STAT 703/J703
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-Lecture 15-

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Today

- Homework 4
- 9.3: Duality Between Tests and Confidence Intervals
- 9.2.1: The p-value
- Power of a Test

Chapter 9: #7) Let X_1, … X_n be a sample from a Poisson distribution. Find the likelihood ratio for testing H_0: $\lambda=\lambda_0$ versus H_A: $\lambda=\lambda_1$ where $\lambda_1>\lambda_0$. Explain how to determine a rejection region for a test at level α.

Chapter 9: #8) Show that the test of problem 7 is UMP for H_0: $\lambda=\lambda_0$ versus H_A: $\lambda > \lambda_0$.

Consider a sample of size 20 and the null hypothesis $\lambda=1$. Find the possible alpha level closest to 0.05 without going exceeding it, and the corresponding rejection region.

9.3 The Duality of Confidence Intervals and Hypothesis Tests

There is a duality between confidence intervals and hypothesis tests. A confidence interval is found by "inverting" a two-sided test (and vice-versa).

Theorem A, pg. 338: Suppose there is a test of level α for H_0: $\theta = \theta_0$, and let $A(\theta_0)$=acceptance region

Then the set $C=\{\theta: \underline{X} \in A(\theta)\}$ is a $100(1-\alpha)\%$ confidence region for θ.

Theorem B, pg. 338: Let C($\underline{X}$) be a 100(1- α)% confidence region for θ_0.

Then $A(\theta_0)=\{\underline{X}: \theta_0 \in C(\underline{X})\}$ is an acceptance region for a test of level α for H_0: $\theta = \theta_0$

Example cont.: Again, consider the random sample from a normal distribution with unknown mean and unknown variance.

9.2.1 The Concept of p-value.

The p-value is the probability of observing a test statistic at least as extreme as the one observed if the null hypothesis is true.

Reject the null hypothesis if the p-value is < α