Cited References

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4.3. Berkson, J. "Are There Two Regressions?" *Journal of the American Statistical Association* 45 (1950), pp. 164–80.
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Problems

4.1. When joint confidence intervals for β_0 and β_1 are developed by the Bonferroni method with a family confidence coefficient of 90 percent, does this imply that 10 percent of the time the confidence interval for β_0 will be incorrect? That 5 percent of the time the confidence interval for β_0 will be incorrect and 5 percent of the time that for β_1 will be incorrect? Discuss.

4.2. Refer to Problem 2.1. Suppose the student combines the two confidence intervals into a confidence set. What can you say about the family confidence coefficient for this set?

*4.3. Refer to **Copier maintenance** Problem 1.20.

a. Will b_0 and b_1 tend to err in the same direction or in opposite directions here? Explain.

b. Obtain Bonferroni joint confidence intervals for β_0 and β_1, using a 95 percent family confidence coefficient.

c. A consultant has suggested that β_0 should be 0 and β_1 should equal 14.0. Do your joint confidence intervals in part (b) support this view?

*4.4. Refer to **Airfreight breakage** Problem 1.21.

a. Will b_0 and b_1 tend to err in the same direction or in opposite directions here? Explain.

b. Obtain Bonferroni joint confidence intervals for β_0 and β_1, using a 99 percent family confidence coefficient. Interpret your confidence intervals.

4.5. Refer to **Plastic hardness** Problem 1.22.

a. Obtain Bonferroni joint confidence intervals for β_0 and β_1, using a 90 percent family confidence coefficient. Interpret your confidence intervals.

b. Are b_0 and b_1 positively or negatively correlated here? Is this reflected in your joint confidence intervals in part (a)?

c. What is the meaning of the family confidence coefficient in part (a)?

*4.6. Refer to **Muscle mass** Problem 1.27.

a. Obtain Bonferroni joint confidence intervals for β_0 and β_1, using a 99 percent family confidence coefficient. Interpret your confidence intervals.

b. Will b_0 and b_1 tend to err in the same direction or in opposite directions here? Explain.

c. A researcher has suggested that β_0 should equal approximately 160 and that β_1 should be between -1.9 and -1.5. Do the joint confidence intervals in part (a) support this expectation?

*4.7. Refer to **Copier maintenance** Problem 1.20.

a. Estimate the expected number of minutes spent when there are 3, 5, and 7 copiers to be serviced, respectively. Use interval estimates with a 90 percent family confidence coefficient based on the Working-Hotelling procedure.

b. Two service calls for preventive maintenance are scheduled in which the numbers of copiers to be serviced are 4 and 7, respectively. A family of prediction intervals for the times to be spent on these calls is desired with a 90 percent family confidence coefficient. Which procedure, Scheffé or Bonferroni, will provide tighter prediction limits here?

c. Obtain the family of prediction intervals required in part (b), using the more efficient procedure.

a. Obtain a 90 percent confidence interval for the student's ACT test score. Interpret your confidence interval.

b. Is criterion (4.33) as to the appropriateness of the approximate confidence interval met here?

4.20. Refer to **Plastic hardness** Problem 1.22. The measurement of a new test item showed 238 Brinell units of hardness.

a. Obtain a 99 percent confidence interval for the elapsed time before the hardness was measured. Interpret your confidence interval.

b. Is criterion (4.33) as to the appropriateness of the approximate confidence interval met here?

Exercises

4.21. When the predictor variable is so coded that $\bar{X} = 0$ and the normal error regression model (2.1) applies, are b_0 and b_1 independent? Are the joint confidence intervals for β_0 and β_1 then independent?

4.22. Derive an extension of the Bonferroni inequality (4.2a) for the case of three statements, each with statement confidence coefficient $1 - \alpha$.

4.23. Show that for the fitted least squares regression line through the origin (4.15), $\sum X_i e_i = 0$.

4.24. Show that $\hat{Y}$ as defined in (4.15) for linear regression through the origin is an unbiased estimator of $E\{Y\}$.

4.25. Derive the formula for $s^2\{\hat{Y}_h\}$ given in Table 4.1 for linear regression through the origin.

Projects

4.26. Refer to the **CDI** data set in Appendix C.2 and Project 1.43. Consider the regression relation of number of active physicians to total population.

a. Obtain Bonferroni joint confidence intervals for β_0 and β_1, using a 95 percent family confidence coefficient.

b. An investigator has suggested that β_0 should be -100 and β_1 should be .0028. Do the joint confidence intervals in part (a) support this view? Discuss.

c. It is desired to estimate the expected number of active physicians for counties with total population of $X = 500, 1{,}000, 5{,}000$ thousands with family confidence coefficient .90. Which procedure, the Working-Hotelling or the Bonferroni, is more efficient here?

d. Obtain the family of interval estimates required in part (c), using the more efficient procedure. Interpret your confidence intervals.

4.27. Refer to the **SENIC** data set in Appendix C.1 and Project 1.45. Consider the regression relation of average length of stay to infection risk.

a. Obtain Bonferroni joint confidence intervals for β_0 and β_1, using a 90 percent family confidence coefficient.

b. A researcher suggested that β_0 should be approximately 7 and β_1 should be approximately 1. Do the joint intervals in part (a) support this expectation? Discuss.

c. It is desired to estimate the expected hospital stay for persons with infection risks $X = 2, 3, 4, 5$ with family confidence coefficient .95. Which procedure, the Working-Hotelling or the Bonferroni, is more efficient here?

d. Obtain the family of interval estimates required in part (c), using the more efficient procedure. Interpret your confidence intervals.