

# INFERENCIA ESTADÍSTICA: Test de hipótesis.

## Contrastes para una población Normal: Contrastes sobre la media

Varianza Conocida

Estadístico de  
contraste

$$Z = \frac{\bar{X} - \mu_0}{\sigma_0 / \sqrt{n}} \rightarrow N(0, 1)$$

Hipótesis del  
test

$$H_0: \mu = \mu_0$$

$$H_1: \mu \neq \mu_0$$

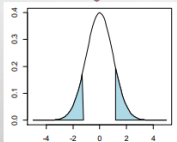
$$H_0: \mu \leq \mu_0$$

$$H_1: \mu > \mu_0$$

$$H_0: \mu \geq \mu_0$$

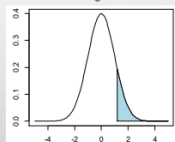
$$H_1: \mu < \mu_0$$

Criterio de  
rechazo

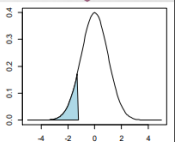


$$Z_{\text{exp}} \leq -Z_{\alpha/2}$$

$$Z_{\text{exp}} \geq Z_{\alpha/2}$$



$$Z_{\text{exp}} \geq Z_{\alpha}$$



$$Z_{\text{exp}} \leq -Z_{\alpha}$$

## Contrastes para una población Normal: Contrastes sobre la media

Varianza Desconocida

Estadístico de  
contraste

$$T = \frac{\bar{X} - \mu_0}{S / \sqrt{n}} \rightarrow t_{n-1}$$

Hipótesis del  
test

$$H_0: \mu = \mu_0$$

$$H_1: \mu \neq \mu_0$$

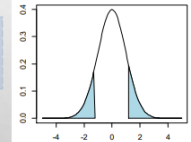
$$H_0: \mu \leq \mu_0$$

$$H_1: \mu > \mu_0$$

$$H_0: \mu \geq \mu_0$$

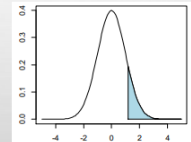
$$H_1: \mu < \mu_0$$

Criterio de  
rechazo

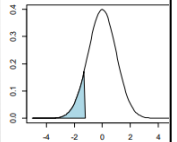


$$t_{\text{exp}} \leq -t_{n-1, \alpha/2}$$

$$t_{\text{exp}} \geq t_{n-1, \alpha/2}$$



$$t_{\text{exp}} \geq t_{n-1, \alpha}$$



$$t_{\text{exp}} \leq -t_{n-1, \alpha}$$

## Contrastes para una población Normal: Contrastes sobre la media

Varianza Desconocida,  $n > 30$

Estadístico de  
contraste

$$Z = \frac{\bar{X} - \mu_0}{S / \sqrt{n}} \rightarrow N(0, 1)$$

Hipótesis del  
test

$$H_0: \mu = \mu_0$$

$$H_1: \mu \neq \mu_0$$

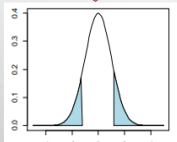
$$H_0: \mu \leq \mu_0$$

$$H_1: \mu > \mu_0$$

$$H_0: \mu \geq \mu_0$$

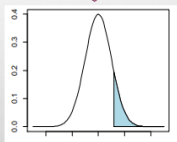
$$H_1: \mu < \mu_0$$

Criterio de  
rechazo

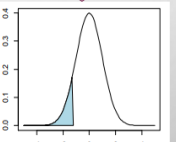


$$Z_{\text{exp}} \leq -Z_{\alpha/2}$$

$$Z_{\text{exp}} \geq Z_{\alpha/2}$$



$$Z_{\text{exp}} \geq Z_{\alpha}$$



$$Z_{\text{exp}} \leq -Z_{\alpha}$$

## Contrastes para una población Normal: Contrastes sobre la varianza

Estadístico de  
contraste

$$\chi^2 = \frac{(n-1)S^2}{\sigma_0^2} \rightarrow \chi_{n-1}^2$$

Hipótesis del  
test

$$H_0: \sigma^2 = \sigma_0^2$$

$$H_1: \sigma^2 \neq \sigma_0^2$$

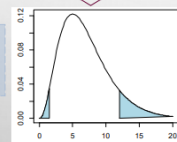
$$H_0: \sigma^2 \leq \sigma_0^2$$

$$H_1: \sigma^2 > \sigma_0^2$$

$$H_0: \sigma^2 \geq \sigma_0^2$$

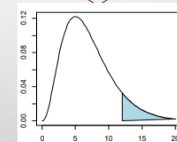
$$H_1: \sigma^2 < \sigma_0^2$$

Criterio de  
rechazo

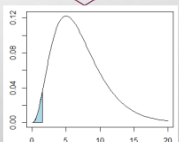


$$\chi_{\text{exp}}^2 \leq \chi_{n-1, 1-\alpha/2}^2$$

$$\chi_{\text{exp}}^2 > \chi_{n-1, \alpha/2}^2$$



$$\chi_{\text{exp}}^2 \geq \chi_{n-1, \alpha}^2$$



$$\chi_{\text{exp}}^2 \leq \chi_{n-1, 1-\alpha}^2$$

## Contrastes para una población Binomial: Contrastes sobre la proporción

Estadístico de  
contraste

$$Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \rightarrow N(0, 1)$$

Hipótesis del  
test

$$H_0: p = p_0$$

$$H_1: p \neq p_0$$

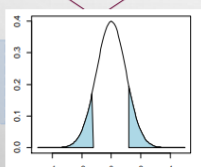
$$H_0: p \leq p_0$$

$$H_1: p > p_0$$

$$H_0: p \geq p_0$$

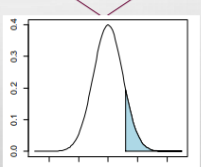
$$H_1: p < p_0$$

Criterio de  
rechazo

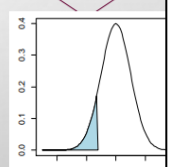


$$Z_{\text{exp}} \leq -Z_{\alpha/2}$$

$$Z_{\text{exp}} \geq Z_{\alpha/2}$$



$$Z_{\text{exp}} \geq Z_{\alpha}$$



$$Z_{\text{exp}} \leq -Z_{\alpha}$$

## Contrastes para dos poblaciones Normales: Contrastes sobre la diferencia de medias

Varianzas Conocidas

Estadístico de  
contraste

$$Z = \frac{(\bar{X} - \bar{Y}) - \mu_0}{\sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}} \rightarrow N(0, 1)$$

Hipótesis del  
test

$$H_0: \mu_x - \mu_y = \mu_0$$

$$H_1: \mu_x - \mu_y \neq \mu_0$$

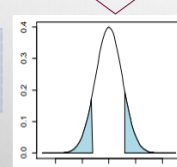
$$H_0: \mu_x - \mu_y \leq \mu_0$$

$$H_1: \mu_x - \mu_y > \mu_0$$

$$H_0: \mu_x - \mu_y \geq \mu_0$$

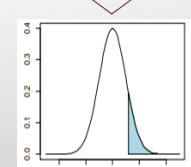
$$H_1: \mu_x - \mu_y < \mu_0$$

Criterio de  
rechazo

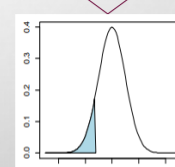


$$Z_{\text{exp}} \leq -Z_{\alpha/2}$$

$$Z_{\text{exp}} \geq Z_{\alpha/2}$$



$$Z_{\text{exp}} \geq Z_{\alpha}$$



$$Z_{\text{exp}} \leq -Z_{\alpha}$$

Contrastes para dos poblaciones Normales:  
Contrastes sobre la diferencia de medias

Varianzas desconocidas pero iguales

$$S_p = \sqrt{\frac{(n_x - 1)S_x^2 + (n_y - 1)S_y^2}{n_x + n_y - 2}}$$

Estadístico de contraste

$$T = \frac{\bar{X} - \bar{Y} - \mu_0}{S_p \sqrt{\frac{1}{n_x} + \frac{1}{n_y}}} \rightarrow t_{n_x + n_y - 2}$$

Hipótesis del test

$$H_0: \mu_x - \mu_y = \mu_0$$

$$H_1: \mu_x - \mu_y \neq \mu_0$$

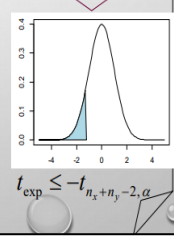
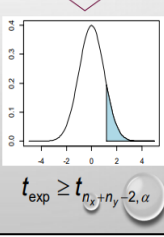
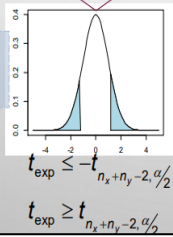
$$H_0: \mu_x - \mu_y \leq \mu_0$$

$$H_1: \mu_x - \mu_y > \mu_0$$

$$H_0: \mu_x - \mu_y \geq \mu_0$$

$$H_1: \mu_x - \mu_y < \mu_0$$

Criterio de rechazo



Contrastes para dos poblaciones Normales:  
Contrastes sobre la diferencia de medias

Varianzas desconocidas, distintas o no,  
tamaños muestrales grandes  
( $n_x, n_y \geq 30$ )

Estadístico de contraste

$$Z = \frac{(\bar{X} - \bar{Y}) - \mu_0}{\sqrt{\frac{S_x^2}{n_x} + \frac{S_y^2}{n_y}}} \rightarrow N(0, 1)$$

Hipótesis del test

$$H_0: \mu_x - \mu_y = \mu_0$$

$$H_1: \mu_x - \mu_y \neq \mu_0$$

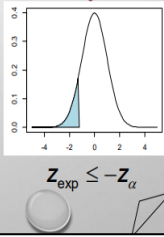
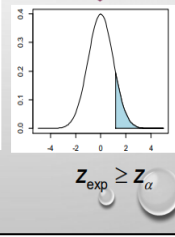
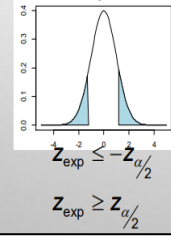
$$H_0: \mu_x - \mu_y \leq \mu_0$$

$$H_1: \mu_x - \mu_y > \mu_0$$

$$H_0: \mu_x - \mu_y \geq \mu_0$$

$$H_1: \mu_x - \mu_y < \mu_0$$

Criterio de rechazo



Contrastes para dos poblaciones Normales:  
Contrastes sobre el cociente de varianzas

Hipótesis del test

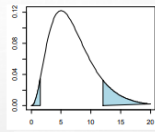
Criterio de rechazo

Estadístico de contraste

$$F = \frac{S_x^2}{S_y^2} \rightarrow F_{n_x-1, n_y-1}$$

$$H_0: \sigma_x^2 = \sigma_y^2$$

$$H_1: \sigma_x^2 \neq \sigma_y^2$$

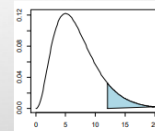


$$F_{\text{exp}} \leq F_{n_x-1, n_y-1, 1-\alpha/2}$$

$$F_{\text{exp}} \geq F_{n_x-1, n_y-1, \alpha/2}$$

$$H_0: \sigma_x^2 \leq \sigma_y^2$$

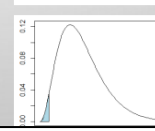
$$H_1: \sigma_x^2 > \sigma_y^2$$



$$F_{\text{exp}} \geq F_{n_x-1, n_y-1, \alpha}$$

$$H_0: \sigma_x^2 \geq \sigma_y^2$$

$$H_1: \sigma_x^2 < \sigma_y^2$$



$$F_{\text{exp}} \leq F_{n_x-1, n_y-1, 1-\alpha}$$

Contrastes para dos poblaciones Binomiales:  
Contrastes sobre la diferencia de proporciones

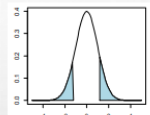
Estadístico de contraste

$$Z = \frac{(\hat{P}_x - \hat{P}_y) - p_0}{\sqrt{\frac{\hat{P}_x(1-\hat{P}_x)}{n_x} + \frac{\hat{P}_y(1-\hat{P}_y)}{n_y}}} \rightarrow N(0, 1)$$

Criterio de rechazo

$$H_0: p_x - p_y = p_0$$

$$H_1: p_x - p_y \neq p_0$$

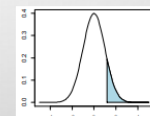


$$Z_{\text{exp}} \leq -Z_{\alpha/2}$$

$$Z_{\text{exp}} \geq Z_{\alpha/2}$$

$$H_0: p_x - p_y \leq p_0$$

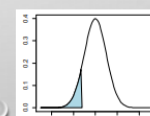
$$H_1: p_x - p_y > p_0$$



$$Z_{\text{exp}} \geq Z_{\alpha}$$

$$H_0: p_x - p_y \geq p_0$$

$$H_1: p_x - p_y < p_0$$



$$Z_{\text{exp}} \leq -Z_{\alpha}$$

