EXERCISES

Data for exercises are presented in the SPSS data file „Data_for_exercises.sav".

1. A department-store manager is interested in the number of complaints received by the customer-service department about the quality of electrical products sold by the store. Records over a 100-week period show the number of complaints for each week (variable „Complaints"). Compute the mean number of weekly complaints, the most frequent number of weekly complaints, the variance of the number of weekly complaints. Calculate a 90% confidence interval for the mean number of weekly complaints (distribution of the number of weekly complaints is normal).

2. A large chain of supermarkets sells 5000 packets of cereal in each of its stores each month. It decides to test-market a different brand of cereal in 150 of its stores. After a month the 150 stores have sold a number of packets of cereal that are presented in the variable "Cereal". Does the selling of the new brand of cereal remain the same as the selling of the old brand? ($\alpha = 0.05$)

3. A transport company wants to compare the fuel efficiencies of the two types of lorry it operates (Type A and Type B). It obtains data from samples of the two types of lorry, with the results presented in the variables "Fuel" and "Lorry". Test the hypothesis that there is no difference in fuel efficiency, using the 1% significance level.

4. A market research firm used a sample of individuals to rate the purchase potential of a particular product before (variable "Before") and after (variable "After") the individuals saw a new television commercial about the product. The purchase potential ratings were based on a 0 to 10 scale, with higher values indicating a higher purchase potential. Can you conclude that a new television commercial influenced the purchase potential ratings? ($\alpha = 0.05$)

5. Following a presidential debate, people were asked how they might vote in the forthcoming election (variables "Candidate" and "Gender"). Is there any association between one's gender and choice of presidential candidate (or in other words, whether being a man or a woman is independent of choosing a presidential candidate (or simply "is gender and choice of presidential candidate independent")? ($\alpha = 0.01$)

6. A gas company has determined from past experience that at the end of winter 80% of its accounts are fully paid, 10% are 1 month in arrears, 6% are 2 months in arrears, and 4% are more than 2 months in arrears. At the end of this winter the company checked a random sample of 400 of its accounts (variable "Account"). Do these data suggest that the pattern of previous years is not being followed this winter? ($\alpha = 0.05$)

ANSWERS

1. SPSS commands:
Analyze→Descriptive Statistics→Descriptives...
Analyze→Descriptive Statistics→Frequencies
Analyze→Descriptive Statistics→Explore...

The mean number of weekly complaints is 9.67.
The most frequent number of weekly complaints is 9.
The variance of the number of weekly complaints is 11.233.
A 90% confidence interval for the mean number of weekly complaints is [9.11; 10.23].

2. SPSS commands:
Analyze→Compare Means→One-Sample T Test...

One sample t-test is used.

Hypothesis $\begin{cases} H_0 : \mu = 5000 \\ H_1 : \mu \neq 5000 \end{cases}$; where μ – the average number of packets of cereal.

Conclusion. Yes, the selling of the new brand of cereal remains the same as the selling of the old brand. The selling of the new brand is not statistically significantly different from the selling of the old brand ($p = 0.119 > \alpha = 0.05$, thus H_0 is not rejected).

3. SPSS commands:
Analyze→Compare Means→Independent–Samples T Test...

Two independent samples t-test is used.

Hypothesis $\begin{cases} H_0 : \mu_x = \mu_y \\ H_1 : \mu_x \neq \mu_y \end{cases}$; where μ_x – the average fuel efficiency of Type A lorry, μ_y – the average fuel efficiency of Type B lorry.

Conclusion. There is no statistically significant difference in fuel efficiency of the two types of lorry ($p = 0.746 > \alpha = 0.01$, thus H_0 is not rejected).

4. SPSS commands:
Analyze→Compare Means→Paired-Samples T Test...

Two dependent samples t-test (Paired samples t-test) is used.

Hypothesis $\begin{cases} H_0 : \mu_x = \mu_y \\ H_1 : \mu_x \neq \mu_y \end{cases}$; where μ_x – the average purchase potential rating before a new television commercial about the product, μ_y – the average purchase potential rating after a new television commercial about the product.

Conclusion. Yes, a new television commercial influenced the purchase potential ratings since the mean purchase potential ratings of a particular product before and after the individuals saw a new television commercial about the product are statistically significantly different ($p = 0.002 < \alpha = 0.05$, thus H_0 is rejected).

5. SPSS commands:
Analyze→Descriptive Statistics→Crosstabs...

Chi-square (χ^2) test of independence is used.

Hypothesis:

H_0: X and Y *are* independent,
H_1: X and Y *are not* independent (are dependent),
where X – gender, Y – choice of presidential candidate.
or

H_0: gender and choice of presidential candidate *are* independent,
H_1: gender and choice of presidential candidate are dependent.

Conclusion. Being a man or a woman is independent of choosing a presidential candidate ($p = 0.072 > \alpha = 0.01$, thus, H_0 is not rejected).

6. SPSS commands:
Analyze→Nonparametric Tests→Chi-Square...

Chi-square (χ^2) goodness-of-fit test is used.
Hypothesis:

H_0: the pattern of previous years is being followed this winter (80% of accounts are fully paid, 10% are 1 month in arrears, 6% are 2 months in arrears, and 4% are more than 2 months in arrears),
H_1: the pattern of previous years is not being followed this winter (the proportions changed at the end of this winter or at least one of the proportions in the null hypothesis is false).

Conclusion. These data suggest that the pattern of previous years is not being followed this winter ($p = 0.000 < \alpha = 0.05$, thus H_0 is rejected).