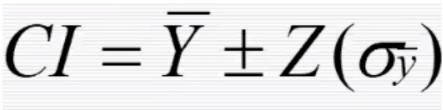
Chapter 7 - Estimation

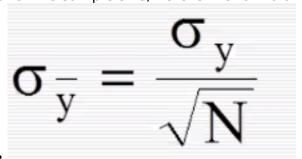
Estimation

Estimation:

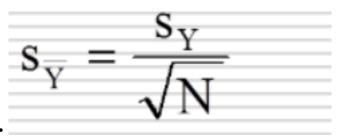
- inferential statistics
- **Estimation** is a process where we select a random sample from a population & use a sample statistic to estimate a population parameter.
 - Parameter measure used to describe an entire population
 - Statistic any measure used to describe the sample pulled from population
- 2 types of **estimation**:
 - Point estimation attempting to estimate the exact value of a population parameter.
- Interval estimation Creating a range of values which we believe that the population parameter is going to fall into.
- **Confidence interval** range of values defined by the confidence level within which the population parameter is estimated to fall
 - for 90% confidence level, z value is 1.65
 - for 95% confidence level, z value is 1.96
 - for 99% confidence level, z value is 2.58
 - These were the top 3 confidence levels used in social sciences
 - You need confidence level to construct confidence interval
- **Confidence level** Likelihood, expressed as a percent or probability that a specified interval will contain the population parameter. Expressed as a percentage or a probability. Basically, evaluates accuracy of the estimate of population parameters falling into the confidence interval.
 - To have more confidence, expand confidence interval
 - To be more precise, decrease confident level which results in a less expanded confidence interval
- To construct a confidence interval is:



- Confidence Interval = Sample Mean & add & subtract the z value (z value is based on our confidence level) times the standard error.
 - → Calculate the product of the z value & the standard error first.
- → Line over the y indicates standard error. Without the line over the y, it indicates standard deviation.
- → **Standard error** is calculated by taking *population standard deviation* & divide it by the square root of the sample size, here is the formula:



→ You may have to estimate the standard error instead of finding the actual standard error because the standard error isn't generally known. To calculate the **estimate standard error**, you divide the *sample standard deviation* by the square root of the sample size. Here is the formula:



■ When calculating the confidence interval, the reason you add & subtract the values is to find the **upperbound** & the **lowerbound**

Reducing Risk

Reducing Risk:

- To reduce the risk of being incorrect in terms of our interval not containing the true population mean, we can increase the level of confidence being used
 - By increasing the level of confidence, this widens our confidence interval
- When we use the highest level of confidence (99% confident), there is only a 1% risk that we're wrong that the specified interval doesn't contain the true population mean

Sample Size & Confidence Intervals:

• By increasing the sample size, researchers increase the precision of their estimate, and as a result decreases the confidence interval size

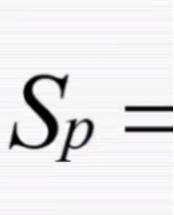
Confidence Intervals for Proportions & Percentages

For Proportions:

• For Proportions, the formula is:

$$CI = p \pm Z (S_p)$$

- CI = Confidence interval
- P = observed sample proportion
- \blacksquare Z = Z corresponding to the confidence level
- Sp = Estimated standard error of proportions



→ Formula used for calculating **estimated standard error of proportions**:

Interpreting Results:

- We are x% confident that the true population proportion is somewhere between x and x
- Express the results in percentages as it's easier to understand percents

For Percentages:

• For percents, convert it into a proportion then use the proportions method of calculating the confidence interval.