

Hypothesis testing

1. What would be the correct null and alternative hypothesis for the following statement?
Average monthly income in Sri Lanka is Rs.120,000.

a. $H_0: \mu \neq 120,000$
 $H_1: \mu = 120,000$

b. $H_0: \mu = 120,000$
 $H_1: \mu \neq 120,000$

c. $H_0: \bar{x} = 120,000$
 $H_1: \bar{x} \neq 120,000$

d. $H_0: \mu = 120,000$
 $H_1: \mu > 120,000$

2. Which of the following statements is correct?

- When carrying out testing where the alternative hypothesis of the form $H_1: \mu < \mu_0$, the rejection region is on the right side of the distribution.
- The critical value used for hypothesis testing and the critical value used to build the confidence interval are the same.
- If the test statistic falls into the rejection region, we reject the alternative hypothesis in favor of the null.

- When σ is unknown, we use the Z-distribution to account the additional uncertainty from using an estimate of σ .
3. We want to make sure that a particular pill has no more than 40mg of the active ingredient. So test a hypothesis of the form:

- $H_0: \mu = 40$
- $H_1: \mu > 40$

The type I error is the probability that you incorrectly conclude that the pill is faulty and change the production process and type II error is the probability that you incorrectly conclude that the pill is fine and sell sub-standard medicine.

(True/False)

4. Let's continue with the medicine example.

We want to make sure that a particular pill has no more than 40mg of the active ingredient. So we take a sample of 25 pills and obtain a sample mean of 40.2 and a sample standard deviation of 5mg.

If we carry out the hypothesis test at 5% significance level, which of the following statements is correct?

- We reject the null hypothesis because $40.2 > 40$.
- We reject the null hypothesis because the critical value is larger than the test statistic.
- The test statistic is 0.2 and the critical value is taken from the Z-distribution since the sample is large.
- The test statistic is 0.2 and the critical value is taken from the t-distribution with 24 degrees of freedom.

5. You calculate the p-value of a particular test as 0.023. This means that we cannot reject the null hypothesis at 5% significance.

(True/False)

6. Which statement is true?

- If you can reject a null hypothesis at 5% significance, you can also reject at 10% significance.
 - If you can reject a null hypothesis at 5% significance, you can also reject at 1% significance.
 - If the hypothesized value lies within the confidence interval, you reject the null hypothesis.
 - If you can reject the null hypothesis in favor of a one-sided alternative, you can always reject the null hypothesis in favor of a two-sided alternative.
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