Monday, Mar 28

Power

The **power** of a significance test is the probability that it will *reject* the null hypothesis when it is *false*. Power is therefore the probability of *not* making a type II error when the null hypothesis is false (recall that a type II error is failing to reject a false null hypothesis).

Note: The following can also be explored dynamically using this application.

Example: Suppose we have the hypotheses $H_0 : \mu = 0$ versus $H_a : \mu > 0$ and so will use the test statistic

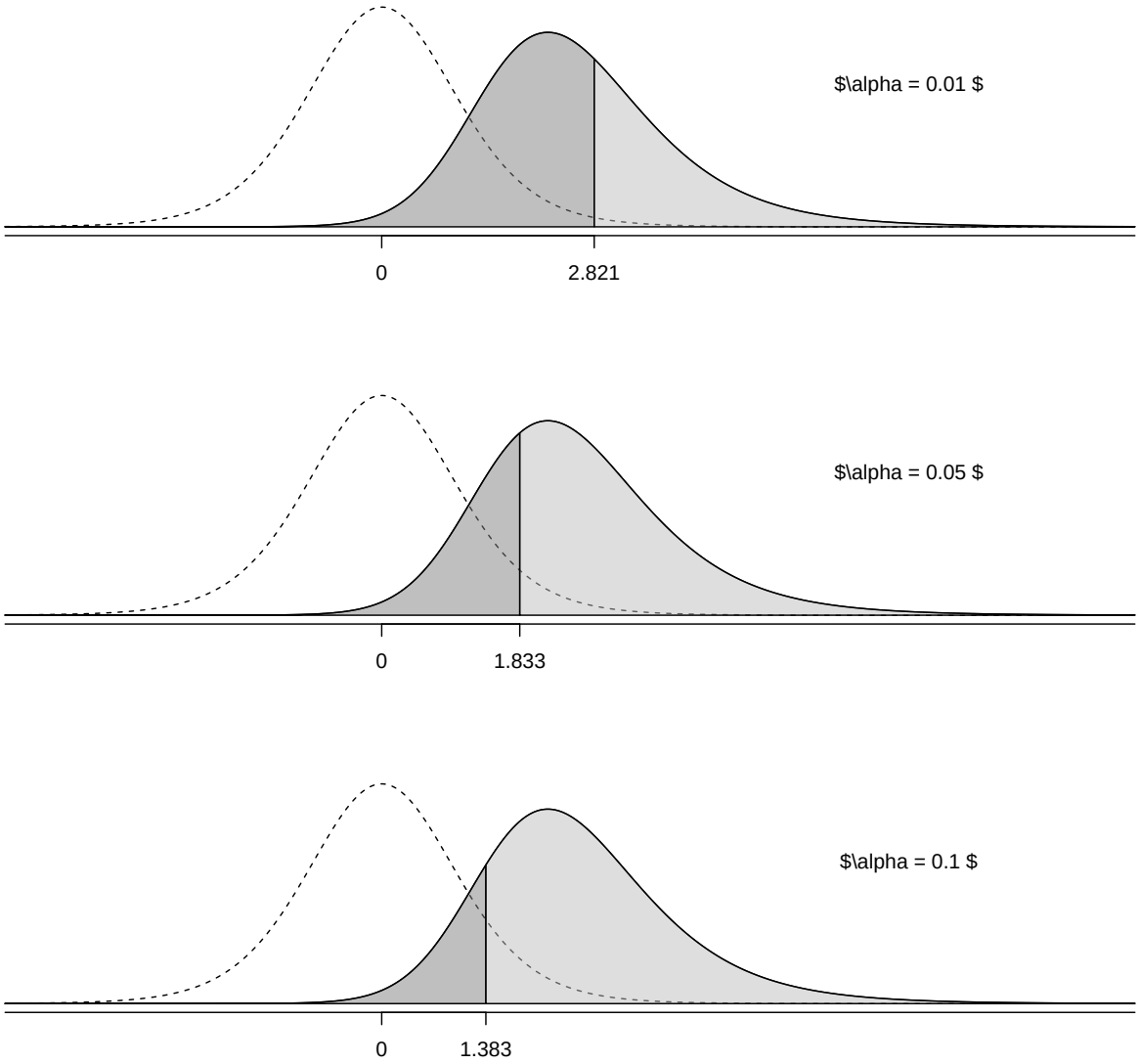
$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}.$$

with a sample of $n = 10$ observations.

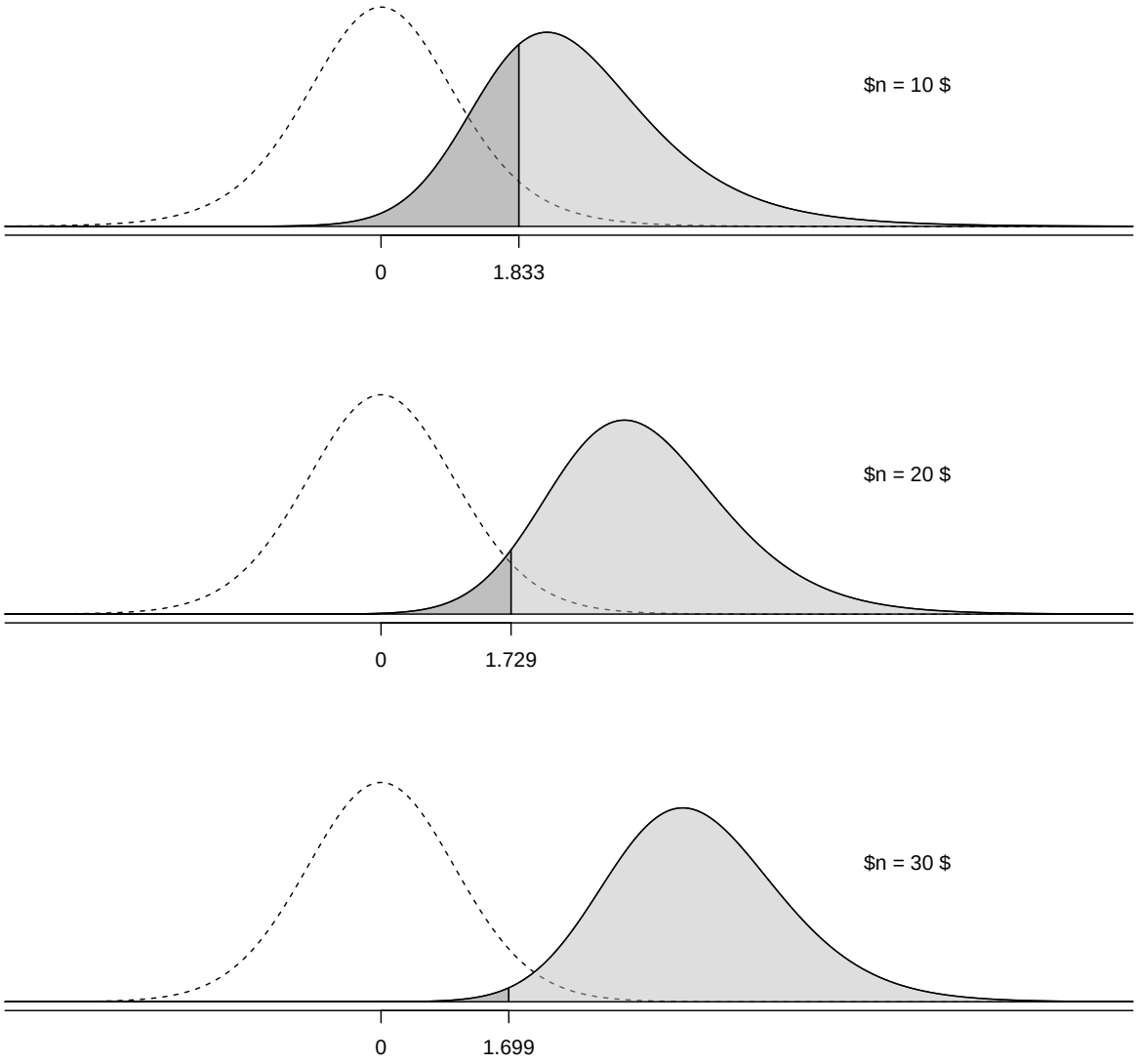
Suppose that H_0 is *false*. What can we do to increase the probability of *rejecting* H_0? That is, how do we increase *power*?

In the following figures, the *solid* line shows the sampling distribution of the test statistic when the null hypothesis is false, and the *dotted* line shows the sampling distribution of the test statistic under the assumption that the null hypothesis is true. The *light* grey area is power, and the *dark* grey area is the probability of making a type II error.

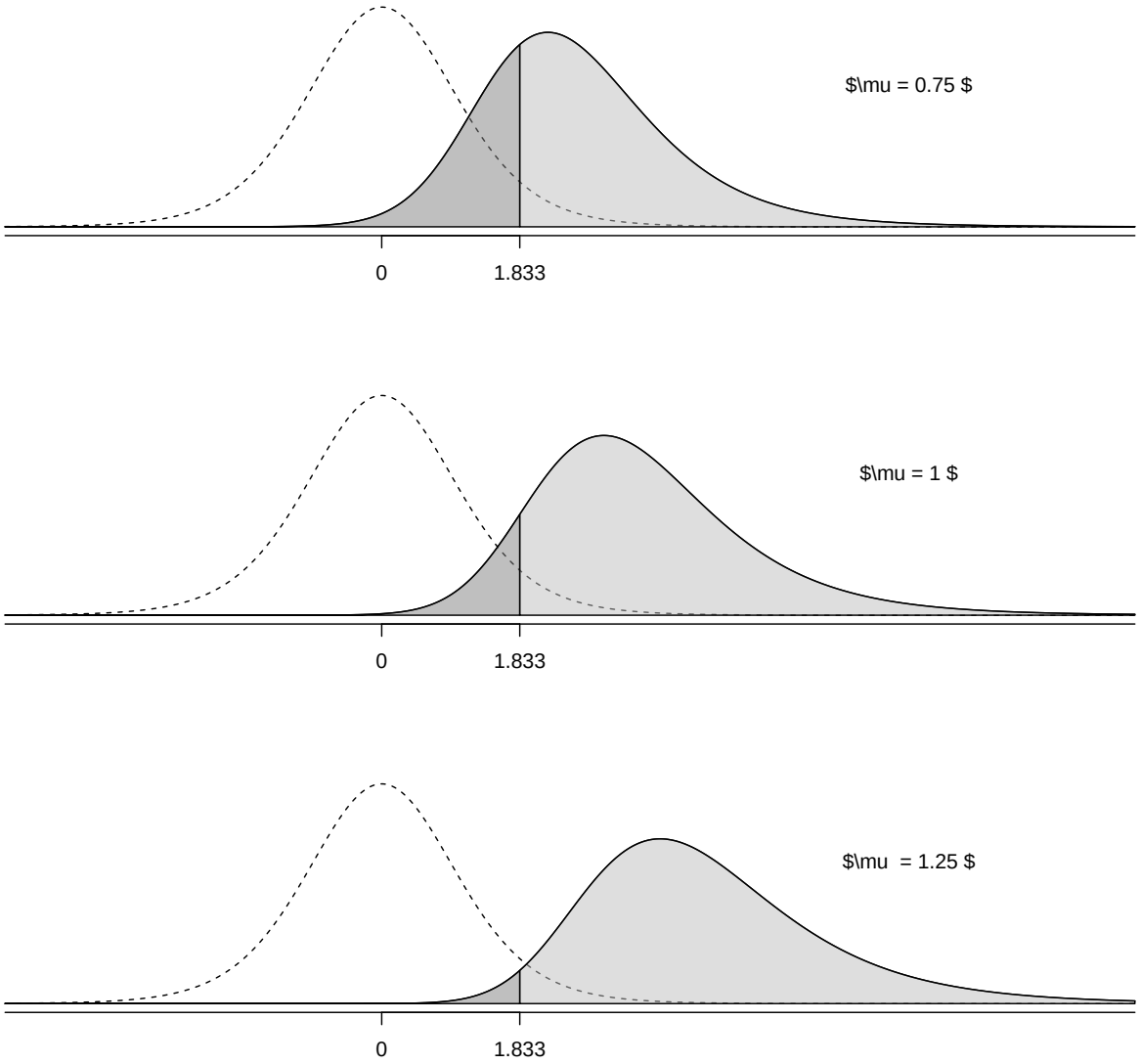
Effect of α on Power



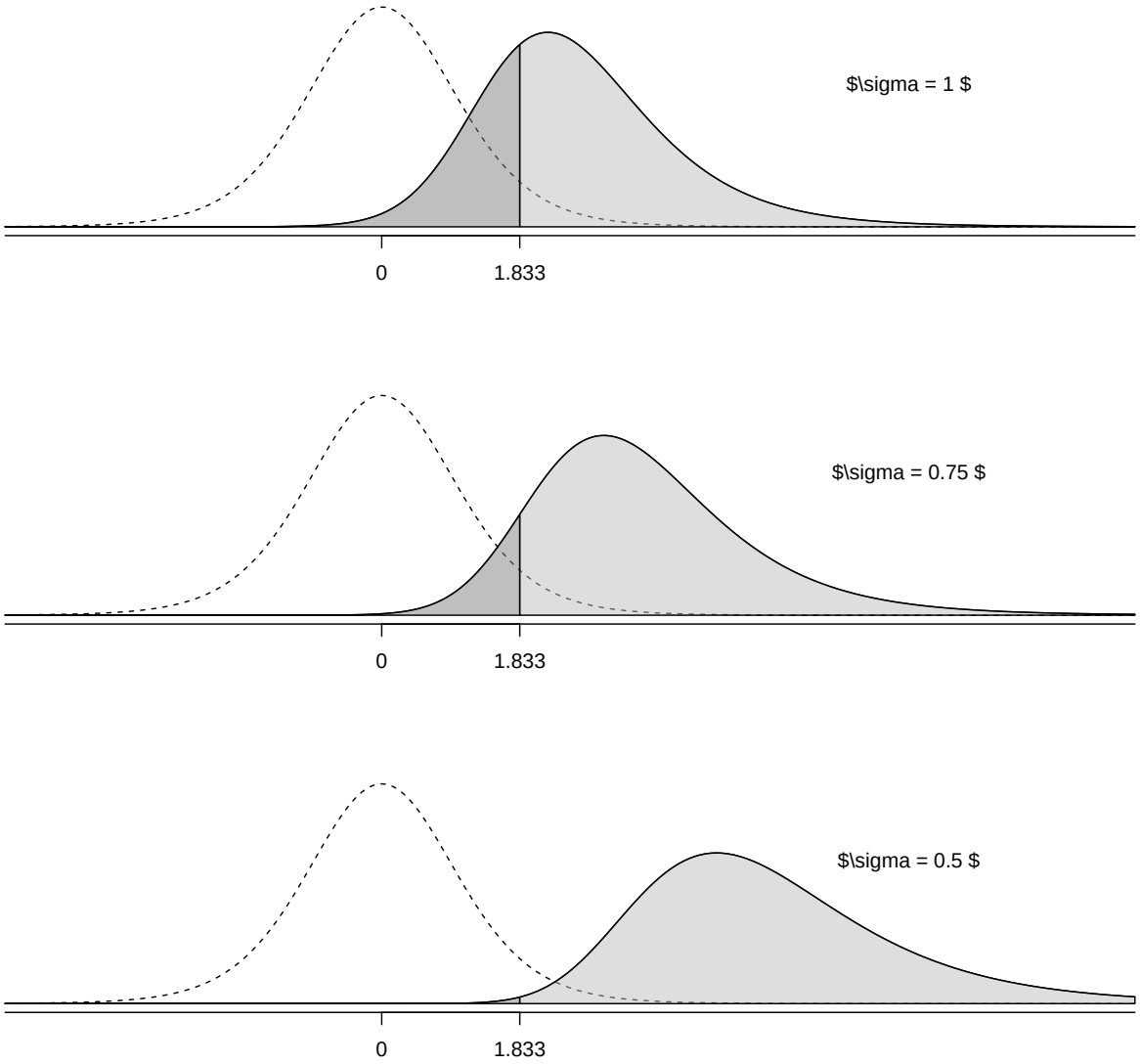
Effect of n on Power



Effect of μ on Power



Effect of σ on Power



Effect of One- Versus Two-Sided Tests on Power