APPENDIX E

EXAMPLES OF RELIABILITY TESTS FOR THE MEAN AND STANDARD DEVIATION

Mean

Analysis of 19 annual flood peaks indicates that $\overline{X} = 3.8876$ and $S = 0.4681$. It is hypothesized on the basis of a regional analysis that the true mean is 3.7782. Sample means, where the population variance is unknown, are distributed like the t-distribution. If $\mu = 3.7782$, what is the probability of obtaining an X greater than 3.8876?

For $N = 19 \quad \overline{X} = 3.8876 \quad S = 0.4681 \quad \mu = 3.7782$

$$t = \frac{\overline{X} - \mu}{(S^2/N)^{½}} = \frac{3.8876 - 3.7782}{((0.4681)^2/19)^{½}}$$

$$\text{Prob}\ (\overline{X} > 3.8876) = \text{Prob}\ (t > 1.019)$$

From a table for the t-distribution (Appendix F-4), there is a 16.2% chance that a sample with 18 degrees of freedom will have an $\overline{X}$ of 3.8876 or more.

Standard Deviation

Find the 90% confidence interval for the population variance from a sample for which $S^2 = 14.4818$ and $N = 20$. Sample values of variance (standard deviation squared) are distributed like the Chi-square (χ^2) distribution. From a table (Appendix F-5) for the Chi-square distribution with 19 degrees of freedom:

Exceedance Probability	Chi-square
0.95	10.117
0.05	30.144

The 90% confidence interval is computed as:

$$\frac{(N - 1)\ S^2}{\chi^2_5} < \sigma < \frac{(N-1)\ S^2}{\chi^2_{95}}$$

$$\frac{19(14.4918)}{30.144} < \sigma < \frac{19(14.14818)}{10.117}$$

$$9.128 < \sigma < 27.197$$