

Math 148 Quiz Ten Version B

Name:

Answer the following questions:

1. For the following, write out either 'True' or 'False'

(a) The average of an error box is 0. **True.**

(b) The alternative hypothesis says the difference is due to chance. **False.**

2. Are small values of P evidence for or against the null hypothesis? Explain!

Against.

The P value is the chance of getting a test statistic as extreme as or more extreme than the observed one, computed based on the assumption that the null hypothesis is correct. Therefore a small P value is an evidence for that the null hypothesis is unlikely to be true.

3. A die is tossed 9,000 times.

(a) Suppose the die is balanced. Estimate the chance of getting a 3 or a 5 at least 2,955 times but no more than 3,090 times.

$$\begin{aligned}EV &= 3000; \\SE &= \sqrt{9000} \times \sqrt{\left(\frac{2}{6} \times \frac{4}{6}\right)} = 44.72; \\z_1 &= \frac{3000 - 2955}{44.72} \approx 1 \sim 68\%, 68\%/2 = 34\%; \\z_2 &= \frac{3090 - 3000}{44.72} \approx 2 \sim 96\%, 96\%/2 = 48\%; \\34\% + 48\% &= 82\%.\end{aligned}$$

(b) Now suppose 2,850 out of 9,000 tosses turned out to be 1 or 6. Is the die likely to be balanced? Do a hypothesis test to find out.

H_0 : the die is balanced.

H_1 : the die is not balanced.

$$\begin{aligned}z &= \frac{3000 - 2850}{44.72} = 3.35 \sim 99.919\%; \\P &= (1 - 99.919\%)/2 < 5\% \Rightarrow \text{reject the null hypothesis.}\end{aligned}$$

The die is unlikely to be balanced.