What is the relationship between statistics and estimation?

Authored by

stats writer

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The relationship between statistics and estimation can be described as a symbiotic one, where they both rely on each other to provide accurate and meaningful results. Statistics is a branch of mathematics that deals with collecting, organizing, analyzing, and interpreting data. On the other hand, estimation is a process of using statistical methods to make predictions or draw conclusions about a population based on a sample of data.

In simpler terms, statistics provides the necessary tools and techniques to gather and make sense of data, while estimation uses these tools to make inferences and predictions about a larger population. Without the use of statistical methods, estimation would not be possible, and without the need for estimation, the field of statistics would have limited practical applications.

Furthermore, statistics and estimation are closely related in the sense that estimation involves the use of statistical models and techniques to estimate unknown parameters of a population, such as mean, variance, or correlation. These parameters are essential in understanding and making decisions about a population, and they can only be accurately estimated through the use of statistical methods.

In conclusion, the relationship between statistics and estimation is integral, as they both play crucial roles in understanding and making inferences about data. Without one, the other would not be as effective, making them dependent on each other for a comprehensive and accurate analysis of data.

Statistics - Estimation

Point estimates are the most likely value for a population parameter.

Confidence intervals express the uncertainty of an estimated population parameter.

The Point Estimate

A point estimate is calculated from a sample.

The point estimate depends on the type of data:

Categorical data: the number of occurrences divided by the sample size.**Numerical data**: the mean (the average) of the sample.

One example could be:

The point estimate for the average height of people in Denmark is 180 cm.

Estimates are always **uncertain**. This uncertainty can be expressed with a **confidence interval**.

Confidence Intervals

The confidence interval is defined by a **lower bound** and an **upper bound**.

This gives us a range of values that the true parameter is likely to be between.

For example that:

The average height of people in Denmark is between 170 cm and 190 cm.

Here, 170 cm is the lower bound, and 190 cm is the upper bound.

The lower and upper bounds of a confidence interval is based on the **confidence level**.

The Confidence Level

Confidence levels can be expressed as percentages or decimal numbers, and the most commonly used are:

90% (0.90)95% (0.95)99% (0.99)

The higher the confidence level, the bigger the interval will be.

For example, the confidence intervals for the average height of people in Denmark might be:

90% confidence level: between 175 cm and 185 cm.

95% confidence level: between 170 cm and 190 cm.

99% confidence level: between 160 cm and 200 cm.

We use this confidence level together with a probability distribution to decide how large the **margin of error** is.

The Margin of Error

The margin of error is the distance between the point estimate and the lower and upper bounds.

The margin of error is based on the confidence level and the data we have from the sample.

For example, if the point estimate for the average height of people in Denmark is 180 cm:

5 cm margin of error: between 175 cm and 185 cm.

10 cm margin of error: between 170 cm and 190 cm.

20 cm margin of error: between 160 cm and 200 cm.

Steps for Calculating the Confidence Interval

The following steps are used to calculate a confidence interval:

Check the conditionsFind the point estimateDecide the confidence levelCalculate the margin of errorCalculate the confidence interval

One **condition** is that the sample is randomly selected from the population.

The other conditions depends on what type of parameter you are calculate the confidence interval for.

Commonly estimated parameters are:

Proportions (for qualitative data)Mean values (for numerical data)

You will learn the steps for both types in the following pages.

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