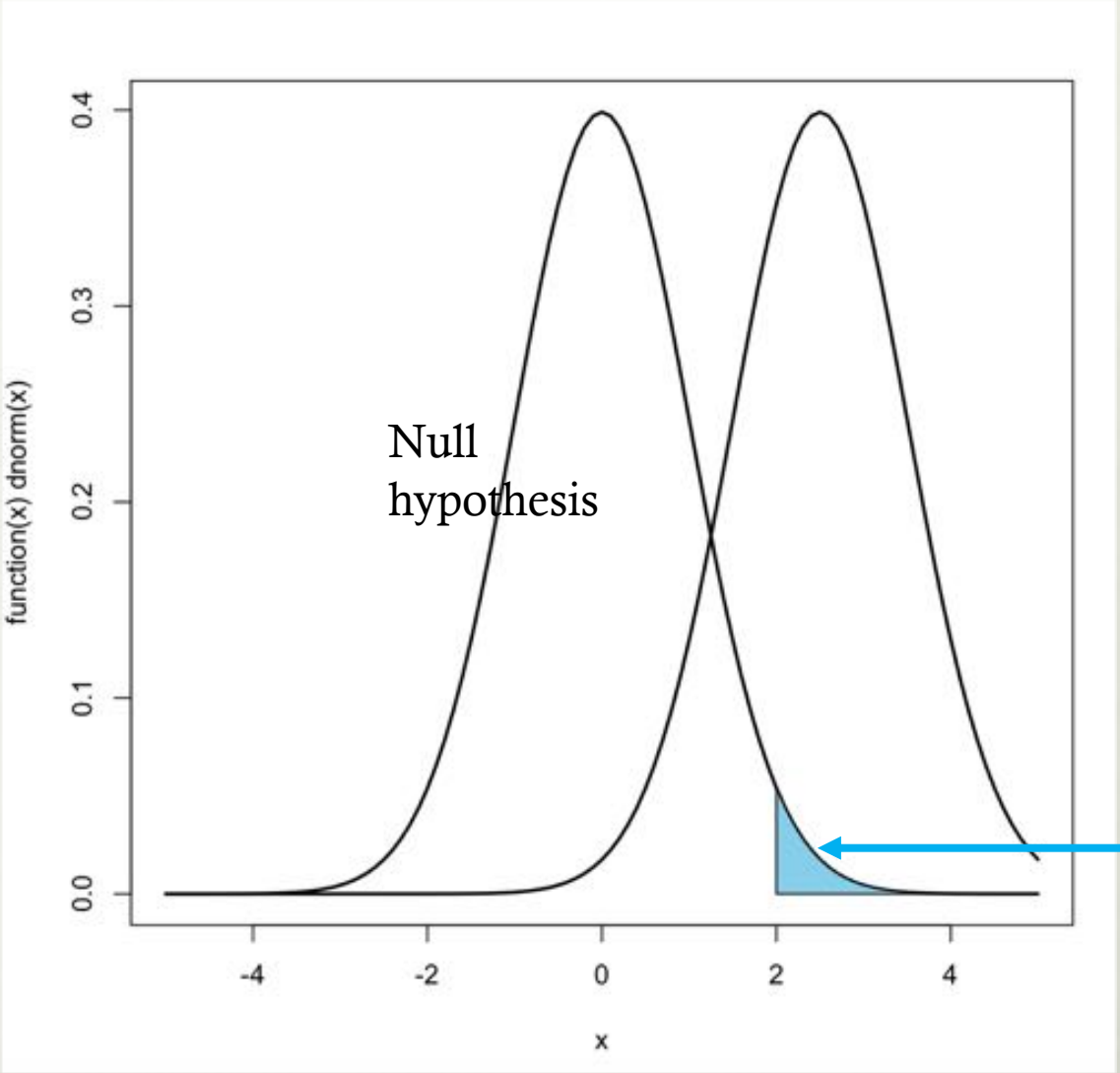
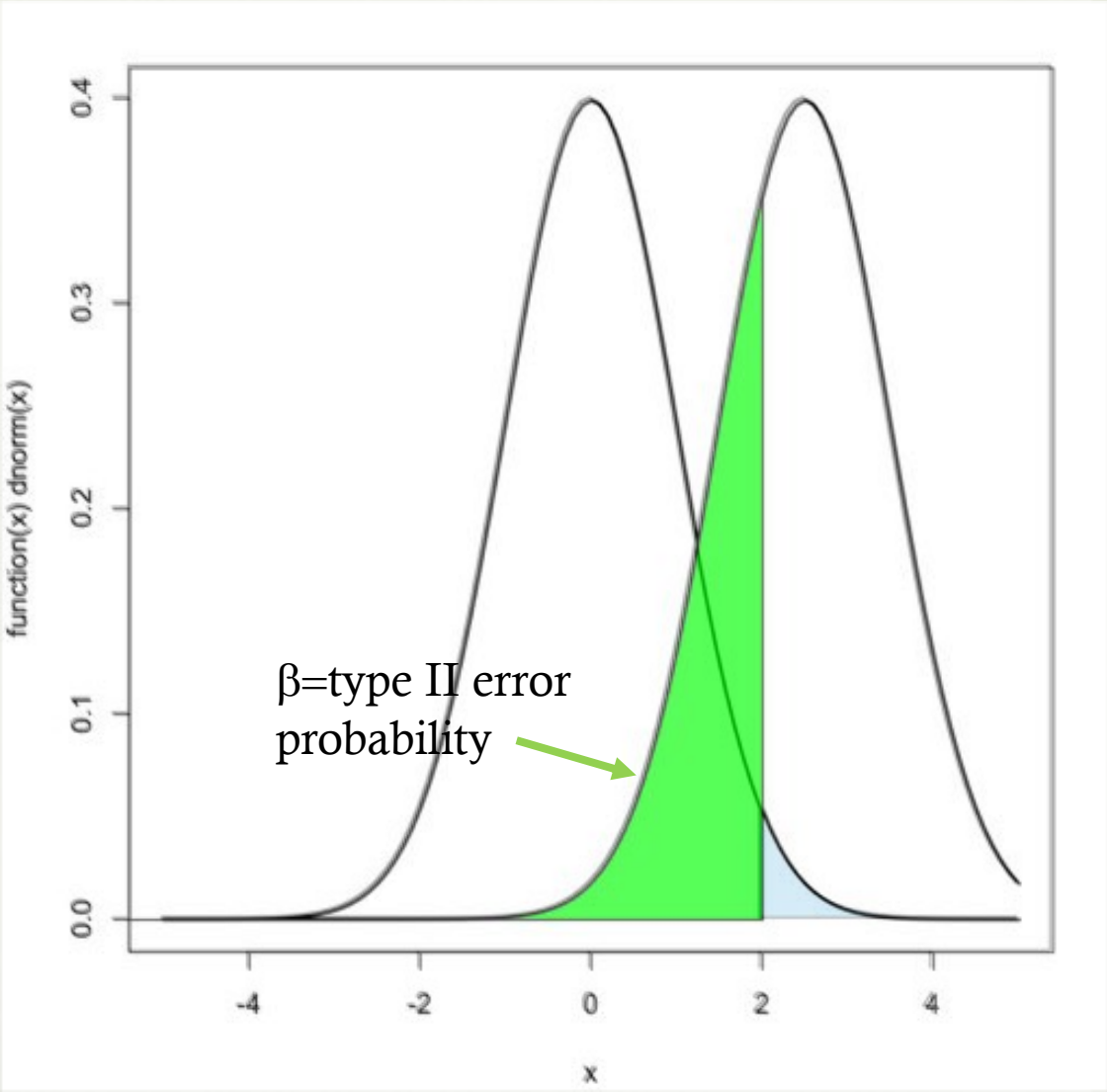
Graduate Seminar- A 780 Astrostatistics and Scientific Computing

Power analysis



Power analysis



Type II error

Fail to reject the null hypothesis when the alternative hypothesis is true.

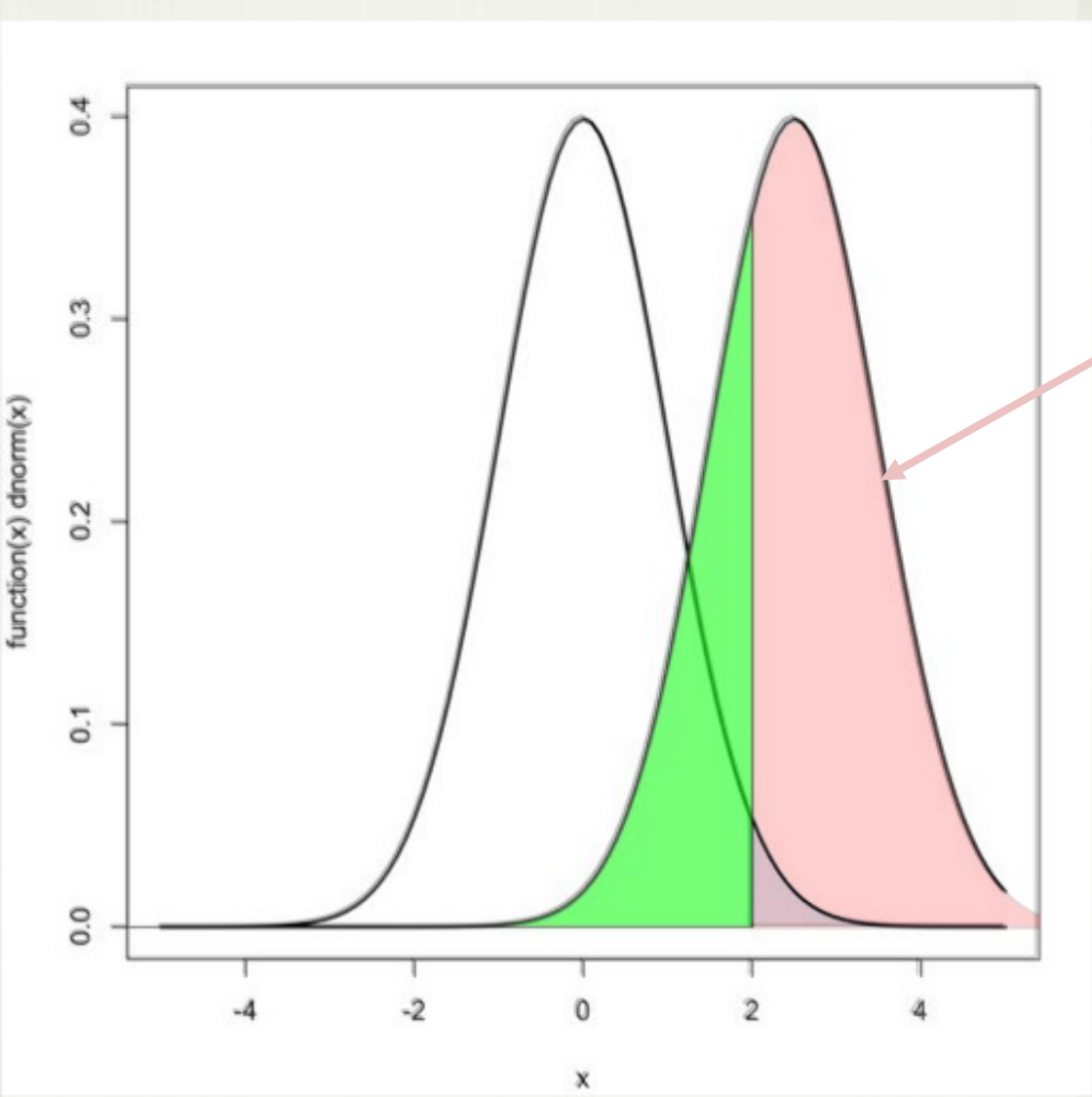
β=Probability (type II error)

Power of hypothesis test:

Probability of rejecting the null hypothesis when the alternative hypothesis is true

=1-β

Power analysis



1−β= statistical power

Project 1 - Appendix

- Power analysis
  - Assuming abs(m1-m2)=0.2 and sd=1 for N=50 and for N=100. With a power analysis, calculate the expected fraction of cases in which your statistical test failed to reject the null hypothesis (for meanfilesA.tar and meanfilesB.tar).
- What fraction of the statistically significant results you found for meanfilesE.tar are actually not real?
  - Answer this question with a power analysis by assuming that abs(m1-m2)=0.25, sd=1 for 40 per cent of the cases.

Project 1 - Appendix

- Generate 100 samples with *n* numbers from a normal distribution with mean =1 and sd=1 (subsample 1) and *n* numbers from a normal distribution with mean =1.2 and sd=1 (subsample 2)
- t.test for (m1-m2)=0, alpha=0.05, alternative m1 different from m2 (assume equal variances)
- calculate mean(m1-m2) of all the statistically significant results (i.e. of all the cases for which p-value<0.05).
- Effect size is defined as d=abs(m1-m2)/sd
- power analysis for effect size 0.2; what is the power of the test for effect size=0.2?
- Plot *'mean(m1-m2) of all the statistically significant tests'* vs *n*
- Plot *'mean(m1-m2) of all the statistically significant tests'* vs *power of the test*
- For *n=10 to 1000* in steps of 10

Power analysis in R

- power.t.test
- ..or library(pwr) pwr.t.test, pwr.t2n.test

Effect size needed for pwr.t.test= abs(m1-m2)/(pooled sd)

library(lsr)

d=cohensD(x,y)

pwr.t.test(d,…

Python

- statsmodels.stats.power.tt_ind_solve_power