

EEB 596z, Problem Set Three

Due Tuesday 29 Jan. 2002

1 : Consider a one-way ANOVA design with 5 factors and 10 replicates per factor. Suppose that factor variance σ_t^2 is ten percent of the total variance σ_T^2 (i.e., $\sigma_t^2/\sigma_T^2 = 0.10$).

- (a) Given that the total variance equals the treatment plus error variance ($\sigma_T^2 = \sigma_t^2 + \sigma_e^2$), what is σ_t^2/σ_e^2 ?
- (b) What is the 95% critical value for the F-test?
- (c) What is the power of this design (assuming a test of $\alpha = 0.5$) for a fixed-effects ANOVA?
- (d) What is the power of this design under a random-effects ANOVA?
- (e) Given these sample sizes, what is the smallest value of σ_t^2/σ_e^2 that gives a (fixed-effects) 95% test a power of 0.90? (You will need to do this, and some the remaining problems, by trial and error.)
- (f) Given these sample sizes, what is the smallest value of σ_t^2/σ_e^2 that gives a random-effects 95% test a power of 0.90?
- (g) How many replicates per factor are needed to give the fixed-effects ANOVA a power of 90% under a test of significant with $\alpha = 0.05$?
- (h) How many replicates per factor are needed to give the random-effects ANOVA a power of 90% under a test of significant with $\alpha = 0.05$?