Large Sample Tests

Test of significance of the difference between the means of two samples.

1. *If the samples are drawn from the same population, i.e. if* $\sigma_1 = \sigma_2 = \sigma$, *then*

$$z = \frac{\bar{X}_1 - \bar{X}_2}{\sigma\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \qquad (2)$$

2. *If* σ_1 *and* σ_2 *are not known and* $\sigma_1 \neq \sigma_2$, σ_1 *and* σ_2 *can be approximated by the sample SDs* s_1 *and* s_2. *Hence, in such a situation [from (1)],*

$$z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad (3)$$

3. *If* σ_1 *and* σ_2 *are equal and not known, then* $\sigma_1 = \sigma_2 = \sigma$ *is approximated by* $\sigma^2 = \frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2}$. *Hence, in such a situation, [from (2)],*

$$z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}},$$

i.e.

$$z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_2} + \frac{s_2^2}{n_1}}} \qquad (4)$$

4. *The difference in the denominators of the values of* z *given in (3) and (4) may be noted.*