# R projects 5 and 6

Testing H0: the digits of pi come from a uniform discrete distribution (i.e. each appears with probability 0.1) agains H1: the digits of pi don’t come from a uniform discrete distribution (i.e. at least one digits appears with a probability different than 0.1):

Chi-squared test for given probabilities

data: freq

X-squared = 6.76, df = 9, p-value = 0.6621

The data do not provide any evidence against the null hypothesis. It’s entirely plausible that the digits of pi come from a uniform discrete distribution.

Testing H0: the digits come from a Poisson distribution with mean 4.5.

Chi-squared test for given probabilities

data: xfreq

X-squared = 36.984, df = 10, p-value = 5.695e-05

Warning message:

In chisq.test(xfreq, p = expected) :

 Chi-squared approximation may be incorrect

The data provide strong evidence for rejection of H0, however we should consider different bins to resolve the problem of expected values for some bins being too small for a normal approximation to be reasonable.

Testing H0: the digits come from a Poisson distribution with mean 5.

Chi-squared test for given probabilities

data: xfreq

X-squared = 15.131, df = 10, p-value = 0.1274

Warning message:

In chisq.test(xfreq, p = expected) :

 Chi-squared approximation may be incorrect

This time the data do not support rejection of H0. Again we should consider different bins.

Testing H0: the digits come from a Poisson distribution with mean 5.5.

 Chi-squared test for given probabilities

data: xfreq

X-squared = 7.3661, df = 10, p-value = 0.6905

Warning message:

In chisq.test(xfreq, p = expected) :

 Chi-squared approximation may be incorrect

This time the data do not support rejection of H0. Again we should consider different bins.

Summary: this kind of test can’t tell us what the “right” mean is. That needs to come from somewhere else.

ANOVA for the concrete data:

Analysis of Variance Table

Response: AbsorbtionWeight

 Df Sum Sq Mean Sq F value Pr(>F)

as.factor(Aggregate) 4 85356 21339.1 4.3015 0.008752 \*\*

Residuals 25 124020 4960.8

The p-value above is for a test of H0: there is no difference between the mean moisture absorption of the different aggregate mixes against H1: at least one aggregate mix has a different mean moisture absorption. This data provides strong evidence for rejection of the null hypothesis. We must conclude that aggregate mix has some effect on moisture absorption.