

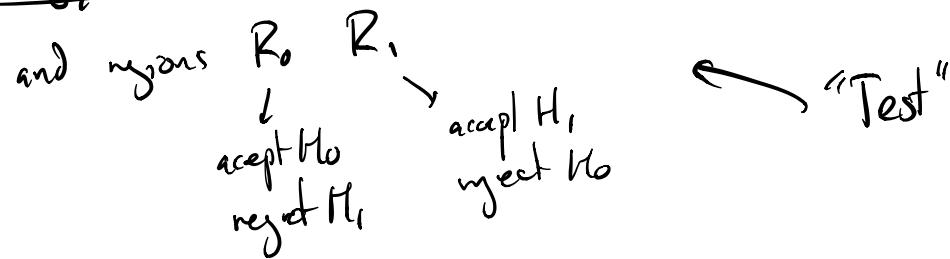
Plot:

Decide between hypotheses

H_0 "Null hypothesis" "Basic Assumption"
"innocent until proven guilty"

H_1 "Alternative hypothesis" "significant conclusion"
"beyond reasonable doubt"

Strategy: choose some sample statistic \bar{y}



Suppose we want to test hypotheses about a population mean, assume normally distributed

$$H_0: \mu = 50$$

$$H_1: \mu = 85$$

$$n = 10$$

$$\sigma^2 = 120$$

$$\bar{X} = N(\mu, \frac{120}{10})$$

look for a value x_{big} so that

If $\bar{X} \geq x_{\text{sig}}$ then reject H_0

$$P(\bar{X} \geq x_{\text{sig}} | H_0) \leq 0.001 = \alpha$$

$$H_0: \bar{X} \sim N(50, 12)$$

$$\frac{\bar{X} - 50}{\sqrt{12}} = z$$

$$\bar{X} = \sqrt{12}z + 50$$

$$P(z \geq z_{\text{sig}}) = 0.001$$

$$P(\bar{X} \geq \sqrt{12} z_{\text{sig}} + 50) = 0.001$$

$$R_1: \bar{X} \geq x_{\text{sig}}$$

$$R_0: \bar{X} < x_{\text{sig}}$$

$$P(\text{type 1 error}) = 0.001$$

$$P(\text{type 2 error})$$

$$P(\bar{X} < x_{\text{sig}} | H_1)$$

If we don't know variance

$T = \frac{\bar{X} - \mu}{S/\sqrt{n}}$ is t-distributed random var
w/ $(n-1)$ degrees of freedom.

$$P(T \geq t_{\text{sig}} | H_0) = 0.001$$

$$H_0: \mu = 50$$

$$H_1: \mu = 85$$

statistic: T

$R_0: T < t_{\text{hyp}}$ $R_1: T \geq t_{\text{hyp}}$.