# For vignette

we’re trying to show that KS w/o the correction **\*fails to reject\*** the null hypothesis often enough, right? i.e., when the distribution is different from the one being hypothesized (and therefore Ho is false and should be rejected), because uncorrected KS estimates its parameters from the sample and therefore starts out “close” to the sample, it does not reject as often as it should. That is our assertion, correct? Then this is a Type II error, not Type I. Type II = false negative, whereas Type I = false positive. We’re saying that the uncorrected KS has too many false negatives (when it should have rejected Ho but didn’t), which is too many Type II errors.

Here’s some code to demonstrate this:

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numreps <- 500

pvalues <- matrix(NA, numreps, 2)

for(i in 1:numreps) {

cat(i, " ")

x <- runif(100)

results1 <- LcKS(x, cdf="pnorm", nreps=999)

results2 <- ks.test(x, "pnorm", mean(x), sd(x))

pvalues[i,1] <- results1$p.value

pvalues[i,2] <- results2$p.value

}

table(pvalues[,1] < .05)

table(pvalues[,2] < .05)

——

We take a sample of n=100 from a uniform distribution. Since we are testing against a Normal hypothesis, Ho is false and should be rejected. Nonetheless, in 500 simulated samples, the uncorrected version rejected Ho only 3 out of 500 times!

Our corrected version did better, with 273 rejections out of 500, but even still had a power of only 55% (= 273/500) even with a huge sample size of n=100.

To check the Type I error rate, we use the above code except replace

x <- runif(100)

with

x <- rnorm(100)

So now we are indeed sampling from a normal distribution, and Ho is in fact true. The uncorrected version rejected Ho once out of 500 simulations, so the Type I error rate was 0.002%. The corrected version rejected 19 times out of 500, for a Type I error rate of 3.8%, which is still under 5%.

Also tried running 500 samples from a Poisson distribution (plus some random noise to avoid ties). Uncorrected KS rejected Ho 139 times for a power of 28%, whereas corrected version rejected 493 out of 500, for a power of 98.6%. That’s a pretty dramatic difference! If we write up a paper on this, this would be a good example.

The code I used was the same as in the last email, except

x <- rpois(100, 5) + .1\*runif(100)