

2.04 Central Limit Theorem

What Is the Central Limit Theorem (CLT)?

- CLT states that the distribution of sample means approximates a normal distribution as the sample size gets larger, regardless of the population's distribution.
- Sample sizes equal to or greater than 30 are often considered sufficient for the CLT to hold.

What Is the Central Limit Theorem (CLT)?

- A key aspect of CLT is that the average of the sample means and standard deviations will equal the population mean and standard deviation.
- A sufficiently large sample size can predict the characteristics of a population more accurately.

Applying CLT

- According to the central limit theorem, the mean of a sample of data will be closer to the mean of the overall population in question, as the sample size increases, notwithstanding the actual distribution of the data.
- In other words, the data is accurate whether the distribution is normal or aberrant.

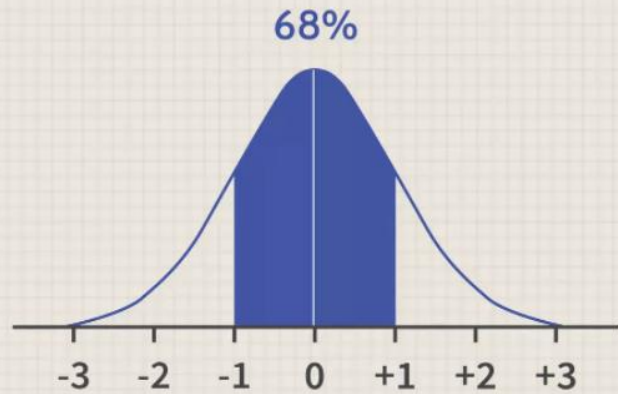
Applying CLT

- As a general rule, sample sizes of around 30-50 are deemed sufficient for the CLT to hold, meaning that the distribution of the sample means is fairly normally distributed.
- Therefore, the more samples one takes, the more the graphed results take the shape of a normal distribution.
- Note, however, that the central limit theory will still be approximated in many cases for much smaller sample sizes, such as $n=8$ or $n=5$

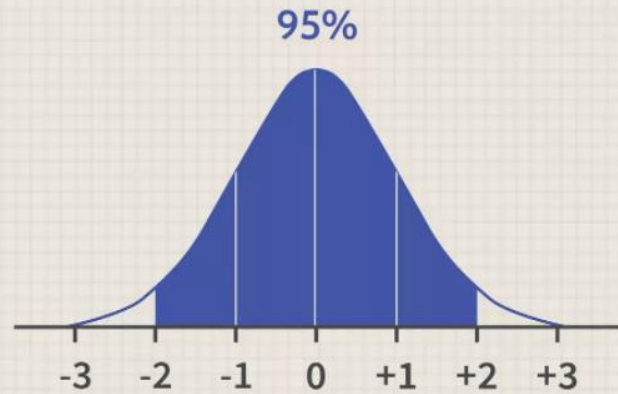
Applying CLT

- The central limit theorem is often used in conjunction with the law of large numbers, which states that the average of the sample means and standard deviations will come closer to equaling the population mean and standard deviation as the sample size grows, which is extremely useful in accurately predicting the characteristics of populations.

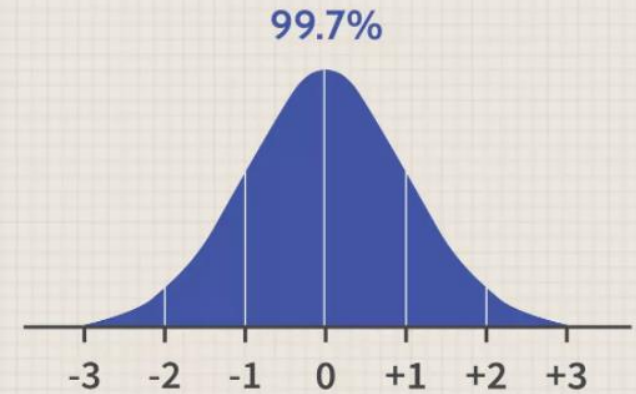
CLT Summary



68% of all values are within 1 standard deviation of mean value



95% of all values are within 2 standard deviations of mean value



99% of all values are within 3 standard deviations of mean value