Tests of hypotheses

Hypotheses	Rejection Region of H_0
$H_0: \mu = \mu_0$ $H_1: \mu > \mu_0$	$\dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} \geq z(\alpha)$
$H_0: \mu = \mu_0$ $H_1: \mu > \mu_0$	$\dfrac{\bar{x} - \mu_0}{s/\sqrt{n}} \geq t(\alpha; n - 1)$
$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 > \mu_2$	$\dfrac{\bar{x} - \bar{y}}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}} \geq z(\alpha)$
$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 > \mu_2$	$\dfrac{\bar{x} - \bar{y}}{\sqrt{\dfrac{(n_1 - 1)s_x^2 + (n_2 - 1)s_y^2}{n_1 + n_2 - 2}\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}} \geq t(\alpha; n_1 + n_2 - 2)$
$H_0: p = p_0$ $H_1: p > p_0$	$\dfrac{y/n - p_0}{\sqrt{\dfrac{p_0(1 - p_0)}{n}}} \geq z(\alpha)$
$H_0: p_1 = p_2$ $H_1: p_1 > p_2$	$\dfrac{y_1/n_1 - y_2/n_2}{\sqrt{\left(\dfrac{y_1 + y_2}{n_1 + n_2}\right)\left(1 - \dfrac{y_1 + y_2}{n_1 + n_2}\right)\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}} \geq z(\alpha)$
$H_0: \beta_1 = \beta_{10}$ $H_1: \beta_1 > \beta_{10}$	$\dfrac{\hat{\beta}_1 - \beta_{10}}{\sqrt{\dfrac{\sum(y_i - \hat{y}_i)^2/(n - 2)}{\sum(x_i - \bar{x})^2}}} \geq t(\alpha; n - 2)$

Tolerance regions

With normal assumptions, $\bar{x} \pm ks$ covers at least $(100)p$ percent of the population with probability $1 - \alpha$.

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Confidence intervals

Parameter	Assumptions	Endpoints
μ	$N(\mu, \sigma^2)$ or n large σ^2 known	$\bar{x} \pm z(\alpha/2)\dfrac{\sigma}{\sqrt{n}}$
μ	$N(\mu, \sigma^2)$ σ^2 unknown	$\bar{x} \pm t(\alpha/2; n-1)\dfrac{s}{\sqrt{n}}$
$\mu_1 - \mu_2$	Independent Distributions σ_1^2, σ_2^2 known n_1, n_2 large	$\bar{x} - \bar{y} \pm z(\alpha/2)\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}$
$\mu_1 - \mu_2$	Independent Normal Distributions σ_1^2, σ_2^2 unknown but equal	$\bar{x} - \bar{y} \pm t(\alpha/2; n_1 + n_2 - 2)$ $\times \sqrt{\dfrac{(n_1 - 1)s_x^2 + (n_2 - 1)s_y^2}{n_1 + n_2 - 2}\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}$
p	Binomial $b(n, p)$ n large	$\dfrac{y}{n} \pm z(\alpha/2)\sqrt{\dfrac{(y/n)(1 - y/n)}{n}}$
$p_1 - p_2$	Independent Binomial Distributions n_1, n_2 large	$\dfrac{y_1}{n_1} - \dfrac{y_2}{n_2} \pm z(\alpha/2)$ $\times \sqrt{\dfrac{(y_1/n_1)(1 - y_1/n_1)}{n_1} + \dfrac{(y_2/n_2)(1 - y_2/n_2)}{n_2}}$
β_1	$N(\beta_0 + \beta_1 x, \sigma^2)$	$\hat{\beta}_1 \pm t(\alpha/2; n-2)\sqrt{\dfrac{\Sigma(y_i - \hat{y}_i)^2/(n-2)}{\Sigma(x_i - \bar{x})^2}}$

Control charts

$\bar{x}$: $\bar{\bar{x}} \pm A_2\overline{R}$

p: $\overline{p} \pm 3\sqrt{\dfrac{\overline{p}(1-\overline{p})}{n}}$

R: LCL $= D_3\overline{R}$, UCL $= D_4\overline{R}$

c: $\overline{c} \pm 3\sqrt{\overline{c}}$