

Table 11-8 Summary of Hypothesis Testing Procedures on Means and Variances

Null Hypothesis	Test Statistic	Alternative Hypothesis	Criteria for Rejection	OC Curve Parameter
$H_0: \mu = \mu_0$ σ^2 known	$Z_0 = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$	$H_1: \mu \neq \mu_0$ $H_1: \mu > \mu_0$ $H_1: \mu < \mu_0$	$ Z_0 > Z_{\alpha/2}$ $Z_0 > Z_\alpha$ $Z_0 < -Z_\alpha$	$d = \mu - \mu_0 /\sigma$ $d = (\mu - \mu_0)/\sigma$ $d = (\mu_0 - \mu)/\sigma$
$H_0: \mu = \mu_0$ σ^2 unknown	$t_0 = \frac{\bar{X} - \mu_0}{S/\sqrt{n}}$	$H_1: \mu \neq \mu_0$ $H_1: \mu > \mu_0$ $H_1: \mu < \mu_0$	$ t_0 > t_{\alpha/2, n-1}$ $t_0 > t_{\alpha, n-1}$ $t_0 < -t_{\alpha, n-1}$	$d = \mu - \mu_0 /\sigma$ $d = (\mu - \mu_0)/\sigma$ $d = (\mu_0 - \mu)/\sigma$
$H_0: \mu_1 = \mu_2$ σ_1^2 and σ_2^2 known	$Z_0 = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$	$H_1: \mu_1 \neq \mu_2$ $H_1: \mu_1 > \mu_2$ $H_1: \mu_1 < \mu_2$	$ Z_0 > Z_{\alpha/2}$ $Z_0 > Z_\alpha$ $Z_0 < -Z_\alpha$	$d = \mu_1 - \mu_2 /\sqrt{\sigma_1^2 + \sigma_2^2}$ $d = (\mu_1 - \mu_2)/\sqrt{\sigma_1^2 + \sigma_2^2}$ $d = (\mu_2 - \mu_1)/\sqrt{\sigma_1^2 + \sigma_2^2}$
$H_0: \mu_1 = \mu_2$ $\sigma_1^2 = \sigma_2^2 = \sigma^2$ unknown	$t_0 = \frac{\bar{X}_1 - \bar{X}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$	$H_1: \mu_1 \neq \mu_2$ $H_1: \mu_1 > \mu_2$ $H_1: \mu_1 < \mu_2$	$ t_0 > t_{\alpha/2, n_1+n_2-2}$ $t_0 > t_{\alpha, n_1+n_2-2}$ $t_0 < -t_{\alpha, n_1+n_2-2}$	$d = \mu_1 - \mu_2 /2\sigma$ $d = (\mu_1 - \mu_2)/2\sigma$ $d = (\mu_2 - \mu_1)/2\sigma$
$H_0: \mu_1 = \mu_2$ $\sigma_1^2 \neq \sigma_2^2$ unknown	$t_0 = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$ $v = \frac{\left(\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}\right)^2}{\left(\frac{S_1^2/n_1}{n_1+1}\right)^2 + \left(\frac{S_2^2/n_2}{n_2+1}\right)^2} - 2$	$H_1: \mu_1 \neq \mu_2$ $H_1: \mu_1 > \mu_2$ $H_1: \mu_1 < \mu_2$	$ t_0 > t_{\alpha/2, v}$ $t_0 > t_{\alpha, v}$ $t_0 < -t_{\alpha, v}$	— — —
$H_0: \sigma^2 = \sigma_0^2$	$\chi_0^2 = \frac{(n-1)S^2}{\sigma_0^2}$	$H_1: \sigma^2 \neq \sigma_0^2$ $H_1: \sigma^2 > \sigma_0^2$ $H_1: \sigma^2 < \sigma_0^2$	$\chi_0^2 > \chi_{\alpha/2, n-1}^2$ or $\chi_0^2 < \chi_{1-\alpha/2, n-1}^2$ $\chi_0^2 > \chi_{\alpha, n-1}^2$ $\chi_0^2 < \chi_{1-\alpha, n-1}^2$	$\lambda = \sigma/\sigma_0$ $\lambda = \sigma/\sigma_0$ $\lambda = \sigma/\sigma_0$
$H_0: \sigma_1^2 = \sigma_2^2$	$F_0 = S_1^2/S_2^2$	$H_1: \sigma_1^2 \neq \sigma_2^2$ $H_1: \sigma_1^2 > \sigma_2^2$	$F_0 > F_{\alpha/2, n_1-1, n_2-1}$ or $F_0 < F_{1-\alpha/2, n_1-1, n_2-1}$ $F_0 > F_{\alpha, n_1-1, n_2-1}$	$\lambda = \sigma_1/\sigma_2$ $\lambda = \sigma_1/\sigma_2$

11-5. Consider the data in Exercise 10-40. Test the hypothesis that the mean life of the light bulbs is 1000 hours. Use $\alpha = 0.05$.

11-6. Consider the data in Exercise 10-41. Test the hypothesis that mean compressive strength equals 3500 psi. Use $\alpha = 0.01$.

11-7. Two machines are used for filling plastic bottles with a net volume of 16.0 ounces. The filling processes can be assumed normal, with standard deviations $\sigma_1 = 0.015$ and $\sigma_2 = 0.018$. Quality engineering suspects that both machines fill to the same net vol-

ume, whether or not this volume is 16.0 ounces. A random sample is taken from the output of each machine.

Machine 1		Machine 2	
16.03	16.01	16.02	16.03
16.04	15.96	15.97	16.04
16.05	15.98	15.96	16.02
16.05	16.02	16.01	16.01
16.02	15.99	15.99	16.00