Advanced Statistics HW10

Due date: December 10, 2018

Exercises 1

Define α and β for a test of hypothesis. What is the quantity $1 - \beta$ called?

Exercises 2

Using a 5% significance level, what is the power of the test $H_0 : \mu = 100$ versus $H_1 : \mu \neq 100$ if a sample of size 36 is taken from a $N(120, 50)$?

Exercises 3

The research and development department of an appliance company suspects the energy consumption required of their 18-cubic-foot refrigerator can be reduced by a slight modification to the current motor. Sixty 18-cubic-foot refrigerators were randomly selected from the company's warehouse. The first 30 had their motors modified while the last 30 were left intact. The energy consumption (kilowatts) for a 24-hour period for each refrigerator was recorded and stored in the data frame `REFRIGERATOR`. Is there evidence that the design modification reduces the refrigerators' average energy consumption?

Excercise 4

According to the Pamplona, Spain, registration, 0.4% of immigrants in 2002 were from Bolivia. In June of 2005, a sample of 3740 registered foreigners was randomly selected. Of these, 87 were Bolivians. Is there evidence to suggest immigration from Bolivia has increased? (Use $\alpha = 0.05$.)

Excercise 5

A cell phone provider has estimated that it needs revenues of £2 million per day in order to make a profit and remain in the market. If revenues are less than £2 million per day, the company will go bankrupt. Likewise, revenues greater than £2 million per day cannot be handled without increasing staff. Assume that revenues follow a normal distribution with $\sigma = $ £0.5 million and a mean of μ.

(a) Graphically depict the power function for testing $H_0 : \mu = 2$ versus $H_1 : \mu \neq 2$ if $n = 150$ and $\alpha = 0.05$ for values of μ ranging from 1.8 to 2.2.

(b) Graphically depict the power for testing $H_0 : \mu = 2$ versus $H_1 : \mu \neq 2$ when $\mu_1 = 2.1$ and $n = 150$ for values of α ranging from 0.001 to 0.999.

(c) Graphically depict the power for testing $H_0 : \mu = 2$ versus $H_1 : \mu \neq 2$ when $\mu_1 = 2.1$ and $\alpha = 0.05$ for values of n ranging from 1 to 500.

(d) Generalize what is seen in the graphs for (a), (b), and (c).