

CONFIDENCE LEVELS AND/V.S. STATISTICAL HYPOTHESIS TESTING IN STATISTICAL ANALYSIS. CASE STUDY.

INTERVALELE DE ÎNCREDERE ȘI/V.S. TESTAREA IPOTEZELOR STATISTICE ÎN ANALIZA STATISTICĂ. STUDIUL DE CAZ.

ILEANA BRUDIU

USAMVB Timisoara, Department of Exact Sciences, România, brudiu@yahoo.com

Estimated parameters with confidence intervals and testing statistical assumptions used in statistical analysis to obtain conclusions on research from a sample extracted from the population. Paper to the case study presented aims to highlight the importance of volume of sample taken in the study and how this reflects on the results obtained when using confidence intervals and testing for pregnant. If statistical testing hypotheses not only give an answer "yes" or "no" to some questions of statistical estimation using statistical confidence intervals provides more information than a test statistic, show high degree of uncertainty arising from small samples and findings build in the "marginally significant" or "almost significant (p very close to 0.05).

Keywords: confidence interval, significance testing, the sample volume.

Introduction

Estimate parameters and testing hypotheses is the two sides of inferential statistics. Both allow the use of information obtained from a sample chosen at random to obtain conclusions on the values of the parameters that characterize the population. Estimate shows the most likely position of the parameter. Point estimate as a result gives us a single point which is most likely representative of the parameter, and estimating the range offers a range that is likely to take calculated. Most often used in the estimation of confidence intervals because they are associated with a probability that indicates how much of their value is correct. A condition of a correct estimate is low variability between samples, called variant minimum.

Hypothesis testing (testing the statistical significance) provides decision rules regarding the null hypothesis, a response of "yes" or "no" questions of statistical. As with the estimate and confidence limits, hypothesis testing purpose is to allow generalization to the population from the sample taken in the study. Both

methods assume that the sample has been properly selected. If statistical significance testing is essential to clarify the power test. It consists in determining how extensive should be a sample to detect a difference of some magnitude.

When we use the confidence and when testing statistical significance in a statistical study - or which one it is more useful and more indicative of the presentation of research findings of the research.

Materials and Methods

In the proposed research were taken in the study five samples "large", the feature being tracked quantitative variable measured on the scale interval/report is the average temperature at the ground in five consecutive years (2003-2007), in the same area.

Following descriptive statistical calculations is a large variability observed data, but taking into account the central limit theorem and the fact that samples are "high", the standard error of the mean allows a calculation to estimate the average temperature within a relatively limited.

Table 1

Values for descriptive statistics

	T ° C average air				
	2003	2004	2005	2006	2007
Mean	11.041	11.129	10.492	11.196	12.448
Standard Error	0.539	0.455	0.489	0.474	0.444
Standard Deviation	10.295	8.698	9.335	9.061	8.487
Count	365	366	365	365	365
Confidence Level(95.0%)	1.0597	0.8941	0.9609	0.9327	0.8736

The values obtained for the upper and lower limits of confidence intervals are presented in Table 2 and the graphical representation of these intervals in Fig.1

Table 2

Values for upper and lower limits the confidence intervals

	T ° C average air				
	2003	2004	2005	2006	2007
Lower limit	9.98	10.24	9.53	10.26	11.57
Media	11.04	11.13	10.49	11.20	12.45
Upper limit.	12.10	12.02	11.45	12.13	13.32

Testing statistical significance test was performed with ANOVA (analysis of variance). Following comparison of average temperature on the ground 5 years in the study taking equal environments hypothesis is confirmed, but likely at the limit ($p = 0.063101$), so the differences are marginally significant or nearly significant.

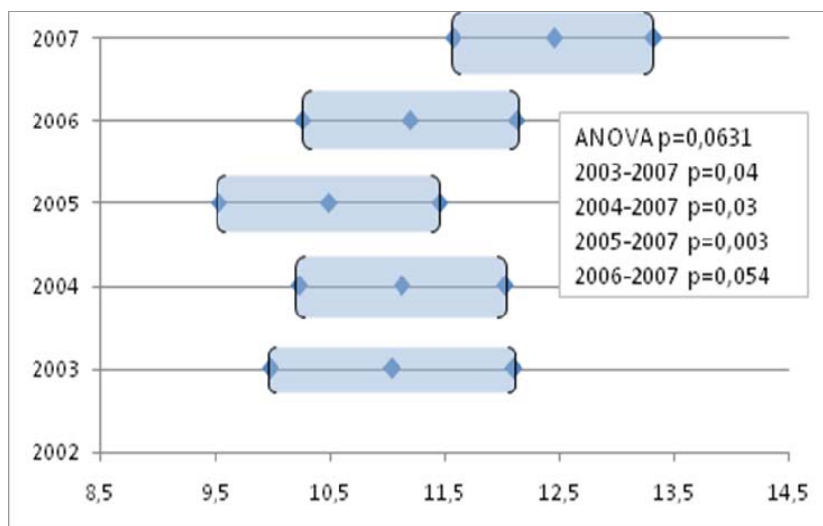


Fig 1. N = 365 observations, confidence intervals for the average levels of significance obtained

Was also conducted testing of significance between each of the five samples, achieving p values for the threshold of significance. They are presented in Table. 3

Table No.3

Probabilities obtained for test of significance

p	2004	2005	2006	2007
2003	0.901	0.450	0.829	0.044
2004		0.340	0.919	0.038
2005			0.301	0.003
2006				0.054

Were carried out similar calculations for situations in which the number of sample observations is 1/2 and 1 / 4 of the first (365 observations). In Fig.2 and Fig.4 were represented graphically confidence intervals and the values obtained for specified levels of significance obtained when comparing test and ANOVA test environments T

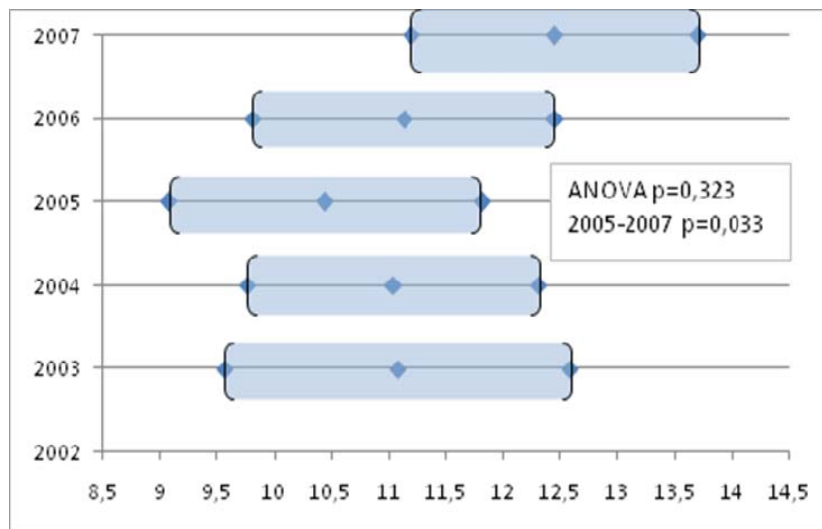


Fig 2. N = 183 observations, confidence intervals for the average significance levels obtained

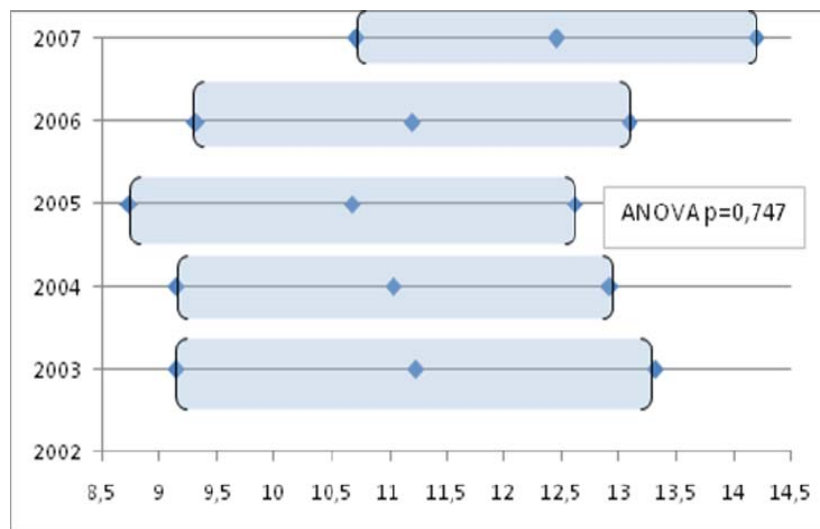


Fig 3. N = 93 observations. Confidence intervals for the average significance levels obtained

Results and Discussion

Analyzing the results obtained from the calculations made, it notes that confidence intervals calculated, but especially their graphical representation, shows clearly the existence of significant differences between the first four samples and one from 2007. Limits of confidence intervals of 2005 and 2007 samples do not

overlap, and the average values of samples 2003, 2004, 2005 and 2006 fall within the confidence of the sample 2007. These conclusions can be drawn when the samples are "high".

The situation is different in that these samples are 1/2 or 1/4 of the original. In these cases, the graphical representations of confidence intervals for the parameter average are larger than those initial (Fig.4).

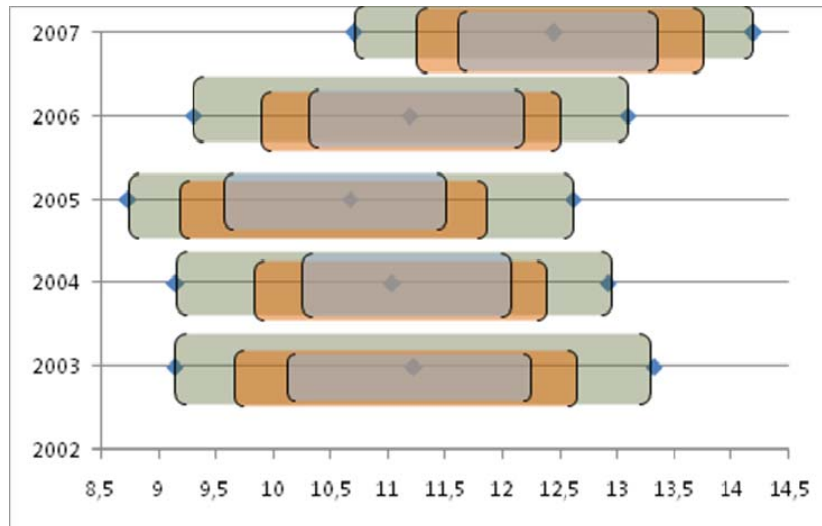


Fig. 4. Graphical representation of confidence intervals for the mean sample size depending on

By applying the tests of significance not obtain significant differences between samples from 2003, 2004, 2005, 2006 and in 2007 (ANOVA - $p = 0.323$, $p = 0.747$). In the situation when the sample is 1 / 4 of the initial tests of significance leads to the conclusion that there are significant differences between samples.

Application of significance tests only give us the answer "yes" or "no" on the case issued.

In this situation the question which of the two: confidence intervals and testing statistical assumptions better capture the reality.

It is enough computing confidence intervals, if the graphical representation of them, to draw conclusions about differences between the average temperatures during the period studied?

As a first step note that confidence intervals are very sensitive to sample variability, the sample is higher, even if there is a large variability of data, they can be quite restricted.

Secondly, confidence intervals provide more information than a test statistic. A confidence interval can be viewed as a rejection of all null hypotheses associated

with higher or lower limits of trust can be regarded as summarizing several statistical tests.

The third and probably the most important explanation is related to the study purpose. Common objective consists in estimating a value of the population and not the testing of hypotheses on a parameter. In this sense, the use of confidence intervals provides more valuable relationship than hypothesis testing.

Conclusions

It prefers the calculation of confidence intervals, as they clearly explain the role of sample size.

If a study conducted on a sample extended even insignificant difference will acquire significance from a statistical viewpoint, although the clinical significance of the difference could be very low, confidence intervals clearly illustrates the difference.

If the negative results of a study (not significant from a statistical viewpoint), the results will have a greater impact by using confidence intervals than hypothesis testing, because the confidence intervals indicate high degree of uncertainty resulting from limited samples, while testing assumptions provides a statistical result inconclusive.

Confidence intervals avoid also express a conclusion when testing the hypothesis is not significant at 0.05, but becomes significant at 0.06.

References

1. Rateau, Patrick, 2004, Metodele și statisticile experimentale în științele umane, editura Polirom
2. Marian Popa Statistica pentru psihologie. Teorie și aplicații SPSS, 2008 editura Polirom |
3. Traian Rotariu, Irina Culic, Gabriel Badescu, Elemer Mezei, Cornelia Muresan, 2006, Metode statistice aplicate în științele sociale, editura Polirom
4. Electronic TextBook-StatSoft – www.statsoft.nl/textbook/esc.htm