

Lecture 31

niceguy

March 29, 2023

1 Hypothesis Testing

In statistics, a hypothesis is a conjecture about a population.

Example 1.1 (Coins). One hypothesis is that $P(\text{heads}) = 0.5$. Another hypothesis is $P(\text{heads}) \neq 0.5$.

The status quo is called the **null hypothesis**.

Example 1.2 (Die).

$$H_0 : P(1) = \frac{1}{6}$$
$$H_1 : P(6) > P(1)$$

Definition 1.1. A Type I error is a false positive, and a type II error is a false negative.

Example 1.3.

$$H_0 : \mu = 1000$$
$$H_1 : \mu \neq 1000$$

We have a sample X_1, \dots, X_{25} , $\sigma = 50$. Then we want to find the probability that we have a Type I error. We reject H_0 if the sample mean deviates from μ by more than 10. Then the desired probability becomes

$$P(\bar{X} < 990) + P(\bar{X} > 1010)$$

Assuming a normal distribution, note that $\frac{\sigma}{\sqrt{n}} = \frac{50}{\sqrt{25}} = 10$. Then the probability is

$$P(Z < -1) + P(Z > 1) = 0.1587 \times 2 = 0.32$$

which is quite high. If we want to reduce this, we can have a wider region or increase n .