

Bus 274: Further Statistics for Business

Spring 2015

PROBLEM SHEET # 8

Problem 1: Paint jobs in the automotive industry are increasingly taken over by robots. A certain robotic operation resulted in 12 flaws (defects) in a random sample of 250 parts.

- Compute a point estimator for the probability of a defect when using this operation. Will this estimate equal the probability? Give reasons for your answer.
- Now consider the test of $H_0 : p \leq 5\%$ against $H_1 : p > 5\%$, where p is the probability that a paint job results in a flaw. What is the goal when testing this null hypothesis against this alternative? (What is to be shown, and why would anyone want to show this?)
- Write down the test statistic for this test problem, with all values substituted correctly. What is the distribution of the test statistic, if the true probability of a defect is $p = 0.05$?
- Determine the critical region of the test statistic. (Use a significance level of $\alpha = 5\%$.)
- The value of the test statistic in (c) is -0.145 . Will the null hypothesis be rejected? Give reasons for your answer.

Problem 2: A municipality introduced technology-based self service (TBSS) in the form of a “smartcard” (like *İstanbulkart*), to be used as ticket for all public transport. The city administration commissioned a public opinion poll to determine what users think of the smartcard. One of the statements of the survey was:

“Describe your feelings with regard to using the smartcard”

with possible answers “Good” and “Bad”. 300 valid responses were obtained, of which 170 were “Good”.

- Find an approximate 95% confidence interval for the share of *all* those users who would say their feelings were good when asked. (Show that this confidence interval is $[0.511, 0.623]$.)

For the remainder of this question, we assume that the city administration’s goal was that a majority (at least 50%) of smartcard users should have “Good feelings”.

- Which hypothesis has to be tested, against which alternative? Give reasons for your answer. Please make sure you define and explain the parameter in question.
- Is the confidence interval in (a) helpful for testing the hypothesis in (b)? Give reasons for your answer.
- Write the test statistic T for the test problem in (b). Determine the critical region. (Give the critical region, using suitable values from the normal distribution table. Assume $\alpha = 5\%$.)
- Test the null hypothesis, using the critical region of (d).
- Compute the p-value (the prob-value) of the null hypothesis. Show that the same decision as in (e) is made when you base your argument on the p-value.
- In this situation, would it make sense to collect a bigger sample?