

Testing of Hypothesis

Example

Example 1

Hilton Press hypothesizes that the average life of its largest web press is 14,500 hrs. They know that the S. D. of press life is 2100 hrs. From a sample of 25 presses, the company finds sample mean of 13,000 hrs. At a 0.01 sig. level, should the company conclude that the average life of the presses is less than the hypothesized 14,500 hrs.?

Example 2

From 1980 until 1985, the mean price/ earnings (P/E) ratio of the approximately 1800 stocks listed on the NY stock exchange (NYSE) was 14.35 & S. D. was 9.73. In a sample of 30 randomly chosen NYSE stocks, the mean P/E ratio in 1986 was 11.77. Does this sample present sufficient evidence to conclude (at 0.05 level of sig.) that in 1986 the mean P/E ratio for NYSE stocks had changed from its earlier value?

Example 3

A television documentary on overeating claimed that Americans are about 10 lb overweight on average. To test this claim, 18 randomly selected individuals were examined; their average excess weight was found to be 12.4 lb, and the sample S.D. 2.7 lb. At 0.01 sig. level, is there any reason to doubt the validity of the claimed 10 lb value ?

Example 4

Eleven measured values of a physical quantity have a S. D. 0.14. Is there suspicion that the S. D. of the population of measured values is greater than 0.1 true? Assume the population to be normal, and use 5% sig. level.

Example 5

A production manager feels that the output rate of experienced employees is surely greater than that of new employees, but he doesn't expect the variability in output rates to differ for the two groups. In previous output studies, it has been shown that the average unit output per hour for new employees at this particular type of work is 20 units per hour with a variance of 56 units squared. For a group of 20 employees with 5 years' experience, the average output for this same type of work is 30 units per hour with a sample variance of 28 units squared. Does the variability in output appear to differ at the two experience levels? Test the hypotheses at a 0.05 sig. level.

Example 6

A ketchup manufacturer is in the process of deciding whether to produce a new extra-spicy brand. The company's marketing-research department used a national telephone survey of 6,000 households and found that the extra-spicy ketchup would be purchased by 335 of them. A much more extensive study made 2 yrs. ago showed that 5% of the households would purchase the brand then. At a 2% sig. level, should the company conclude that there is an increased interest in the extra-spicy flavor?

Example 7

Rick Douglas, the new manager of Food Barn, is interested in the percentage of customers who are totally satisfied with the store. The previous manager had 86% of the customers totally satisfied, and Rick claim the same is true today. Rick sampled 187 customers and found 157 were totally satisfied. At the 1% sig. level, is there evidence that Rick's claim is valid?

Example 8

A quality control supervisor for an automobile manufacturer is concerned with uniformity in the number of defects in cars coming off the assembly line. If one assembly line has significantly more variability in the no. of defects, then changes have to be made. The supervisor has collected the following data:

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| Number of Defects | | |
|-------------------|-----------------|-----------------|
| | Assembly line A | Assembly line B |
| Mean | 10 | 11 |
| Variance | 9 | 25 |
| Sample size | 20 | 16 |

Does assembly line B have significantly more variability in the no. of defects? Test at 0.05 level of sig.

Example 9

There are two brands, A & B, of pipelines used in IOCL for transportation of Oil & Gas, of which the brand A sells at a slightly higher price than the brand B. 12 pieces of each brand of pipe were chosen at random, and their breaking strength observed. The sample mean & variance for the A-pipe were $18.8 \times 10^5 \text{ lb}$ & 4.08 lb^2 , while those for the B-pipe were $16.9 \times 10^5 \text{ lb}$ and 3.25 lb^2 respectively. Test the assumption, at 10% sig. level, that the populations of breaking strengths of the A & B-pipes have a common variance.

Chi-Square test of independence

Suppose SBI wants to find out whether its new services such as mobile banking and internet banking will only be used by its younger customers or by customers across all age groups. Let us assume that the management has a perception that personal banking would be more popular with middle-age and older customers.

Suppose it hires the services of a marketing research firm, which conduct a survey among customers from different age groups to find out an answer. This marketing research firm has randomly selected 2413 customers across the age groups 17 to 27, 28 to 35, 36 to 44, 45 to 57, and 58 to 70. The observations made by the marketing research firm about the type of banking opted by different age groups are given in the following table:

| Banking Type Age Group | Mob. Banking | Internet Banking | Personal Banking |
|---|---------------------|-------------------------|-------------------------|
| 17 to 27 | 125 | 175 | 145 |
| 28 to 35 | 155 | 180 | 197 |
| 36 to 44 | 167 | 210 | 150 |
| 45 to 57 | 146 | 156 | 142 |
| 58 to 70 | 133 | 156 | 176 |

The marketing research group wants to determine whether the type of product usage in the population is independent of age group. Use 5% significance level.

Regression & Correlation

SBI is interested in reducing the amount of time people spend waiting to see a personal banker. The bank is interested in the relationship between waiting time in minutes and number of bankers on duty. Customers were randomly selected with the data given below:

X : 2 3 5 4 2 6 1

3 4 3 3 2 4

Y : 12.8 11.3 3.2 6.4 11.6 3.2 8.7

10.5 8.2 11.3 9.4 12.8 8.2

Calculate the regression equation that best fits the data. Calculate the sample coefficient of determination and coefficient of correlation and interpret the result. Also calculate the standard error of estimate.