1. True or False

(a)

1/2 points (graded)

Suppose that according to a fixed statistical model, a pair of hypotheses, and a test ψ_α, we observe a sample and compute $p = 0.01$. For each of the following groups of statements, select the one that is necessarily true. If there is none, select "None of the above."

Which of the following is necessarily true?

- Any test ψ_α that rejects H_0 for this observation will have a Type 1 error of at most 0.01.
- Any test ψ_α that rejects H_0 for this observation will have a Type 2 error of at most 0.01.
- Any test ψ_α that does not reject H_0 for this observation will have a Type 1 error of at most 0.01. □
- Any test ψ_α that does not reject H_0 for this observation will have a Type 2 error of at most 0.01.
- None of the above. □

There are a lot of tests. A more stringent test would be less sensitive and make you reject less H0.

A less stringent test would be more sensitive(and more type1 error) and make you reject more H0.

If there exist a test, does not reject H0, means this test is more stringent. And the test is less sensitive, make less type 1 error.

If there exist a test, does reject H0, and we don't know if this test is more or less stringent.

Which of the following is necessarily true?

- There is exactly a 0.99 chance for the null hypothesis to be true.
- There is exactly a 0.99 chance for the null hypothesis to be false.
- There is exactly a 0.01 chance for the alternative hypothesis to be true.
- There is exactly a 0.01 chance for the alternative hypothesis to be false.
- None of the above □

Solution:

Based on the definition of the p-value of a test, $p = 0.01$ is equivalent to $\alpha = 0.01$ being the smallest level α at which ψ_α rejects H_0 at our particular sample. Now, turning to the definition of the level of a test, this is equivalent to having less than or equal to 0.01 probability that any test that does not reject the null hypothesis for this particular sample would incorrectly reject the null hypothesis for any given $\theta \in \Theta_0$, so the Type 1 error (rate) of the test is at most 0.01.

On the other hand, any tests that reject H_0 for this sample will have a type 1 error rate of at least 0.01.

This does not provide any claims on the Type 2 error.

提交 你已经尝试了2次（总共可以尝试2次）

□ Answers are displayed within the problem

(b)

1/1 point (graded)

Consider a statistical experiment $X_1, \ldots, X_n \overset{iid}{\sim} P_{\theta^*}$ with an associated statistical model $(E, \{P_\theta\}_{\theta \in \Theta})$. You perform a hypothesis test on the true parameter θ^* via a statistical test ψ.

Which of the following is true about the p-value associated to this statistical experiment?
(Choose all that apply.)

- [ ] The set of all possible values that the p-value can take varies depending on the distribution P_θ. For example, one distribution may have p-values in $(0, \infty)$, while another may be constrained to a discrete set like $\mathbb{Z}_{\geq 0}$.
- [x] Regardless of the distribution of $X_1, \ldots, X_n$, the p-value lies in the interval $[0, 1]$.
- [x] The p-value will vary from one statistical experiment to another (*i.e.*, it varies depending on the particular sample), but it will always take values between 0 and 1.

Solution:

We first examine the correct responses.

- The second and third choice are correct. Recall that the p-value is the smallest value α such that a test ψ of level α will reject the null hypothesis for the given sample $X_1, \ldots, X_n$. Recall that the level of a test is some α such that the type 1 error is uniformly bounded:

$$\alpha_\psi(\theta) = P_\theta(\psi = 1) \leq \alpha, \quad \text{for all } \theta \in \Theta_0,$$

  and since it upper bounds a probability, the level α is in the interval $(0, 1)$. Thus, so is the p-value.

- The first choice is incorrect. The previous bullet explains how p-values are *always* on the scale $(0, 1)$, regardless of the particular distribution P_{θ^*}.

Remark: Part of the usefulness of p-values is that they put all distributions 'on the same scale'. Regardless of whether P_θ is Gaussian, Exponential, Poisson, or uniform, the p-value which lives in $(0, 1)$, so we just have to look at this number (and not particular properties of the distribution) to assess whether or not H_0 should be rejected.

提交 你已经尝试了1次（总共可以尝试2次）

Answers are displayed within the problem

讨论

显示讨论

主题： Unit 2 Foundation of Inference:Homework 3: Introduction to Hypothesis Testing / 1. True or False

认证证书是什么?