ST 705 Linear models and variance components
Homework problem set 12

April 14, 2022

1. Exercise 5.12 from Monahan.
2. Exercise 5.14 from Monahan.
3. Exercise 5.16 from Monahan.
4. Exercise 5.19 from Monahan.
5. Exercise 5.27 from Monahan.
6. Let $\{X_n\}_{n\geq 1}$ be a sequence of random variables with $X_n \sim \chi^2_p(\phi_n)$ for all $n \geq 1$. For fixed p, show that if $\phi_n \to \infty$ as $n \to \infty$, then X_n converges in distribution to a normal distribution as $n \to \infty$, after centering and rescaling X_n.
7. Consider the model $Y_i = \beta_0 + \beta_1 \cdot i + U_i$ for $i \in \{1, \ldots, 5\}$, where $U_1, \ldots, U_5 \overset{\text{iid}}{\sim} \text{N}(0, 1)$. Find the power of the F-test for testing whether the slope is zero when testing at level $\alpha = 0.05$ and the slope takes values $0.1, 0.2$, and 0.3.
8. Exercise 6.4 from Monahan.