**Basics of Econometrics**

**A**[**parameter**](https://www.statisticshowto.com/what-is-a-parameter-statisticshowto/)in statistics refers to an aspect of a population, as opposed to a [statistic](https://www.statisticshowto.com/statistic/), which refers to an aspect about a [sample](https://www.statisticshowto.com/sample/). For example, the [population mean](https://www.statisticshowto.com/population-mean/) is a parameter, while the [sample mean](https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/sample-mean/) is a statistic. A **parametric statistical test** makes an assumption about the population parameters and the distributions that the data came from. These types of test include [Student’s T tests](https://www.statisticshowto.com/probability-and-statistics/t-test/) and [ANOVA](https://www.statisticshowto.com/probability-and-statistics/hypothesis-testing/anova/)tests, which assume data is from a [normal distribution](https://www.statisticshowto.com/probability-and-statistics/normal-distributions/).

The opposite is a [**nonparametric test**](https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/parametric-and-non-parametric-data/), which doesn’t assume anything about the population parameters. Nonparametric tests include [chi-square](https://www.statisticshowto.com/probability-and-statistics/chi-square/), [Fisher’s exact test](https://www.statisticshowto.com/fishers-exact-test-independence/) and the [Mann-Whitney test](https://www.statisticshowto.com/mann-whitney-u-test/).

Every [parametric](https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/parametric-and-non-parametric-data/)test has a nonparametric equivalent. For example, if you have parametric data from two independent groups, you can run an independent samples t-test to compare means. If you have nonparametric data, you can run a [Mann Whitney test](https://www.statisticshowto.com/mann-whitney-u-test/) instead.

**The Central Limit Theorem** states that the [sampling distribution](https://www.statisticshowto.com/sampling-distribution/)**of the**[sample means](https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/sample-mean/) approaches a [normal distribution](https://www.statisticshowto.com/probability-and-statistics/normal-distributions/) as the [sample size](https://www.statisticshowto.com/probability-and-statistics/find-sample-size/) gets larger — no matter what the shape of the [population](https://www.statisticshowto.com/what-is-a-population/) distribution. This fact holds especially true for sample sizes over 30.

All this is saying is that as you take more [samples](https://www.statisticshowto.com/sample/), especially large ones, your graph of the [sample means](https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/sample-mean/) will look more like a normal distribution.

Here’s what the Central Limit Theorem is saying, graphically. The picture below shows one of the simplest types of test: rolling a [fair die](http://loki3.com/poly/fair-dice.html). The **more times you roll the die**, the more likely the shape of the distribution of the means tends to look like a**normal distribution graph**.

An essential component of the Central Limit Theorem is that the [average](https://www.calculushowto.com/average-value-of-a-function/#def)**of your sample means will be the population mean**. In other words, add up the means from all of your samples, find the average and that average will be your actual population mean. Similarly, if you find the average of all of the [standard deviations](https://www.statisticshowto.com/probability-and-statistics/standard-deviation/) in your [sample](https://www.statisticshowto.com/sample/), you’ll find the actual standard deviation for your population. It’s a pretty useful phenomenon that can help accurately predict characteristics of a [population](https://www.statisticshowto.com/what-is-a-population/).

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The easiest way to understand Degrees of Freedom conceptually is through an example:

* Consider a data sample consisting of, for the sake of simplicity, five positive integers. The values could be any number with no known relationship between them. This data sample would, theoretically, have five degrees of freedom.
* Four of the numbers in the sample are {3, 8, 5, and 4} and the average of the entire data sample is revealed to be 6.
* This must mean that the fifth number has to be 10. It can be nothing else. It does not have the freedom to vary.
* So the Degrees of Freedom for this data sample is 4.

The formula for Degrees of Freedom equals the size of the data sample minus one:

Where, Df = degrees of freedom

N= Sample size

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