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Кафедра прикладной математики и информатики (И7).

Математическая статистика и случайные процессы.

Лабораторная работа №4.

Оценивание параметров вероятностных распределений в пакетах Statgraphics и Mathcad.

Вариант 12.

Выполнил

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Санкт-Петербург

2011

**Задание 1.**

В соответствии с вариантом выбрать распределение и получить точечные интервальные оценки (β = 0.95) математического ожидания и дисперсии в математических пакетах Statgraphics и Mathcad. В пакете Mathcad по методу максимального правдоподобия оценить параметры выбранного распределения.

Распределение – нормальное.

**Решение в пакете Statgraphics:**

**Random Numbers**

To generate random numbers from the selected distribution,

use the save button on the analysis toolbar.

Random numbers to be generated: 100

**The StatAdvisor**

*This pane allows you to specify the number of observations desired in a random sample from the normal distribution. You set the number of observations by pressing the alternate mouse button and selecting Pane Options. After setting the size, press the Save Results button on the analysis toolbar. This allows you to save random samples from the specified distribution in columns of the current data file. Every time you select Save Results, a new random sample will be generated.*



**Analysis Summary**

Data variable: Normal

100 values ranging from -10,3988 to 7,31992

**The StatAdvisor**

*This procedure is designed to summarize a single sample of data. It will calculate various statistics and graphs. Also included in the procedure are confidence intervals and hypothesis tests. Use the Tabular Options and Graphical Options buttons on the analysis toolbar to access these different procedures.*

**Summary Statistics for Normal**

Count = 100

Average = -0,388401

Median = 0,331567

Mode =

Geometric mean =

Variance = 11,7623

Standard deviation = 3,42963

Standard error = 0,342963

Minimum = -10,3988

Maximum = 7,31992

Range = 17,7187

Lower quartile = -2,33249

Upper quartile = 1,84915

Interquartile range = 4,18164

Skewness = -0,596123

Stnd. skewness = -2,43366

Kurtosis = 0,552261

Stnd. kurtosis = 1,1273

Coeff. of variation = -883,012%

Sum = -38,8401

**The StatAdvisor**

*This table shows summary statistics for Normal. It includes measures of central tendency, measures of variability, and measures of shape. Of particular interest here are the standardized skewness and standardized kurtosis, which can be used to determine whether the sample comes from a normal distribution. Values of these statistics outside the range of -2 to +2 indicate significant departures from normality, which would tend to invalidate any statistical test regarding the standard deviation. In this case, the standardized skewness value is not within the range expected for data from a normal distribution. The standardized kurtosis value is within the range expected for data from a normal distribution.*

**Confidence Intervals for Normal**

95,0% confidence interval for mean: -0,388401 +/- 0,680514 [-1,06891;0,292113]

95,0% confidence interval for standard deviation: [3,01124;3,98411]

**The StatAdvisor**

*This pane displays 95,0% confidence intervals for the mean and standard deviation of Normal. The classical interpretation of these intervals is that, in repeated sampling, these intervals will contain the true mean or standard deviation of the population from which the data come 95,0% of the time. In practical terms, we can state with 95,0% confidence that the true mean Normal is somewhere between -1,06891 and 0,292113, while the true standard deviation is somewhere between 3,01124 and 3,98411.*

*Both intervals assume that the population from which the sample comes can be represented by a normal distribution. While the confidence interval for the mean is quite robust and not very sensitive to violations of this assumption, the confidence interval for the standard deviation is quite sensitive. If the data do not come from a normal distribution, the interval for the standard deviation may be incorrect. To check whether the data come from a normal distribution, select Summary Statistics from the list of Tabular Options, or choose Normal Probability Plot from the list of Graphical Options.*

**Confidence Intervals for Normal**

99,0% confidence interval for mean: -0,388401 +/- 0,900761 [-1,28916;0,51236]

99,0% confidence interval for standard deviation: [2,89453;4,18428]

**The StatAdvisor**

*This pane displays 99,0% confidence intervals for the mean and standard deviation of Normal. The classical interpretation of these intervals is that, in repeated sampling, these intervals will contain the true mean or standard deviation of the population from which the data come 99,0% of the time. In practical terms, we can state with 99,0% confidence that the true mean Normal is somewhere between -1,28916 and 0,51236, while the true standard deviation is somewhere between 2,89453 and 4,18428.*

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**Решение в пакете Matcad:**

































Доверительные интервалы:



















Изменение длины точного доверительного интервала для дисперсии в зав-ти от объема выборки:











