6. Goodness of Fit Test of Continuous Distributions: Kolmogorov-Smirnov Test

Kolmogorov-Smirnov Test

7:32 / 7:32 1.0x

you have tables, OK?
So this is a asymptotic test, all right?
So this test will have asymptotic level alpha, all right?
We used an asymptotic statement.
What was the asymptotic statement that we used?
Donsker's theorem, OK?
That was the equivalent of--
that's the uniform central limit theorem.
So we used that.

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Concept Check: Goodness of Fit Testing

1/1 point (graded)

Let $X_1,\ldots,X_n$ be i.i.d. random variables with unknown cdf F. We will use the tools of goodness of fit testing to test if $X_1,\ldots,X_n \stackrel{iid}{\sim} \mathcal{N}(0,1)$. Let Φ denote the cdf of a standard normal.

Accordingly, you set the null and alternative hypotheses to be, respectively,

$$\begin{aligned} H_0 &: F = \Phi \\ H_1 &: F \neq \Phi. \end{aligned}$$

If the null hypothesis holds and n is very large, you expect the empirical cdf $F_n(t)$ and standard normal cdf $\Phi(t)$ to be...

- (selected) Similar ✔
- Dissimilar

Solution:

We know by the Glivenko-Cantelli theorem that

$$\sup_{t\in\mathbb{R}} |F_n(t) - F(t)| \xrightarrow[n\to\infty]{a.s.} 0.$$

In particular, for fixed t,

$$\lim_{n\to\infty} F_n(t) = F(t).$$

If the null hypothesis holds, then $F(t) = \Phi(t)$, and we have

$$\sup_{t\in\mathbb{R}} |F_n(t) - \Phi(t)| \xrightarrow[n\to\infty]{a.s.} 0.$$

Therefore, if n is sufficiently large, this uniform convergence guarantees that the empirical cdf $F_n(t)$ and standard normal cdf $\Phi(t)$ are 'close' as functions of t. Thus, the correct response for this problem is 'Similar.'

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

Discussion

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Topic: Unit 4 Hypothesis testing:Lecture 16: Goodness of Fit Tests Continued: Kolmogorov-Smirnov test, Kolmogorov-Lilliefors test, Quantile-Quantile Plots / 6. Goodness of Fit Test of Continuous Distributions: Kolmogorov-Smirnov Test