Chapter 8 Hypothesis Testing (Part I)

Introduction

Hypothesis testing is like a "backwards" confidence interval. Given a value θ_0 for some parameter, we want to decide if θ_0 is correct.

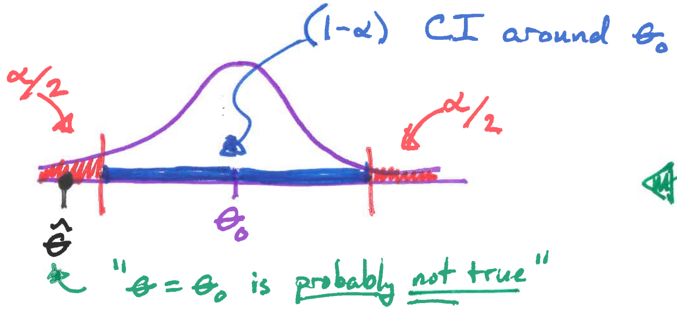
- As in the previous chapter, we make a point estimator $\hat{\Theta}$ for θ and evaluate it to get point estimate $\hat{\theta}$.
- Make a $(1-\alpha)$ Confidence Interval around θ_0 and check if $\hat{\theta}$ is inside.

→ $\hat{\theta}$ inside Confidence Interval:

Conclude that $\hat{\theta}$ is not unusually inconsistent with $\boxed{\theta = \theta_0.}$

→ $\hat{\theta}$ outside Confidence Interval:

Conclude that $\hat{\theta}$ is not consistent with assumption that $\theta = \theta_0$. So $\boxed{\theta \neq \theta_0.}$



[Note: If the distribution of $\hat{\Theta}$ is symmetric, then this is equivalent to putting the CI around $\hat{\theta}$ instead.]

"Backwards" CI because in Ch 7 we said:

$$\theta = \hat{\theta} \pm z_{\alpha/2}\,\sigma_{\hat{\theta}}$$

Now we ASK:

$$\hat{\theta} \overset{??}{=} \theta_0 \pm z_{\alpha/2}\,\sigma_{\theta_0}$$

↳ The general setup will look slightly different, however, because we are interested in also computing some other things along the way. Such as

p-value of $\hat{\theta}$: The maximum value of α so that $\hat{\theta}$ is outside of the $(1-\alpha)$ CI around θ_0

Also some things will be given new names

test statistic $\hat{\Theta}$ with value $\hat{\theta}$: The function of sample data used in test ("Point Estimator")