Testing Your Hypothesis

1. **Collect All Needed Information**
   $H_0, \bar{X} = \bar{x}, N, \sigma_{\bar{X}}, \sigma$ (If you have it)
2. **Draw Your Hypothesis**
   - Determine if it is a Left, Right, or Two-Tail Test.
3. **Do Your Work on** $N(0,1)$
4. **Use Z-Transform to Test Point Estimate** $\bar{X} = \bar{x}$
   - With pre-determined α confidence.
5. **(Optional)**
   - *(After Applying Z-Test in Final Project for Personal Interest)*

I: Z-Test

1. **Calculating $\sigma_{\bar{x}}$ for an Actual Sample of Size N: $x_1, x_2, \ldots, x_N$:**

   (i) If we know σ = Standard Deviation of Original Population,

   Then we make:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{N}} \quad \text{[Preferred Method]}$$

   (ii) [Alternate Method]

   - First, calculate S, the Standard Deviation of $x_1, x_2, \ldots, x_N$:
     Let $M_x = \frac{1}{N}(x_1 + x_2 + \cdots + x_N)$

$$S^2 = \frac{1}{N}\left[(x_1 - M_x)^2 + (x_2 - M_x)^2 + \cdots + (x_N - M_x)^2\right]$$

   - Then calculate:

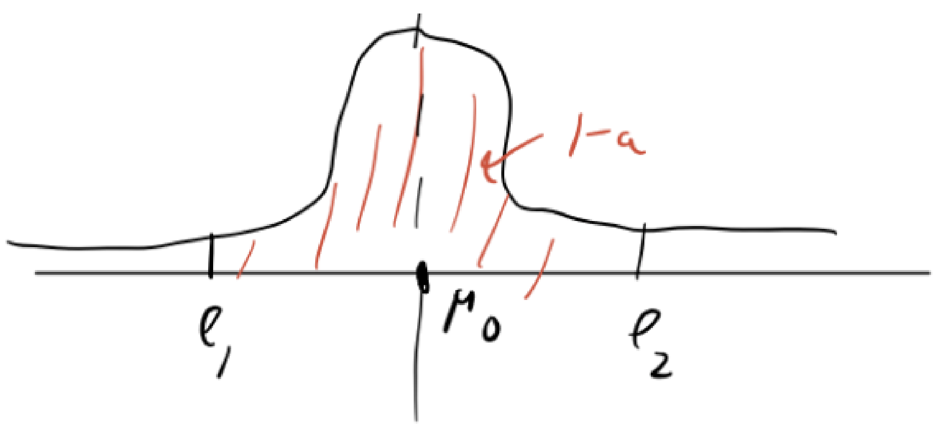
$$\sigma_{\bar{x}} = \frac{S}{\sqrt{N-1}}$$

For example,

Assume That Instead of $E(X) = \mu_0$, Let's Assume Initially $E(X) = \bar{x}$; Find with a confidence what this interval will be.

- **When we Test** we have:

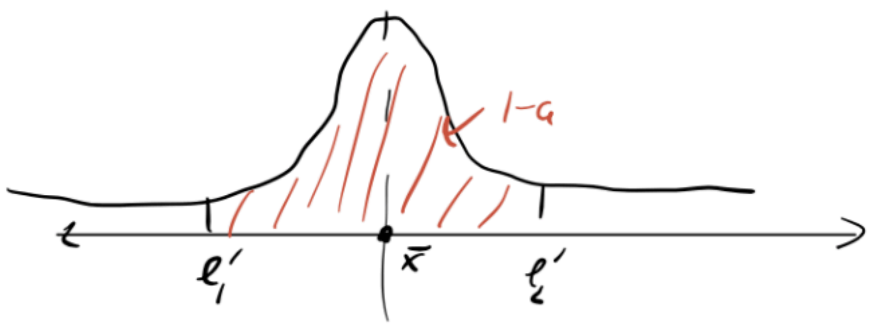
$$N(\bar{X}, \mu_0, \sigma_{\bar{x}})$$



(Illustration with a normal distribution curve showing μ_0, ℓ_1, and ℓ_2, with the shaded area $1 - \alpha$.)

- **For Step (v)** Do the same Thing Except Use:

$$N(\bar{X}, \bar{x}, \sigma_{\bar{x}})$$



- **This Tells You How Far Away From our Point Estimate:**

From Actual Average of Population with a Confidence.

II: Chi-Squared

Testing Your Hypothesis

a) **Table of Collected Values** *(two-to-twenty unique values)*

- [Multiple occurrences of each value]

b) **Each Value Must Occur At-Least 5-Times**

c) **(Goodness-To-Fit)**

- A Hypothesis About the Expected Distribution of the Data

c') **(Test For Independence)**

- Use the Method to Calculate the Expected Values Assuming Independence:

$$E_{ij} = \frac{\text{Row}_i \cdot \text{Col}_j}{\text{Total}}$$

d) Calculate Degrees of Freedom

- If a list of length N: $d.f. = N - 1$
- If a Table with Rows, Columns: $d.f. = (\text{Rows} - 1)(\text{Cols} - 1)$

e) Need a confidence $a \leq 5\%$

f) Need to make your calculations:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

g) Find χ^2_{crit} using χ^2-Table

h) Test if $\chi^2 \leq \chi^2_{\text{crit}}$:

- **If Yes:** Fail to Reject H_0
- **If Not:** Reject H_0