FORMULARIO DE ESTADÍSTICA

MODELOS DE PROBABILIDAD

Nombre	Símbolo	F. de probabilidad o densidad	Media	Varianza
Bernoulli	$B(1,p)$	$P(x=r)=p^r q^{1-r}; r=0,1$	p	pq
Binomial	$B(n,p)$	$P(x=r)=\binom{n}{r} p^r q^{n-r}; r=0,1,...,n$	np	npq
Geométrica	$G(p)$	$P(x=r)=pq^{r-1}; r=1,2,...$	$\frac{1}{p}$	$\frac{q}{p^2}$
Poisson	$P(\lambda)$	$P(x=r)=\frac{\lambda^r e^{-\lambda}}{r!}; r=0,1,...$	λ	λ
Uniforme (cont.)	$U(a,b)$	$f(x)=\frac{1}{b-a}; a \leq x \leq b$	$\frac{b+a}{2}$	$\frac{(b-a)^2}{12}$
Exponencial	$\text{Exp}(\lambda)$	densidad: $f(x)=\lambda e^{-\lambda x}; x>0$ distribución: $F(x)=1-e^{-\lambda x}$	$1/\lambda$	$1/\lambda^2$
Normal	$N\left(\mu,\sigma^2\right)$	$f(x)=\frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\frac{(x-\mu)^2}{2\sigma^2}\right\}$	μ	σ^2
Weibull	densidad	$f(t)=\frac{\beta}{\alpha^\beta} t^{\beta-1} \exp\left\{-\left(\frac{t}{\alpha}\right)^\beta\right\}; t>0$	Media	
	distribución	$F(t)=1-\exp\left\{-\left(\frac{t}{\alpha}\right)^\beta\right\}$	$\mu=\alpha\Gamma\left(1+\frac{1}{\beta}\right)$	
	tasa de fallos	$\lambda(t)=\frac{\beta}{\alpha}\left(\frac{t}{\alpha}\right)^{\beta-1}$	con $\Gamma(r)=(r-1)!$	

Gráficos de Control

Gráfico de	Dispersión	Línea Central	Límites de Control
Medias $\bar{x}_i$	$\bar{s}$	$\bar{\bar{x}}$	$\bar{\bar{x}} \pm 3\frac{\bar{s}}{c_2\sqrt{n}}$
Medias $\bar{x}_i$	Rangos	$\bar{\bar{x}}$	$\bar{\bar{x}} \pm 3\frac{\bar{R}}{d_2\sqrt{n}}$
D. típicas s_i	$\bar{s}$	$\bar{s}$	$B_3\bar{s}; B_4\bar{s}$
Rangos R_i	Rangos	$\bar{R}$	$D_3\bar{R}; D_4\bar{R}$
Proporciones p_i		$\bar{p}$	$\bar{p} \pm 3\sqrt{\frac{\bar{p}(1-\bar{p})}{n_i}}$

$\bar{s}$ =promedio de las desv. típicas s_i del estudio inicial, con k muestras de tamaño n

Regresión simple: $\hat{y}=a+bx;\ a=\bar{y}-b\bar{x};\ b=\text{cov}(x,y)/\text{var}(x)$

UNA POBLACIÓN

Población	Contrastes	Estadísticos de contraste	Región de rechazo (p-valor<α)	Intervalo de confianza $\text{IC}(1-\alpha)$
Cualquiera (μ,σ^2) con $n\to\infty$	(1)-$\text{H}_0: \mu=\mu_0$; $\text{H}_1: \mu\neq\mu_0$ (2)-$\text{H}_0: \mu\geq\mu_0$; $\text{H}_1: \mu<\mu_0$ (3)-$\text{H}_0: \mu\leq\mu_0$; $\text{H}_1: \mu>\mu_0$	$(a)\ z_0=\frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$ $(b)\ t_0=\frac{\bar{x}-\mu_0}{\hat{s}/\sqrt{n}}$	(1-a) $\lvert z_0\rvert>z_{\alpha/2}$ (1-b) $\lvert t_0\rvert>z_{\alpha/2}$ (2-a) $z_0<-z_\alpha$ (2-b) $t_0<-z_\alpha$ (3-a) $z_0>z_\alpha$ (3-b) $t_0>z_\alpha$	$\mu \underset{n\to\infty}{\in} \left\{\bar{x}\pm z_{\alpha/2}\sigma/\sqrt{n}\right\}$ $\mu \underset{n\to\infty}{\in} \left\{\bar{x}\pm z_{\alpha/2}\hat{s}/\sqrt{n}\right\}$
$N(\mu,\sigma^2)$	(1)-$\text{H}_0: \mu=\mu_0$; $\text{H}_1: \mu\neq\mu_0$ (2)-$\text{H}_0: \mu\geq\mu_0$; $\text{H}_1: \mu<\mu_0$ (3)-$\text{H}_0: \mu\leq\mu_0$; $\text{H}_1: \mu>\mu_0$	$(a)\ z_0=\frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$ $(b)\ t_0=\frac{\bar{x}-\mu_0}{\hat{s}/\sqrt{n}}$	(1-a) $\lvert z_0\rvert>z_{\alpha/2}$ (1-b) $\lvert t_0\rvert>t_{n-1;\alpha/2}$ (2-a) $z_0<-z_\alpha$ (2-b) $t_0<-t_{n-1;\alpha}$ (3-a) $z_0>z_\alpha$ (3-b) $t_0>t_{n-1;\alpha}$	$\mu\in\left\{\bar{x}\pm z_{\alpha/2}\sigma/\sqrt{n}\right\}$ $\mu\in\left\{\bar{x}\pm t_{n-1;\alpha/2}\hat{s}/\sqrt{n}\right\}$
$B(n,p)$ con $n\to\infty$	(1)-$\text{H}_0: p=p_0$; $\text{H}_1: p\neq p_0$ (2)-$\text{H}_0: p\geq p_0$; $\text{H}_1: p<p_0$ (3)-$\text{H}_0: p\leq p_0$; $\text{H}_1: p>p_0$	$z_0=\frac{\hat{p}-p_0}{\sqrt{p_0q_0/n}}$	(1) $\lvert z_0\rvert>z_{\alpha/2}$ (2) $z_0<-z_\alpha$ (3) $z_0>z_\alpha$	$p \underset{n\to\infty}{\in} \left\{\hat{p}\pm z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}\right\}$
$N(\mu,\sigma^2)$	(1)-$\text{H}_0: \sigma^2=\sigma_0^2$; $\text{H}_1: \sigma^2\neq\sigma_0^2$ (2)-$\text{H}_0: \sigma^2\geq\sigma_0^2$; $\text{H}_1: \sigma^2<\sigma_0^2$ (3)-$\text{H}_0: \sigma^2\leq\sigma_0^2$; $\text{H}_1: \sigma^2>\sigma_0^2$	$X_0=\frac{(n-1)\hat{s}^2}{\sigma_0^2}$ $=\frac{ns^2}{\sigma_0^2}$	(1) $\left[\begin{array}{l} X_0>\chi^2_{n-1;\alpha/2} \\ \text{ó } X_0<\chi^2_{n-1;1-\alpha/2}\end{array}\right.$ (2) $X_0<\chi^2_{n-1;1-\alpha}$ (3) $X_0>\chi^2_{n-1;\alpha}$	$\sigma^2\in\left[\frac{(n-1)\hat{s}^2}{\chi^2_{n-1;\alpha/2}};\frac{(n-1)\hat{s}^2}{\chi^2_{n-1;1-\alpha/2}}\right]$
Cualquiera θ (por Máxima Ver.) con $n\to\infty$	(1)-$\text{H}_0: \theta=\theta_0$; $\text{H}_1: \theta\neq\theta_0$ (2)-$\text{H}_0: \theta\geq\theta_0$; $\text{H}_1: \theta<\theta_0$ (3)-$\text{H}_0: \theta\leq\theta_0$; $\text{H}_1: \theta>\theta_0$	$t_0=\frac{\hat{\theta}_{MV}-\theta_0}{\sqrt{\widehat{\text{Var}}(\hat{\theta}_{MV})}}$ $\widehat{\text{Var}}(\hat{\theta}_{MV})=-\left[\frac{\partial^2 L(\theta)}{\partial\theta^2}\right]^{-1}_{\theta=\hat{\theta}_{MV}}$	(1) $\lvert t_0\rvert>z_{\alpha/2}$ (2) $t_0<-z_\alpha$ (3) $t_0>z_\alpha$	$\theta \underset{n\to\infty}{\in} \left\{\hat{\theta}_{MV}\pm z_{\alpha/2}\sqrt{\widehat{\text{Var}}(\hat{\theta}_{MV})}\right\}$

CONTRASTES- DOS POBLACIONES			
Dos poblaciones x_1, x_2	Contrastes	Estadísticos de contraste	Región de rechazo (p-valor$<\alpha$)
Cualesquiera con $E(x_1) = \mu_1$; $\text{var}(x_1) = \sigma_1^2$ $E(x_2) = \mu_2$; $\text{var}(x_2) = \sigma_2^2$	(1)-$H_0: \mu_1 = \mu_1$; $H_1: \mu_1 \neq \mu_2$ (2)-$H_0: \mu_1 \geq \mu_2$; $H_1: \mu_1 < \mu_2$ (3)-$H_0: \mu_1 \leq \mu_2$; $H_1: \mu_1 > \mu_2$	$(a)\ z_0 = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$ $(b)\ t_0 = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{\hat{s}_1^2}{n_1} + \frac{\hat{s}_2^2}{n_2}}}$	(1-a) $\lvert z_0\rvert > z_{\alpha/2}$ (1-b) $\lvert t_0\rvert > z_{\alpha/2}$ (2-a) $z_0 < -z_\alpha$ (2-b) $t_0 < -z_\alpha$ (3-a) $z_0 > z_\alpha$ (3-b) $t_0 > z_\alpha$
Datos apareados $d = x_1 - x_2$	(1)-$H_0: \mu_d = 0$; $H_1: \mu_d \neq 0$ (2)-$H_0: \mu_d \geq 0$; $H_1: \mu_d < 0$ (3)-$H_0: \mu_d \leq 0$; $H_1: \mu_d > 0$	$t_0 = \dfrac{\bar{d}}{\hat{s}_d / \sqrt{n}}$	(1) $\lvert t_0\rvert > z_{\alpha/2}$ (1) $\lvert t_0\rvert > t_{n-1;\alpha/2}$ (2) $t_0 < -z_\alpha$ (2) $t_0 < -t_{n-1;\alpha}$ (3) $t_0 > z_\alpha$ (3) $t_0 > t_{n-1;\alpha}$ si $n \to \infty$ Sólo si hay normalidad
Cualesquiera con $E(x_1) = \mu_1$; $\text{var}(x_1) = \sigma^2$ $E(x_2) = \mu_2$; $\text{var}(x_2) = \sigma^2$	(1)-$H_0: \mu_1 = \mu_2$; $H_1: \mu_1 \neq \mu_2$ (2)-$H_0: \mu_1 \geq \mu_2$; $H_1: \mu_1 < \mu_2$ (3)-$H_0: \mu_1 \leq \mu_2$; $H_1: \mu_1 > \mu_2$	$(a)\ z_0 = \dfrac{\bar{x}_1 - \bar{x}_2}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$ $(b)\ t_0 = \dfrac{\bar{x}_1 - \bar{x}_2}{\hat{s}_T\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$ con $\hat{s}_T^2 = \frac{(n_1-1)\hat{s}_1^2 + (n_2-1)\hat{s}_2^2}{n_1+n_2-2}$	(1) $\lvert z_0\rvert, \lvert t_0\rvert > z_{\alpha/2}$ (1-b)$\lvert t_0\rvert > t_{n_1+n_2-2;\alpha/2}$ (2) $z_0, t_0 < -z_\alpha$ (2-b) $t_0 < -t_{n_1+n_2-2;\alpha}$ (3) $z_0, t_0 > z_\alpha$ (3-b)$t_0 > t_{n_1+n_2-2;\alpha}$ Sólo si hay normalidad
Binomiales $x_1 \sim B(n_1, p_1)$ $x_2 \sim B(n_2, p_2)$	(1)-$H_0: p_1 = p_2$; $H_1: p_1 \neq p_2$ (2)-$H_0: p_1 \geq p_2$; $H_1: p_1 < p_2$ (3)-$H_0: p_1 \leq p_2$;$H_1: p_1 > p_2$	$z_0 = \dfrac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_0\hat{q}_0\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$ con $\hat{p}_0 = \dfrac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}$	(1) $\lvert z_0\rvert > z_{\alpha/2}$ (2) $z_0 < -z_\alpha$ (3) $z_0 > z_\alpha$ Siempre que $n_1, n_2 \to \infty$
Normales $x_1 \sim N\left(\mu_1, \sigma_1^2\right)$ $x_2 \sim N\left(\mu_2, \sigma_2^2\right)$	(1)-$H_0: \sigma_1^2 = \sigma_1^2$; $H_1: \sigma_1^2 \neq \sigma_2^2$ (2)-$H_0: \sigma_1^2 \geq \sigma_2^2$; $H_1: \sigma_1^2 < \sigma_2^2$ (3)-$H_0: \sigma_1^2 \leq \sigma_2^2$; $H_1: \sigma_1^2 > \sigma_2^2$	$F_0 = \dfrac{\hat{s}_1^2}{\hat{s}_2^2}$	(1) $F_0 > F_{n_1-1;n_2-1;\alpha/2}$ ó $F_0 < F_{n_1-1;n_2-1;1-\alpha/2}$ donde $F_{n_1-1;n_2-1;1-\alpha/2} = 1 \big/ F_{n_2-1;n_1-1;\alpha/2}$ (2) $F_0 < F_{n_1-1;n_2-1;1-\alpha}$(3) $F_0 > F_{n_1-1;n_2-1;\alpha}$

ESTIMADORES-DOS POBLACIONES		
Dos poblaciones x_1, x_2	Parámetro	Intervalo de confianza, IC$(1-\alpha)$
Cualesquiera con $E(x_1) = \mu_1$; $\text{var}(x_1) = \sigma_1^2$ $E(x_2) = \mu_2$; $\text{var}(x_2) = \sigma_2^2$	$\mu_1 - \mu_2$	$\mu_1 - \mu_2 \in \left\{\bar{x}_1 - \bar{x}_2 \pm z_{\alpha/2}\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}\right\}$ Si no hay normalidad, sólo si $n_1, n_2 \to \infty$ $\mu_1 - \mu_2 \in \left\{\bar{x}_1 - \bar{x}_2 \pm z_{\alpha/2}\sqrt{\dfrac{\hat{s}_1^2}{n_1} + \dfrac{\hat{s}_2^2}{n_2}}\right\}$ Siempre que $n_1, n_2 \to \infty$
Cualesquiera con $E(x_1) = \mu_1$; $\text{var}(x_1) = \sigma^2$ $E(x_2) = \mu_2$; $\text{var}(x_2) = \sigma^2$	$\mu_1 - \mu_2$	$\mu_1 - \mu_2 \in \left\{\bar{x}_1 - \bar{x}_2 \pm z_{\alpha/2}\sigma\sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}\right\}$ Si no hay normalidad, sólo si $n_1, n_2 \to \infty$ $\mu_1 - \mu_2 \in \left\{\bar{x}_1 - \bar{x}_2 \pm z_{\alpha/2}\hat{s}_T\sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}\right\}$ Siempre que $n_1, n_2 \to \infty$ $\mu_1 - \mu_2 \in \left\{\bar{x}_1 - \bar{x}_2 \pm t_{n_1+n_2-2;\alpha/2}\hat{s}_T\sqrt{\dfrac{1}{n_1} + \dfrac{1}{n_2}}\right\}$ Sólo si hay normalidad
Normales con $E(x_1) = \mu_1$; $\text{var}(x_1) = \sigma_1^2$ $E(x_2) = \mu_2$; $\text{var}(x_2) = \sigma_2^2$	$\dfrac{\sigma_1^2}{\sigma_2^2}$	$\dfrac{\sigma_1^2}{\sigma_2^2} \in \left[\dfrac{\hat{s}_1^2}{\hat{s}_2^2}F_{n_2-1;n_1-1;1-\alpha/2}; \dfrac{\hat{s}_1^2}{\hat{s}_2^2}F_{n_2-1;n_1-1;\alpha/2}\right]$ donde $F_{n_2-1;n_1-1;1-\alpha/2} = 1 \big/ F_{n_1-1;n_2-1;\alpha/2}$
Binomiales con $x_1 \sim B(n_1, p_1)$; $x_2 \sim B(n_2, p_2)$	$p_1 - p_2$	$p_1 - p_2 \underset{n_1, n_2 \to \infty}{\in} \left\{\hat{p}_1 - \hat{p}_2 \pm z_{\alpha/2}\sqrt{\dfrac{\hat{p}_1\hat{q}_1}{n_1} + \dfrac{\hat{p}_2\hat{q}_2}{n_2}}\right\}$