Topic 16 – Lab

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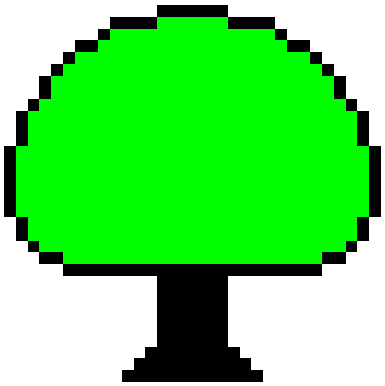
Course in Behavioral and Experimental Economics

Overview

- Excursion to the lab
- Practical issues such as programming languages (z-tree), recruiting etc.
- Statistics



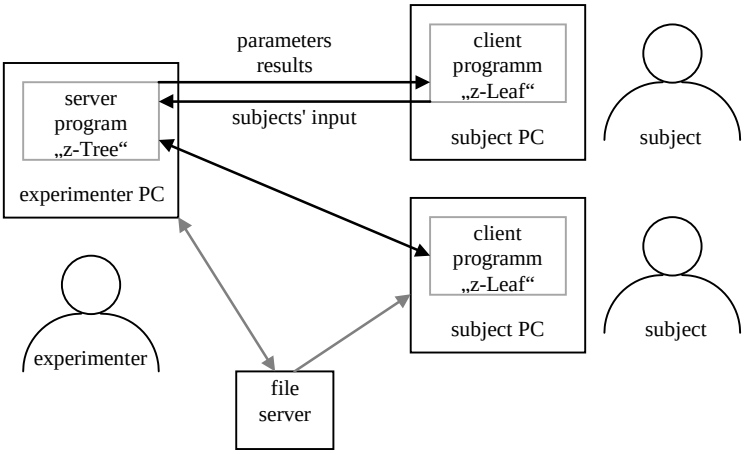
z-Tree

Zurich Toolbox for Ready-made Economic Experiments
Slides © Urs Fischbacher
For more information see: http://www.iew.unizh.ch/ztree
See also: Fischbacher, 2007, in *Experimental Economics*

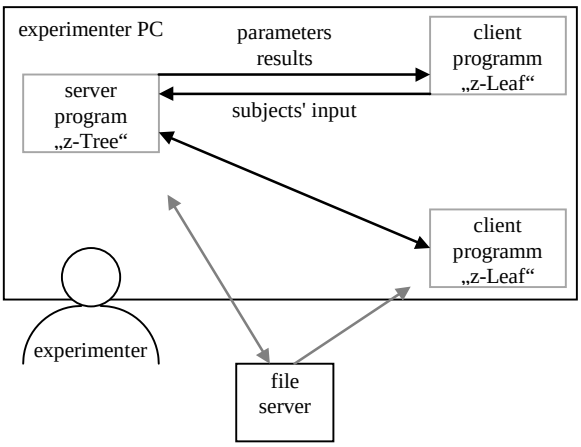
Basic concepts

- There is a server program z-Tree and a client program z-Leaf.
- With z-Tree you can write treatment programs. It is also the server when running experiments.
- In z-Tree experiments are defined and experimental sessions are conducted.

Realtime z-Tree



Testing z-Tree



How to build a test environment with several z-Leaves

- Put z-Tree and z-Leaf into one directory.
- Create shortcuts for z-Leaf with command line options

  zleaf.exe /name 1 /language english /size 640x480
  zleaf.exe /name 2 /language english /size 640x480 /position 10,10
  zleaf.exe /name 3 /language english /size 640x480 /position 20,20
  zleaf.exe /name 4 /language english /size 640x480 /position 30,30
- Start z-Tree
- Start as many z-Leaves as necessary

Concepts

- Subjects go through stages
- Screens are composed of boxes
- Data is stored in z-Tree
- Programs allow us to modify the data (payoff functions)
- Data is shown in z-Leaf (in items)
- Data can be read in in z-Leaf (in items)
- Data is automatically saved
- Earnings are automatically accumulated

Going Through a Stage

Can subject enter stage?

Programs are executed.

Active screen is displayed.

Waiting screen is displayed
(if the next stage cannot be entered)

Tables and Programming

globals table

Period	NumPeriods	RepeatTreatment
1	1	0

subjects table

Period	Subject	Group	Profit	TotalProfit	Participate
1	1	1	0	0	1
1	2	1	0	0	1
1	3	1	0	0	1

- The data is stored in tables.
- The tables can be viewed in a window in z-Tree (menu Treatment)
- Rows are called records.
- Columns are called variables.
- Variables have names.
- Programs are executed in a record (in a table).

Finishing a session – Questionnaires

- Payoff file can be written.
- Questions with no consequence on payoff.
- Different formats for the questions.
- Layout not screen oriented - indefinite end with scrollbar.
- Text entry possible.
- Some variables (FinalProfit,...) can be accessed.
- Importing questionnaires.

Typical Questionnaire

- address form (payment file)
- questionnaires
- profit display
- bye bye screen

A note on emergency handling. Crash of Subject PCs

- Subject PC can simply be restarted.
- If other computer is started: Move the z-Leaf name in the clients' window onto the crashed computer's name …
- … and continue.

Overview: Non-parametric statistics

- Applications of non-parametric statistics
- Some tests
  - U-test (Mann-Whitney; Wilcoxon-Whitney)
  - Kolmogorov-Smirnov-test
  - Wilcoxon test
  - Chi-squared-test

Applications of non-parametric statistics

- Small samples (in experiments often between n=6 und n=30)
- No assumptions regarding the distribution of the population (in contrast to, e.g., the t-test: normal distribution)
- Easy application to ordinal and categorical variables.

Literature: Siegel, S., Castellan, N. J. Jr. (1988), Nonparametric Statistics for the Behavioral Sciences. McGrawHill, New York.

Mann-Whitney U-test

tests, whether data from two statistically independent samples (X and Y) come from the same population (regarding the mean).

H0: no difference (null hypotheses)

H1: difference : $X \neq Y$ (two-sided test) (alternative hypotheses)

(one-sided test would be $X > Y$ or $X < Y$)

Reject H0, if $p < \alpha$ (significance level)

Kolmogorov-Smirnov-test

tests, whether data from two statistically independent samples (X and Y) come from the same population (regarding the distribution of the observations).

H0: no difference

H1: difference (two-sided test)

Reject H0, if $p < \alpha$ (significance level)

Wilcoxon-signed ranks test

tests, whether data from two statistically dependent samples (X1 and X2) come from the same population (regarding the mean (= central tendency)).

H0: no difference (X1 = X2)

H1: difference: $X1 \neq X2$ (two-sided test)

(one-sided test would be X1 > X2 or X1 < X2.)

Reject H0, if $p < \alpha$ (significance level)

Chi-squared-test (χ^2-test)

tests for differences in distributions with two or more categories (average number of observations per cell: at least 5).

The test is between realized distributions or between a realized and an expected distribution.

Easiest application: 2x2-tables.

A	B
C	D

Test statistic (with continuity correction):

$$\chi^2 = N\{|AD - BC| - N/2\}^2 / \{(A+B)(C+D)(A+C)(B+D)\}$$

Reject, if $\chi^2 > 3.84$ ($p < 0.05$).

Binomial-test

Two events [X=1 or X=0] (e.g., Head or Tail with a coin)

Probability for X=1: **p**

Probability for X=0: **q** = 1 – p

H0: $p = p_0$

tests, whether the distribution of event can come from a population with $p = p_0$.

Binomial-test: Example I

Throw of a coin: A coin is thrown 10 times

Wurf	1	2	3	4	5	6	7	8	9	10
Ergebnis	K	Z	K	K	K	K	Z	K	K	K
X	0	1	0	0	0	0	1	0	0	0

Probabilities: p = q = 0.5

Y = Σ X = 2

Probability that Y takes on a certain value:

$$P[Y=k]=\binom{N}{k}p^k q^{N-k}$$

with

$$\binom{N}{k}=\frac{N!}{k!(N-k)!}$$

Binomial-test: Example II

Probability for Y=2

$$P[Y=2]=\binom{10}{2}p^2q^8=\frac{10!}{2!\,8!}0.5^2 0.5^8=\frac{9*10}{2}0.5^{10}=0.043$$

We are interested in the cumulative probability that Y ≤ r or Y ≥ s

$$P[Y\le k]=\sum_{i=0}^{k}\binom{N}{i}p^i q^{N-i}$$

$$P[Y\le 2]=P[Y=0]+P[Y=1]+P[Y=2]=$$

$$=\sum_{i=0}^{2}\binom{N}{i}p^i q^{N-i}=0.055$$