Print

Understanding the Null and Alternative Hypothesis

Now that you have a bit of context about statistical decision-making and hypothesis testing, let's revisit the terms null and alternative hypothesis. In the previous video, you used a hypothesis test to evaluate whether the process is on target, with a mean of 40 hundredths of an inch, based on a pilot sample of 20 observations.

The default decision in this scenario is to assume that the process is on target, unless your data indicate otherwise. In the language of hypothesis testing, we can express the initial situation this way. The null hypothesis is the default decision. We assume the null is true unless our data tell us otherwise. It might seem counterintuitive, but you conduct this analysis to test that the process is not on target. That is, you are testing that the changes are not sufficient to bring the process to target.

This concern or suspicion is represented by the alternative hypothesis. The alternative hypothesis is the motivation to collect and analyze the data. In this scenario, if you haven't achieved the target, you still have a problem. Your team needs to take additional action. We represent the null and alternative hypotheses as statements about the value of population parameters. In this case, the parameter of interest is the population mean, mu.

In hypothesis testing, we start by assuming that the null hypothesis is true, and we use sample data to make decisions about the null hypothesis.

For this scenario, based on your analysis of the sample data, you can make one of two possible decisions: you can reject the null hypothesis that the mean is 40, or you can fail to reject the null hypothesis. If you reject the null hypothesis, you accept the alternative and conclude that the process is not on target. If you fail to reject the null hypothesis, you conclude that the null hypothesis might be true and the process might be on target.

Notice the language we use here: "fail to reject" and "might be true." This is a subtlety in hypothesis testing, one that often leads to a great deal of confusion. You might be tempted to say that you can "accept the null hypothesis as true."

However, you are making decisions based on sample data, so there is always some uncertainty in your decision making. Different samples might lead to different results, and because you are making decisions based on sample data, you can't prove that the true mean is actually 40.

When you fail to reject the null hypothesis, you are simply saying that you don't have evidence, based on the available data, that the null hypothesis is not true. In the metal parts scenario, this is a good thing. Failing to reject the null hypothesis provides some degree of evidence, based on the 20 observations in the pilot period, that the changes were effective in bringing the process to target.

Your next step might be to implement these changes.

Close