Statistical Methods for Decision Making
Hypothesis Testing

For BABI Program[1]

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Example - I

Two Scenarios:

- What if drug is passed when the intended effects are suspect? Or the drug is effective but has side effects?
- What are the implications of not letting the drug hit the market?

Read the following News:

https://prescriptiondrugs.procon.org/view.resource.php?resourceID=005528

http://www.rediff.com/money/report/drugs-ban-these-are-the-worst-hit-brands-companies/20160321.htm

https://www.eurekalert.org/pub_releases/2009-06/l-igd062609.php

Example - II

According to Toyota website, the average mileage per gallon for the 2013 Toyota Prius is between 48 miles per gallons to 51 miles per gallon. We would like to test the claim that the mean miles per gallon for all 2013 Toyota Prius is, at the worst case possible, greater than 48 miles per gallon, and we will perform the hypothesis testing at the significance level of 0.05.

`https://www.wyzant.com/resources/blogs/369788/example_of_hypothesis_testing_in_real_life`

`http://www.fuelly.com/`

Example - III

- NFL: https://www.mathbootcamps.com/using-nfl-understand-hypothesis-testing
- NBA: https://squared2020.com/2015/11/01/hypothesis-testing-is-nba-scoring-up-this-year/
- IPL: Does winning a toss increase winning chances

Example - IV

You are the commercial loan officer at a bank, in the process of reviewing a loan application recently filed by a local firm. Examining the firm's list of assets, you notice that the largest single item is 3 million dollars in accounts receivable. You have heard enough scare stories, about loan applicants manufacturing receivables out of thin air, that it seems appropriate to check whether these receivables actually exist.

http://www.kellogg.northwestern.edu/faculty/weber/decs-430/decs-430%20session%204/hypothesis_testing.htm

Web Resources

- https://onlinecourses.science.psu.edu/stat500/
- http://professormo.com/holistic/HypothesisTesting.pdf
- https://ww2.amstat.org/publications/jse/

Problem I, Test of a single Mean

Experian Marketing Services reported that the typical American spends a mean of 144 minutes (2.4 hours) per day accessing the Internet via a mobile device. (Source: The 2014 Digital Marketer, available at ex.pn/1kXJjfX.) In order to test the validity of this statement, you select a sample of 30 friends and family. The results for the time spent per day accessing the Internet via mobile device (in minutes) are stored in InternetMobileTime.xls

a. Is there evidence that the population mean time spent per day accessing the Internet via mobile device is different from 144 minutes? Use the p-value approach and a level of significance of 0.05.

b. What assumption about the population distribution is needed in order to conduct the t test in (a)?

Problem II, Test of Proportions

Salesforce ExactTarget Marketing Cloud conducted a study of U.S. consumers that included 205 tablet owners. The study found that 134 tablet owners use their tablet while watching TV at least once per day. (Source: "New Mobile Tracking & Survey Data: 2014 Mobile Behavior Report," bit.ly/1odMZ3D.) The authors of the report imply that the survey proves that more than half of all tablet owners use their tablet while watching TV at least once per day.

Use the five-step p-value approach to hypothesis testing and a 0.05 level of significance to try to prove that more than half of all tablet owners use their tablet while watching TV at least once per day.

Problem III, Test of two Sample Means

A hotel manager looks to enhance the initial impressions that hotel guests have when they check in. Contributing to initial impressions is the time it takes to deliver a guest's luggage to the room after check-in. A random sample of 20 deliveries on a particular day were selected in Wing A of the hotel, and a random sample of 20 deliveries were selected in Wing B. The results are stored in Luggage.

Analyze the data and determine whether there is a difference between the mean delivery times in the two wings of the hotel.

Problem IV, Test of Paired Sample Means

The file Concrete1.xls contains the compressive strength, in thousands of pounds per square inch (psi), of 40 samples of concrete taken two and seven days after pouring.

(Data extracted from O. Carrillo Gamboa and R. F. Gunst, "Measurement Error Model Collinearities," Technometrics, 34 (1992): 454 — 464.)

At the 0.01 level of significance, is there evidence that the mean strength is lower at two days than at seven days?

Sporting goods manufacturing company wanted to compare the distance traveled by golf balls produced using four different designs. Ten balls were manufactured with each design and were brought to the local golf course for the club professional to test. The order in which the balls were hit with the same club from the first tee was randomized so that the pro did not know which type of ball was being hit. All 40 balls were hit in a short period of time, during which the environmental conditions were essentially the same. The results (distance traveled in yards) for the four Designs are stored in Golfball.

At the 0.05 level of significance, is there evidence of a difference in the mean distances traveled by the golf balls with different designs?

A company is considering an organizational change involving the use of self-managed work te
assess the attitudes of employees of the company toward this change, a sample of 400 employe
and asked whether they favor the institution of self-managed work teams in the organization. Three responses are permitted: favor, neutral, or oppose. The results of the survey, cross-classified by type of job and attitude toward self managed work teams, are summarized as follows:

	SELF-MANAGED WORK TEAMS			
TYPE OF JOB	Favor	Neutral	Oppose	Total
Hourly worker	108	46	71	225
Supervisor	18	12	30	60
Middle management	35	14	26	75
Upper management	24	7	9	40
Total	185	79	136	400

Self Managed Work Teams

At the 0.05 level of significance, is there evidence of a relationship between attitude toward self-managed work teams and type of job?