Chapter 5 Conclusion

μ Test

- σ **known**

$$Z_{Cal} = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$$

$$Z_{Tab} = \begin{cases} Z_{1-\alpha} & \text{One tailed test} \\ Z_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

- σ **unknown and** $n > 30$

$$Z_{Cal} = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$$

$$Z_{Tab} = \begin{cases} Z_{1-\alpha} & \text{One tailed test} \\ Z_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

- σ **unknown and** $n < 30$

$$T_{Cal} = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$$

$$T_{Tab} = \begin{cases} T_{1-\alpha} & \text{One tailed test} \\ T_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

$\mu_1 - \mu_2$ Test

- σ_1^2 and σ_2^2 **knowns**

$$Z_{Cal} = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$Z_{Tab} = \begin{cases} Z_{1-\alpha} & \text{One tailed test} \\ Z_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

- σ_1^2 and σ_2^2 **unknowns and** $n_1, n_2 > 30$

$$Z_{Cal} = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$Z_{Tab} = \begin{cases} Z_{1-\alpha} & \text{One tailed test} \\ Z_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

- σ_1^2 and σ_2^2 **unknowns and** $n_1, n_2 < 30$

$$S_p^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

$$T_{Cal} = \frac{\bar{x} - \bar{y}}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$T_{Tab} = \begin{cases} T_{(n_1+n_2-2,1-\alpha)} & \text{One tailed test} \\ T_{\left(n_1+n_2-2,1-\frac{\alpha}{2}\right)} & \text{Two tailed test} \end{cases}$$

P Test

$$Z_{Cal} = \frac{P - P_0}{\sqrt{\frac{P_0 q_0}{n}}}$$

$$Z_{Tab} = \begin{cases} Z_{1-\alpha} & \text{One tailed test} \\ Z_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

$P_1 - P_2$ Test

$$\boxed{\hat{P}_1 = \frac{x_1}{n_1}} \quad \text{and} \quad \boxed{\hat{P}_2 = \frac{x_2}{n_2}}$$

$$\boxed{P = \frac{x_1 + x_2}{n_1 + n_2}} \quad \text{then} \quad \boxed{q = 1 - P}$$

$$Z_{Cal} = \frac{\hat{P}_1 - \hat{P}_2}{\sqrt{Pq\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$Z_{Tab} = \begin{cases} Z_{1-\alpha} & \text{One tailed test} \\ Z_{1-\frac{\alpha}{2}} & \text{Two tailed test} \end{cases}$$

P-Value: another scheme for testing hypotheses

1- **Calculate** Z_{Cal} or T_{Cal}

2- **Compute** $P-Value = \begin{cases} P\left(Z > Z_{Cal}\right), & \text{for One Tailed Test} \\ 2P\left(Z > Z_{Cal}\right), & \text{for Two Tailed Test} \end{cases}$

3- **If** $P-Value \begin{cases} \leq \alpha, & \text{Then Reject } H_0 \\ > \alpha, & \text{Then Accept } H_0 \end{cases}$

The Paired T test (Dependent Samples):

The Sample Before	x_1	x_2	$\cdots$	x_n
The Sample After	y_1	y_2	$\cdots$	y_n

- $D := y_1 - x_1, y_2 - x_2, \cdots, y_n - x_n$.
- Use the calculator to compute $\bar{D}$ and S_D
- Easily, calculate $T_{Cal} = \dfrac{\bar{D}}{S_D / \sqrt{n}}$