OTTO-VON-GUERICKE UNIVERSITY OF MAGDEBURG

Faculty of Economics and Management
Chair in E-Business

Final Exam in Experimental Economics

July 6, 2005

Please, read the following experiment description attentively and answer all questions carefully. Explain your answers well. Show or explain all steps needed to derive each numerical result.

Two treatments of an auction experiment were conducted. 12 subjects were randomly assigned to each of the treatments. Within a treatment, subjects were randomly divided up in 6 separate pairs of bidders, B_1 and B_2. The pairs participated in a sequence of 50 auctions, in each of which one item was sold to one of them. Before each auction, the two bidders received their valuations for the item, v_1 and v_2, which were randomly drawn integers in the range [0...100]. The same pair of random draws (v_1 and v_2) was used for all bidder pairs. A bidder only knew the own reservation value (v_i was private information). After receiving v_i, each bidder B_i submitted a bid b_i, i=1,2. Then, in each pair, the bidder with the highest bid received the item at a price equal to the own bid (for example, if $b_1 > b_2$ then B_1 receives the item at a price b_1). In case of a tie, a random draw determined the winner. The bidder who received the item had a payoff of $v_i - b_i$. The other bidder had a payoff of zero.

The two treatments differed in the amount of information given to the subjects. In the first treatment ("All Info"), subjects received information on both bids and on who won the auction at which price. In the second treatment ("Price Info"), subjects only received information on who won the auction at which price. The table below contains an overview of the bid to value ratios (b_i/v_i) in the experiment.

auctions 1 – 25				auctions 26 – 50			
pairs of matched subjects	bid to value ratio (b_i/v_i) (average over first 25 auctions)			pairs of matched subjects	bid to value ratio (b_i/v_i) (average over last 25 auctions)		
	bidder 1	bidder 2	average of the pair		bidder 1	bidder 2	average of the pair
Treatment 1 "All Info"							
1 2	.70	.78	.74	1 2	.56	.44	.50
3 4	.72	.70	.71	3 4	.66	.54	.60
5 6	.62	.70	.66	5 6	.50	.56	.53
7 8	.68	.76	.72	7 8	.52	.60	.56
9 10	.68	.83	.75	9 10	.52	.64	.58
11 12	.76	.66	.71	11 12	.66	.52	.59
Treatment 2 "Price Info"							
13 14	.80	.64	.72	13 14	.60	.62	.61
15 16	.70	.64	.67	15 16	.62	.58	.60
17 18	.71	.61	.66	17 18	.70	.66	.68
19 20	.84	.68	.76	19 20	.76	.58	.67
21 22	.72	.78	.75	21 22	.66	.64	.65
23 24	.68	.80	.74	23 24	.74	.78	.76

(1) Describe the experimental design by answering the following questions:

(a) How many subjects participated in the experiment?

(b) How many decisions were made in total (over all rounds and parts)? Explain your answer.

(c) How many statistically independent observations are available in the "All Info" treatment? (How many in the very first auction? How many in the first 25 auctions? How many in the last 25 auctions? How many in total?) Explain your answers.

(d) How many statistically independent observations are available in the "Price Info" treatment? (How many in the very first auction? How many in the first 25 auctions? How many in the last 25 auctions? How many in total?) Explain your answers.

(e) What are the main effects that the experimenter wants to examine? Explain your answer by briefly discussing the controlled variations in the experiment.

(f) Give some examples of nuisance variables. Explain how the nuisance variables are controlled for in this experiment. Describe the type of experimental design. (Remember that different controls may be used for different treatment variations.)

(2) Use the Mann-Whitney U-test to check whether information has a significant effect (at the 10% level, two-tailed) on the observed bid to value ratios (b_i/v_i):

(a) State the null-hypothesis and the alternative hypothesis.

(b) Explain why the significance level must be two-tailed.

(c) Run the Mann-Whitney U-test comparing the bid to value ratios observed in the first 25 auctions of the two treatments. Use as many independent observations as possible, with all data of both treatments at the same aggregation level (only if necessary use the pair averages as descriptors). Note all steps and state the result.

(d) Run the Mann-Whitney U-test comparing the bid to value ratios observed in the last 25 auctions of the two treatments. Use as many independent observations as possible, with all data of both treatments at the same aggregation level (only if necessary use the pair averages as descriptors). Note all steps and state the result.

(e) Briefly evaluate the results of (c) and (d): In which way does the additional information affect bidding behavior in the auction? How do the effects of experience and information interact?

(3) Use the Wilcoxon matched-pairs signed-ranks test to check whether subjects tend to have significantly lower bid to value ratios (b_i/v_i) in the last 25 auctions compared to the first 25 auctions (at the 2.5% level, one-tailed):

(a) State the null-hypothesis and the alternative hypothesis.

(b) Use the Wilcoxon matched-pairs signed-ranks test to compare the bid to value ratios in the first 25 to those in the last 25 auctions. Pool the data of both treatments together using the same aggregation level of all data. Note all steps and state the results.

(c) What do you think the result of test would have been, if we had tested the responses of the two treatments separately? Explain. (No need to calculate. Just make an "informed" guess.) Briefly discuss whether pooling the data from both treatments for this test is sensible or not.

(d) Explain briefly how a rank correlation analysis could have been used to test for the effect of experience on the bid to value ratios of the subjects. (Imagine you had calculated the rank correlation coefficient between the bid to value ratio and the auction number for each of the subjects and subject pairs.)

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Mann-Whitney-U-test

n1 \ n2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1																	0	0	0	0	0	0	0
2			0	0	0	1	1	1	1	2	2	2	3	3	3	4	4	4	5	6	6	6	7
3	0	0	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	11	12	13	13	14	15
4		1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18	19	20	21	22	23
5			4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25	27	28	29	31	32
6				7	8	10	12	14	16	17	19	21	23	25	26	28	30	32	34	36	38	40	42
7					11	13	15	17	19	21	24	26	28	30	33	35	37	39	42	44	46	49	51
8						15	18	20	23	26	28	31	33	36	39	41	44	47	50	52	55	58	60
9							21	24	27	30	33	36	39	42	45	48	51	54	58	61	64	67	70
10								27	31	34	37	41	44	48	51	55	58	62	65	69	72	76	79
11									34	38	42	46	50	54	57	61	65	69	73	77	81	85	89
12										42	47	51	55	60	64	68	72	77	81	86	90	94	99
13											51	56	61	65	70	75	80	84	89	94	99	104	108
14												61	66	71	77	82	87	92	97	103	108	113	118
15													72	77	83	88	94	100	106	111	117	122	128
16														83	89	95	101	107	114	120	126	132	138
17															96	102	109	115	122	128	135	141	148
18																109	116	123	130	137	144	151	157
19																	123	130	138	145	153	160	167
20																		138	146	154	162	169	177
21																			154	163	171	179	187
22																				171	180	188	197
23																					189	198	207
24																						207	217
25																							227

Rank all $n = n_1 + n_2$ observations in an increasing order.
R_1 = sum of ranks of sample 1 and $U_1 = n_1 \cdot n_2 + ½n_1(n_1 + 1) - R_1$
R_2 = sum of ranks of sample 2 and $U_2 = n_1 \cdot n_2 + ½n_2(n_2 + 1) - R_2$
Critical values of $U = \min\{U_1, U_2\}$ for a significance level of 0.05 (one-tailed) or 0.10 (two-tailed).

Wilcoxon matched-pairs signed-ranks test

Calculated differences $d_i = |x_i - y_i|$, where x_i and y_i are paired observations (e.g. "before" and "after").
Rank differences r_i = rank of d_i, where ranks of tied differences are averaged.
Sign the ranks s_i = signed rank of d_i, where $s_i = -r_i$ if $x_i < y_i$ ans $s_i = r_i$ if $x_i > y_i$.
Calculate the rank sums: T_+ = sum of all positive s_i, T_+ = absolute sum of all negative s_i, $T = \min\{T_+, T_-\}$.
Compare T to the critical values for the chosen α.

significance level one-tailed	significance level two-tailed	N = 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.025	0.050	0	2	4	6	8	11	14	17	21	25	30	35	40	46	52	59	66	73	81	89
0.010	0.020		0	2	3	5	7	10	13	16	20	24	28	33	38	43	49	56	62	69	77
0.005	0.010			0	2	3	5	7	10	13	16	20	23	28	32	38	43	49	55	61	68