

## Exercise

<http://marekrychlik.com/node/43>

{This problem involves modifying the numerical experiment, using your favorite statistical software, to test the formula for the number of replications in a Z-test discussed in class.

{In real life, you almost never know the variance of the reference population. Thus, the Z-test has mostly "academic" value, except when samples are large enough, when it does not matter whether you are using real variance or sample variance. The t-Student test is a suitable replacement for the Z-test when sample variance is used, and the sample size is small.

{Determine experimentally the "power curve" for the t-Student test for various values of parameters:

- $\delta$  - the minimum significant difference
- $\sigma^2$  - the true variance
- $\nu$  - the number of degrees of freedom (the same as  $r-1$  where  $r$  is the number of replications)

{You can pattern your experiment after the one for the Z-test, given here:

{</node/23>}

{Suggestions:

- Use small numbers of replications, say 2-10.
- Experimentally find the number of type II errors.
- The number of type I errors  $\alpha$  can be obtained from the tables of the t-Student distribution. Use  $\alpha = 0.01$  and  $\alpha = 0.05$  only.