar{Y}_{00} = \sum_{i=1}^{I} \sum_{j=1}^{J_i} Y_{ij} / \sum_{i=1}^{I} J_i$.

3. Define Total SS $= \sum_{i=1}^{I} \sum_{j=1}^{J_i} (Y_{ij} - \bar{Y}_{00})^2$, Treatment SS $= \sum_{i=1}^{I} J_i (\bar{Y}_{i0} - \bar{Y}_{00})^2$ and Error SS $= \sum_{i=1}^{I} \sum_{j=1}^{J_i} (Y_{ij} - \bar{Y}_{i0})^2$.

4. Total SS = Treatment SS + Error SS.

5. We want to test $H_0 : \alpha_1 = \cdots = \alpha_I = 0$.

6. Under H_0, Treatment SS is distributed as a chisquare with $I - 1$ degrees of freedom. Error SS is ALWAYS (not just under H_0) is distributed as a chisquare with $\sum_{i=1}^{I} (J_i - 1)$ degrees of freedom.

7. When $J_1 = \cdots = J_I = J$, $\sum_{i=1}^{I} (J_i - 1) = I(J - 1)$.

8. Treatment MS = Treatment SS/DF, Error MS = Error SS/DF.

9. ANOVA TABLE:

Source	DF	SS	MS	F_{obs}	F_{Theo}
Treatment	$I - 1$	Treatment SS	Treatment MS	$\frac{\text{Treatment MS}}{\text{Error MS}}$	$F_{I-1, \sum_{j=1}^{I} (J_i - 1); \alpha}$
Error	$\sum_{i=1}^{I} (J_i - 1)$	Error SS	Error MS		
Total	$\sum_{j=1} J_i - 1$	Total SS			