Lab 6

Creating and Using Our Own Statistical Functions for Correlational Testing
Psychology 310

Instructions. Work through the lab, saving the output as you go. If you work in Microsoft Word, you can easily copy any graph to Word via the clipboard. Numerical output may also be copied easily by highlighting, moving it to the clipboard, then copying into Word. However, you should format R output in TrueType Courier New font so that it is *monospaced*. Your output file should be named `LAST_FIRST_LAB6.DOC`, where `LAST` is your last name, and `FIRST` is your first name. Any additional files should have the same naming scheme, except the file extension should be correct. You may add any description text you wish after `LAB6` in the file name.

Preamble. Today's assignment involves creating and using your own statistical functions for performing correlational tests.

1 Introduction

This week's lab is very basic, and requires very little introduction. Essentially, I want you to create a small library of functions to perform the standard correlational tests.

2 One Sample Hypothesis Test that $\rho = 0$

The one sample test that $\rho = 0$ based on a sample of size n from a bivariate normal distribution uses a t-statistic with $n - 2$ degrees of freedom.

$$t_{n-2} = \sqrt{n-2}\,\frac{r}{\sqrt{(1-r^2)}} \tag{1}$$

Your function call should be of the form

`OneSampleCorrelationTTest(x=NULL,y=NULL,r=NULL,n=NULL,digits=4)`

Input to the function is either `rawdata` in the form of two vectors of observations `x` and `y`, or a correlation `r` and sample size `n`. Assume no missing data is this routine.

Here are some example function calls

```
> OneSampleCorrelationTTest(r=.200,n=100)
$correlation
[1] 0.2

$t.observed
```

```
[1] 2.0207

$df
[1] 98

$p.value
[1] 0.046
> OneSampleCorrelationTTest(r=-.196,n=102)
$correlation
[1] -0.196

$t.observed
[1] -1.9988

$df
[1] 100

$p.value
[1] 0.0483
> OneSampleCorrelationTTest(x=c(1,3,4,5,2),y=c(1,2,3,4,5))
$correlation
[1] 0.4

$t.observed
[1] 0.7559

$df
[1] 3

$p.value
[1] 0.5046
```

3 One Sample Test that $\rho = \rho_0$

Next, construct a routine for a one sample test that $\rho = \rho_0$. Your function should take all the same input as before, except that:

- It should take an additional parameter ρ_0. For simplicity, we'll assume your test is two-sided.
- If $\rho_0 = 0$, then perform the Z test anyway, even though the t test is exact under normality assumptions and the Z test is not.

Here are some sample function calls:

```
> FisherZTest(x=c(1,3,4,5,2),y=c(1,2,3,4,5),rho0=0)
$correlation
[1] 0.4

$z.statistc
[1] 0.5991301

$p.value
[1] 0.5490862
> FisherZTest(x=c(1,3,4,5,2),y=c(1,2,3,4,5),rho0=.4)
$correlation
[1] 0.4

$z.statistc
[1] -7.850462e-17

$p.value
[1] 1
> FisherZTest(r=.196,n=102,rho0=0)
$correlation
[1] 0.196

$z.statistc
[1] 1.97574

$p.value
[1] 0.04818424
> FisherZTest(r=-.196,n=100,rho0=0)
$correlation
[1] -0.196

$z.statistc
[1] -1.955681

$p.value
[1] 0.05050273
```