

LEARNING AND NOISY EQUILIBRIUM BEHAVIOR

IN AN EXPERIMENTAL STUDY OF IMPERFECT PRICE COMPETITION

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Instructions and Data Appendix

You are going to take part in an experimental study of decision making. The funding for this study has been provided by several foundations. The instructions are simple, and by following them carefully, you may earn a considerable amount of money. At this time, you will be given \$6 for coming on time. All the money that you earn subsequently will be yours to keep, and your earnings will be paid to you in cash today at the end of this experiment. We will start by reading the instructions, and then you will have the opportunity to ask questions about the procedures described.

Earnings

The experiment consists of a sequence of periods. In each period, you will be randomly matched with another participant in the room. The decisions that you and the other participant make will determine the amount earned by each of you. At the beginning of each period, you will be asked to choose a number between 60 and 160 cents and write down it on a decision sheet that is attached to these instructions. The number you can choose may be any amount between and including 60 and 160 cents. That is, we allow fractions of cents. The person who you are matched with will also choose a number between and including 60 and 160 cents. Each of you receives 25 cents plus an amount that depends on the number chosen. This amount equals a percentage of the minimum of your number and the other's number. If the numbers are equal, then the percentage for you and the other person each equals the 90% of the number chosen. If you are the person choosing the lower number, the percentage you receive equals the 100% of the number you chose. If you are the person choosing the higher number, the percentage you receive equals the 80% of the other person's number.

Example: Suppose that your number is X and the other's number is Y .

If $X = Y$, you get $0.9 \cdot X$, and the other gets $0.9 \cdot Y$.

If $X > Y$, you get $0.8 \cdot Y$, and the other gets Y .

If $X < Y$, you get X , and the other gets $0.8 \cdot X$.

(In each case, 25 cents will be added to your earnings.)

Record of Results

Now, each of you should examine the record sheet. This sheet is the last one attached to these instructions. Your identification number is written in the top-right part of this sheet. Please look at the columns of your record sheet. Going from left to right, you will see columns for the "period," "your number," "other's number," "minimum number," "your earnings," and "plus 25 cents." You begin by writing down your own number in the appropriate column. As mentioned above, this number must be greater than or equal to 60 and less than or equal to 160

cents, and the number may be any amount in this range, (i.e. fractions of cents are allowed). Use decimals to separate fractions of cents. For example, wx.z cents indicates wx cents, and a fraction z/10 of a cent. Similarly, x.z cents indicates x cents and a fraction z/10 of a cent.

After you make and record your decision for period one, we will collect all decision sheets. Then we will draw numbered ping pong balls to match each of you with another person. Here we have a container with ping pong balls, each ball has one of your identification numbers on it. We will draw the ping pong balls to determine who is matched with whom. After we have matched someone with you, we will write the other's number, the minimum number, and your earnings in the relevant columns of your decision sheet and return it to you. Then, you make and record your decision for period two, we collect all decision sheets, draw ping pong balls to randomly match you with another person, write the other's number, minimum number, and earnings in your decision sheet and return it to you. This same process is repeated a total of ten times.

Summary

To begin, each participant chooses and records a number by writing it in the appropriate column of the decision sheet. Then the decision sheets are collected and participants are randomly matched using draws of numbered ping pong balls. Once the matching is done, the other's decision, the minimum number, and the earnings are written on each person's decision sheet. After all decision sheets are returned, participants choose and record their numbers for the next period. The decisions determine each person's earnings as described above. You will receive an amount that equals 25 cents plus a percentage of the minimum of your number and the other's number. If you chose the lower number, the percentage will be 100% of the minimum number. If you chose the higher number, the percentage will be 80% of the minimum number. And if you and the other person chose the same number, the percentage will be 90% of that number. Note that a new random matching is done in each period.

Final Remarks

This experiment will be followed by another, quite different experiment in which you will have additional opportunity to make decisions that can increase your earnings.

At the end of today's session, we will pay to you, privately in cash, the amount that you have earned. You have already received the \$6 participation payment. Therefore, if you earn an amount X during the exercise that follows, you will receive a total amount of \$6.00 + X. Your earnings are your own business, and you do not have to discuss them with anyone.

During the experiment, you are not permitted to speak or communicate with the other participants. If you have a question while the experiment is going on, please raise your hand and one of us will come to your desk to answer it. At this time, do you have any questions about the instructions or procedures? If you have a question, please raise your hands and one of us will come to your seat to answer it.

Identification Number: _____

Please choose a number that is greater than or equal to 60 and less than or equal to 160, using decimals to indicate fractions; e.g. wx.z or x.z.

Period	Your number	Other's number	Minimum number	Your earnings	Plus 25 cents
1					
2					

Appendix B: Individual Decisions

Session 1: $\alpha = 0.80$

period	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	140 (158)	75 (150)	130 (120)	160 (110.6)	150 (75)	110.6 (160)	150 (80)	80 (150)	158 (140)	120 (130)
2	140 (115)	150 (120)	130 (120)	160 (95)	120 (130)	110.6 (150)	150 (110.6)	95 (160)	120 (150)	115 (140)
3	159.9 (155)	150 (109)	110 (105)	155 (159.9)	109 (150)	110.6 (130)	150.5 (122)	105 (110)	130 (110.6)	122 (150.5)
4	140 (110)	160 (100)	110 (150.5)	155 (109.9)	109.9 (155)	150.5 (110)	151.7 (145)	100 (160)	110 (140)	145 (151.7)
5	140 (115)	150 (157)	120 (125)	157 (150)	109.9 (149)	149.9 (152.8)	152.8 (149.9)	115 (140)	125 (120)	149 (109.9)
6	110 (120)	160 (109.8)	120 (110)	155 (120)	109.8 (160)	149.9 (153.8)	153.8 (149.9)	125 (133)	120 (155)	133 (125)
7	120 (151.7)	160 (120)	120 (160)	149 (125)	109.8 (135)	151.7 (120)	154.8 (130)	130 (154.8)	135 (109.8)	125 (149)
8	130 (151.7)	160 (130)	120 (109.6)	158 (128)	109.6 (120)	151.7 (130)	145 (135)	135 (145)	130 (160)	128 (158)
9	120 (132)	160 (130)	115 (155)	155 (115)	109.5 (130)	135.9 (140)	130 (160)	140 (135.9)	130 (109.5)	132 (120)
10	125 (157)	160 (138)	110 (122)	157 (125)	109.5 (149.9)	149.9 (109.5)	135 (109)	138 (160)	109 (135)	122 (110)

Session 2: $\alpha = 0.20$

period	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	61.13 (60)	60 (95)	95 (60)	92 (75)	60 (61.13)	90 (61)	60 (99.9)	61 (90)	99.9 (60)	75 (92)
2	60 (60)	60 (60)	70 (99.9)	80 (65)	60 (75)	80 (60)	60 (80)	65 (80)	99.9 (70)	75 (60)
3	60 (65)	60 (64)	78 (69.9)	60 (75)	65 (60)	60 (60)	60 (60)	64 (60)	69.9 (78)	75 (60)
4	60.25 (60)	60 (65)	68 (65)	65 (68)	60 (60)	60 (60.25)	60 (69.8)	60 (60)	69.8 (60)	65 (60)
5	60 (72.99)	60 (60)	72.99 (60)	70 (60)	60 (60)	60 (60)	60 (70)	60 (69)	69 (60)	60 (60)
6	63 (60)	60 (63)	63 (60)	65 (65)	60 (65)	70 (60)	65 (65)	65 (60)	60 (70)	60 (63)
7	65.1 (60)	60 (60)	60 (60)	64.9 (60)	60 (60)	60 (64.9)	60 (60)	60 (65.1)	60 (60)	60 (60)
8	61 (60)	60 (60)	60 (61)	60 (60)	60 (63)	64.8 (60)	60 (64.8)	63 (60)	60 (60)	60 (60)
9	60 (60)	60 (60)	60 (60)	60 (60)	60 (60)	60 (60)	60 (60)	60 (60)	60 (60)	60 (60)
10	60 (60)	60 (60)	60 (60)	159 (60)	60 (60)	60 (60)	60 (60)	60 (60)	60 (159)	60 (60)

Session 3: $\alpha = 0.20$

period	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	120 (125)	69 (65)	85 (95.8)	65 (69)	95.8 (85)	68 (100)	120 (155.5)	155.5 (120)	100 (68)	125 (120)
2	100 (60.5)	81 (95.1)	95.1 (81)	94 (120)	82.6 (94)	94 (82.6)	120 (94)	60.5 (100)	60 (110)	110 (60)
3	60 (90.3)	62 (75.5)	90.3 (60)	90 (87.1)	87.1 (90)	137 (60)	110 (80)	75.5 (62)	60 (137)	80 (110)
4	80 (75.4)	69 (60)	75.4 (80)	85 (89.9)	89.9 (85)	142 (60.5)	100 (80)	70.5 (142)	60 (69)	80 (100)
5	65 (98)	64 (80)	82.3 (60)	88.5 (70)	84.9 (75)	98 (65)	75 (84.9)	70 (88.5)	60 (82.3)	80 (64)
6	70 (75.5)	65 (70)	72.4 (62.3)	160 (75)	77.7 (80)	62.3 (72.4)	75 (160)	75.5 (70)	70 (65)	80 (77.7)
7	75 (60)	67 (61.8)	60.5 (60)	72.5 (160)	79.6 (75)	61.8 (67)	75 (79.6)	160 (72.5)	60 (60.5)	60 (75)
8	75 (60)	60 (95.9)	60 (75)	95.9 (60)	70.2 (69.9)	61.7 (60)	75 (60)	69.9 (70.2)	60 (61.7)	60 (75)
9	75 (73.2)	60.64 (60)	73.2 (75)	65 (60)	62.9 (60)	60 (62.9)	70 (70)	70 (70)	60 (60.64)	60 (65)
10	75 (60)	60.64 (66.7)	74.5 (60)	60 (62)	62 (60)	60 (75)	66.7 (60.64)	69.9 (60)	60 (74.5)	60 (69.9)

Session 4: $\alpha = 0.80$

period	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	150 (90)	145 (100)	125 (120)	108.9 (150)	160 (81)	81 (160)	100 (145)	150 (108.9)	120 (125)	90 (150)
2	150 (125)	95 (100)	125 (150)	128.9 (80)	100 (95)	84 (120)	61 (130)	80 (128.9)	130 (61)	120 (84)
3	145 (100)	99 (95)	120 (100)	118.9 (119.9)	100 (120)	95 (99)	100 (120)	120 (100)	119.9 (118.9)	100 (145)
4	125 (118.9)	95 (109.9)	119.9 (90)	118.9 (125)	100 (97)	97 (100)	109 (125)	90 (119.9)	109.9 (95)	125 (109)
5	125 (118.9)	100 (150)	99.98 (100)	118.9 (125)	100 (119)	98.5 (100)	119 (100)	100 (98.5)	100 (99.98)	150 (100)
6	125 (99.9)	125 (95)	94.98 (99.5)	114.9 (100)	100 (114.9)	99.5 (94.98)	99.9 (100)	95 (125)	99.9 (125)	100 (99.9)
7	125 (100)	100 (90.1)	89.49 (96)	114.9 (100)	100 (114.9)	90.1 (100)	99.5 (99.9)	96 (89.49)	99.9 (99.5)	100 (125)
8	120 (120)	95 (125)	89.48 (99.4)	118.9 (95)	120 (120)	93.5 (98.8)	98.8 (93.5)	95 (118.9)	99.4 (89.48)	125 (95)
9	120 (100)	95 (95)	89.48 (101)	89.99 (89.8)	101 (89.48)	94.9 (89.9)	89.8 (89.99)	95 (95)	89.9 (94.9)	100 (120)
10	100 (93.5)	94.9 (89.9)	89.47 (78.99)	78.99 (89.47)	100 (94)	93.5 (100)	84.49 (160)	94 (100)	89.9 (94.9)	160 (84.49)

Session 5: $\alpha = 0.80$

period	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	150 (160)	75.5 (100)	97 (80)	160 (60)	160 (150)	67 (100)	60 (160)	80 (97)	100 (75.5)	100 (67)
2	155 (128)	75.5 (160)	128 (155)	159.9 (98)	160 (75.5)	98 (159.9)	160 (65)	65 (160)	99 (88)	88 (99)
3	156 (135)	95.5 (160)	135 (159)	159.1 (136)	150 (99.9)	136 (159.1)	160 (95.5)	135 (156)	99.9 (150)	159 (135)
4	157.9 (160)	160 (157.9)	145 (159)	140 (160)	160 (140)	67 (70)	159 (145)	70 (67)	99.99 (120)	120 (99.99)
5	159 (158)	155 (140)	150 (66)	159.5 (99.7)	140 (155)	66 (150)	158 (159)	75 (98)	99.7 (159.5)	98 (75)
6	160 (72)	149.5 (62)	145 (140)	155 (157)	140 (145)	62 (149.5)	157 (155)	85 (99.5)	99.5 (85)	72 (160)
7	160 (91)	139 (140)	140 (139)	150 (156)	140 (152)	152 (140)	156 (150)	86 (99.4)	99.4 (86)	91 (160)
8	159 (140)	139 (140)	140 (139)	150 (93)	140 (159)	160 (155)	155 (160)	77 (118)	118 (77)	93 (150)
9	156 (90)	139.5 (92)	138 (154)	130 (117)	150 (60)	60 (150)	154 (138)	90 (156)	117 (130)	92 (139.5)
10	155 (138.5)	138.5 (155)	145 (94)	125 (140)	140 (125)	60 (100)	150 (116)	100 (60)	116 (150)	94 (145)

Session 6: $\alpha = 0.20$

period	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	100 (160)	60 (80.5)	82 (60)	160 (100)	75 (72.3)	109.9 (100)	72.3 (75)	60 (82)	80.5 (60)	100 (109.9)
2	90 (60)	60 (69.9)	75 (60)	60 (99.9)	60 (75)	99.9 (60)	69.9 (60)	100 (60)	60 (100)	60 (90)
3	70 (160)	60 (99.8)	60 (60)	70 (60)	74.9 (94.9)	99.8 (60)	160 (70)	60 (60)	94.9 (74.9)	60 (70)
4	80 (160)	60 (60)	60 (60)	60 (99.8)	84.9 (68)	99.8 (60)	68 (84.9)	160 (80)	60 (85)	85 (60)
5	100 (60)	60 (70.2)	60 (70)	60 (100)	65 (60)	60 (65)	70.2 (60)	60 (60)	60 (60)	70 (60)
6	79 (60)	60 (79)	60 (60)	60 (60)	65 (60)	60 (60)	70 (60)	60 (60)	60 (60)	60 (70)
7	60 (60)	60 (60)	60 (60)	60 (60)	160 (60)	60 (60)	60 (60)	60 (160)	60 (60)	60 (60)
8	60 (60)	60 (60)	60 (60)	60 (160)	160 (60)	60 (60)	60 (160)	160 (60)	60 (60)	60 (60)
9	60 (60)	60 (60)	60 (60)	60 (60)	160 (60)	60 (160)	72 (60)	60 (60)	60 (60)	60 (72)
10	60 (160)	60 (60)	60 (60)	60 (60)	160 (60)	60 (60)	60 (60)	160 (60)	60 (160)	60 (60)