

Hypothesis tests (one-proportion z-tests)

The idea

- We have two competing theories about what's true, the **null hypothesis H_0** (H-naught) and the **alternative hypothesis H_A** .
- We calculate the probability that our sample happened, given that the null hypothesis is true. (A conditional probability!)
- If this probability is low enough, we reject the null hypothesis and conclude the alternative hypothesis.

Hypothesis tests (one-proportion z-tests)

The mechanics

1. State the null and alternative hypotheses.

The null hypothesis is always $H_0: p = p_0$.

The alternative is $H_A: p \neq p_0$ or $H_A: p < p_0$ or $H_A: p > p_0$. (Pick one.)

2. Find the z -score of the sample using the null hypothesis:

$$z = \frac{\text{observed} - \text{expected}}{\text{standard deviation}} = \frac{\hat{p} - p_0}{SD(\hat{p})} = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

3. Convert the z -score to a P -value.

4. Compare the P -value to the pre-determined **alpha level**, or **α -level**, or **significance level**, usually .05 (or .10 or .01).

5. Make a conclusion:

We **retain** the null hypothesis if the P -value is greater than α , and **reject** (or fail to retain) the null hypothesis if the P -value is less than α .

Report the P -value of the test.

The P -value is the probability of the sample data given the null hypothesis.