

13.4: Power Demo II

Learning Objectives

- State the effect of effect size on power
- State the effect of one- versus two-tailed tests on power
- State the effect of the standard deviation on power
- State the effect of α level on power

Instructions

This demonstration shows various aspects of power. The graph displays power for a one-sample Z -test of the null hypothesis that the population mean is 50. The red distribution is the sampling distribution of the mean assuming the null hypothesis is true. The blue distribution is the sampling distribution of the mean based on the "true" mean. The default value of the true mean is 70. The cutoff for significance is based on the red distribution. For a one-tailed test at the 0.05 level, the cutoff point is determined so that 5% of the area is to the right of the cutoff. For the default values, the cutoff is 58.22. Therefore, any sample mean = 58.22 would be significant.

The shaded area of the blue distribution shows power. It is the probability that the sample mean will be 58.22 if the true mean is 70. For the default values it is 0.991.

You specify the true mean by either entering text in the box. The population standard deviation can be specified by the pop-up menu. Finally, you can specify the number of tails of the test and the significance level. Power and the cut-off points are displayed.

1. Notice the effect on power of changing the true mean to 60. Look at the distributions to find the area that represents power.
2. Change the sample size and notice its effect on the cutoff point and on power.
3. Change the population standard deviation (sd) and notice its effect on the cutoff point and on power.
4. Compare the power of one-tailed and two-tailed tests. What is the power for each when the true mean is 55. What about 45? (The one-tailed tests are based on the expectation that the population mean is > 50 .)
5. Set the value of the true mean to 50. Does power make sense in this situation?
6. Determine the effect of the significance level on the red and blue distributions. On what (in addition to power) does it have its effect?

Illustrated Instructions

Video Demo

The video demonstration starts by changing the true mean to 55 and then the standard to 28. Notice how the probability of rejecting the null hypothesis varies with these changes.

The video concludes by changing the test to two-tailed and decreasing the significance level to 0.01. Again notice the changes in the probability of rejection.

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