

Assignment 9

1. Perform Exercises 12.4 and 12.6 from the textbook, Section 12.7. (Be sure to explain your answers. In particular, clearly specify any transformations or redefinitions that you use.)

[In Exercise 12.4, α , β , and k are all parameters, and t is the (known) independent variable value. Both β and k are unknown, and α is unknown in the first two questions. In Exercise 12.6, the parameters α , β , and γ are all unknown.]

2. (a) Perform Exercise 12.21 from the textbook, Section 12.7.
(Show that the approximated variance of $f(Y)$ does not depend on μ .)
(b) Using the same approximation as in part (a), find the *approximate* variance of

$$\sin^{-1}(\sqrt{B/m})$$

where B is a binomial random variable with parameters $m \in \{1, 2, 3, \dots\}$ and $p \in (0, 1)$. Does your approximated value depend on m ? Does it depend on p ?

[Recall that a binomial random variable with parameters m and p has probability function

$$p(y) = \binom{m}{y} p^y (1-p)^{m-y}, \quad y = 0, 1, \dots, m,$$

which gives a mean of mp and variance of $mp(1-p)$. Recall also that

$$\frac{d}{dy} \sin^{-1}(y) = \frac{1}{\sqrt{1-y^2}}$$

for $y \in (-1, 1)$.]

3. Perform Exercises 12.9, 12.10, 12.11 and 12.12 from the textbook, Section 12.7.

[These exercises are all very similar analyses of the same data set given in Exercise 12.8. You do *not* need to solve Exercise 12.8. For the purposes of these exercises, you may ignore the experimental unit structure. That is, you do not need to include an “item” effect in your model, and you may disregard the possibility that measurements on the same “item” are correlated by treating all observations of Y as independent, given X . You may perform your computations using SAS® PROC IML or R.]