

What are the four conditions that need to be met in order to apply the Central Limit Theorem?

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The Central Limit Theorem is a statistical theory that states that the sampling distribution of the mean of a random sample will approximate a normal distribution, regardless of the underlying distribution of the population, given that certain conditions are met. In order to apply the Central Limit Theorem, the following four conditions must be met:

1. The sample size must be sufficiently large: The sample size should be greater than or equal to 30. This ensures that the sample mean is a good estimate of the population mean.
2. The samples must be independent: Each observation in the sample must be selected randomly and should not be influenced by other observations.
3. The samples must be taken from a population with a finite variance: This means that the population from which the samples are taken must have a well-defined and finite variance.
4. The samples must be taken from a population with a distribution that is not heavily skewed: This means that the population distribution should not be heavily skewed or have extreme outliers that may affect the sample mean.

By meeting these four conditions, the Central Limit Theorem can be applied to make inferences about the population mean based on the sample mean. It is a powerful tool in statistics and is widely used in various fields such as economics, biology, and psychology.

Central Limit Theorem: The Four Conditions to Meet

The states that the sampling distribution of a sample mean is approximately normal if the sample size is large enough, even if the population distribution is not normal.

In order to apply the central limit theorem, there are four conditions that must be met:

- 1. Randomization: The data must be sampled randomly such that every member in a population has an equal**

probability of being selected to be in the sample.

2. Independence: The sample values must be independent of each other.

3. The 10% Condition: When the sample is drawn without replacement, the sample size should be no larger than 10% of the population.

4. Large Sample Condition: The sample size needs to be sufficiently large.

This tutorial provides a brief explanation of each condition.

Condition 1: Randomization

In order to apply the central limit theorem, the data that we use must be sampled randomly from the population by using a probability sampling method.

In statistics, there are two types of :

1. Probability sampling methods: Sampling methods in which every member in a population has an equal probability of being selected to be in the sample. Examples include:

Simple random sample
Stratified random sample
Cluster random sample
Systematic random sample

2. Non-probability sampling methods: Sampling methods in which every member in a population does not have an equal probability of being selected to be in the sample. Examples include:

Convenience sample
Purposive sample

It's important that a probability sampling method is used to obtain the sample because this maximizes the chances that we obtain a sample that is .

Condition 2: Independence

In order to apply the central limit theorem, we must also assume that each of the sample values is independent of each other. That is, the occurrence of one event does not affect the occurrence of any other event.

Condition 3: The 10% Condition

When the sample is drawn without replacement (which is almost always the case), the sample size must be no larger than 10% of the total population.

For example:

If our population size is 500, then our sample size should be no larger than 50. If our population size is 1,000 then our sample size should be no larger than 100. If our population size is 50,000, then our sample size should be no larger than 5,000.

And so on.

Condition 4: Large Sample Condition

Lastly, in order to apply the central limit theorem our sample size must be sufficiently large.

In general, we consider "sufficiently large" to be 30 or larger. However, this number can vary a bit based on the underlying shape of the population distribution.

In particular:

If the population distribution is symmetric, sometimes a sample size as small as 15 is sufficient. If the population distribution is skewed, generally a sample size of at least 30 is needed. If the population distribution is extremely skewed, then a sample size of 40 or higher

may be necessary.

Depending on the shape of the population distribution, you may require more or less than a sample size of 30 in order for the Central Limit Theorem to apply.

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