Tutorial 9: Questions

March 21, 2018

Question 9.1.6, Page 372

An experiment to compare the tension bond strength of polymer latex modified mortar (Portland cement mortar to which polymer latex emulsions have been added during mixing) to that of unmodified mortar resulted in $\overline{x} = 18.12$ kgf/cm^2 for the modified mortar ($m = 40$) and $\overline{y} = 16.87$ kgf/cm^2 for the unmodified mortar ($n = 32$). Let μ_1 and μ_2 be the true average tension bond strengths for the modified and unmodified mortars, respectively. Assume that the bond strength distributions are both normal.

(a) Assuming that $\sigma_1 = 1.6$ and $\sigma_2 = 1.4$, test $H_0 : \mu_1 - \mu_2 \leq 0$ versus $H_A : \mu_1 - \mu_2 > 0$ at level $\alpha = 0.01$.

(b) Compute the probability of a type II error for the test of part (a) when $\mu_1 - \mu_2 = 1$.

(c) Suppose the investigator decided to use a level 0.05 test and wished $\beta = 0.10$ when $\mu_1 - \mu_2 = 1$. If $m = 40$, what value of n is necessary?

(d) How would the analysis and conclusion of part (a) change if σ_1 and σ_2 were unknown but $s_1 = 1.6$ and $s_2 = 1.4$?

Question 9.1.14, Page 373

The level of monoamine oxidase (MAO) activity in blood platelets (nm/mg protein/h) was determined for each individual in a sample of 43 chronic schizophrenics, resulting in $\overline{x} = 2.69$ and $s_1 = 2.30$, as well as for 45 normal subjects, resulting in $\overline{y} = 6.35$ and $s_2 = 4.03$. Does this data strongly suggest that true average MAO activity for normal subjects is more than twice the activity level for schizophrenics? Derive a test procedure and carry out the test using $\alpha = 0.01$. [Hint: H_0 and H_A here have a different form from the three standard cases. Let μ_1 and μ_2 refer to true average MAO activity for schizophrenics and normal subjects, respectively, and consider the parameter $\theta = 2\mu_1 - \mu_2$. Write H_0 and H_A in terms of θ, estimate θ, and derive $\sigma_{\hat{\theta}}$].

Question 9.3.36, Page 388

Consider the accompanying data on breaking load (kg/25 mm width) for various fabrics in both an unabraded condition and an abraded condition. Use the paired t-test to test $H_0 : \mu_D \leq 0$ versus $H_A : \mu_D > 0$ at significance level $\alpha = 0.01$.

U	36.4	55.0	51.5	38.7	43.2	48.8	25.6	49.8
A	28.5	20.0	46.0	34.5	36.5	52.5	26.5	46.5