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An Experiment of Round-Robin Tournament by Excel's Macro

-Using 160 Students' Data from Cournot Duopoly Game-

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Abstract

I collected in-class experimental data of 160 subjects who played Cournot duopoly game on May 10, 2001. In this paper, I use these data to run a round-robin tournament of Cournot duopoly game. What type of strategy or strategies can win in the round-robin tournament in the sense of getting maximum payoffs? To the best of my knowledge, no this type of experiment has been run for over 100 subjects. I can easily run the virtual round-robin tournament of 160 subjects using MS Excel's Macro. I find that the best strategy is the repetition of the Cournot-Nash equilibrium quantity of one shot Cournot duopoly game.

Keywords: Cournot duopoly, in-class experiment, round-robin tournament, Excel's Macro

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Abstract

I collected in-class experimental data of 160 subjects who played Cournot duopoly game on May 10, 2001. In this paper, I use these data to run a round-robin tournament of Cournot duopoly game. What type of strategy or strategies can win in the round-robin tournament in the sense of getting maximum payoffs? To the best of my knowledge, no this type of experiment has been run for over 100 subjects. I can easily run the virtual round-robin tournament of 160 subjects using MS Excel's Macro. I find that the best strategy is the repetition of the Cournot-Nash equilibrium quantity of one shot Cournot duopoly game.

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1 Introduction

For several years I have been teaching undergraduate classes of industrial organization. I felt that students were difficult to learn the interdependence between oligopoly firms within limited class time.

I find in the Journal that utilizing in-class experiments such as Cournot duopoly game can stimulate interest among many students. Such experiments were conducted by Hemenway, Moore and Whitney[5], Holt[6], Holt and Capra[7] and others.[1]

Recently, in this Journal, Bodo[1] used the computer software, MATHEMATICA, to program and run the round-robin tournament for the Iterative Prisoner's Dilemma game using 19 strategies (including 18 students' strategies and one random strategy). He confirms that the Tit-for-Tat strategy is the best payoff maximizing in the Iterated Prisoner's Dilemma game in his in-class experiment.

I used in-class experiment of Cournot duopoly game so that students could or might have feelings of interdependence of duopoly. I conducted an in-class experiment of Cournot duopoly on May 10, 2001.[2]

I collected data of 160 subjects who played Cournot duopoly game. There

[1]"Games Economists Play: Non-Computerized Classroom-Games for College Economics" by Greg Delemeester and Jurgen Brauer [URL: http://www/marietta/edu/ delemeeg/games] shows 113 classroom experiments. However, the case involving more than 160 subjects is not reported in it. See, also, Rubinstein[9].

[2]The experiment was done in my undergraduate class of Industrial Organization at Otaru University of Commerce.

were some students who could not understand the instructions no matter how clearly the instructions were written on or how carefully I explained the instructuions to them. After pairwise tournament, I had one idea: what type of strategy or strategies are the payoff maximizing if I could conduct a round-robin tournament using students' strategies? If I conduct the round-robin tournament, I think these disturbances will be disappeared on average. So I tried the round-robin tournament using 160 students' strategies. Their strategies have much variety of strategies.

Remembering that the Tit-for-Tat strategy is the best one in the Iterated Prisoner's Dilemma game, I guess that repetitions of Cournot outcome (Cournot equilibrium quantity) would be the best or effective strategy for the round-robin tournament of Cournot duopoly game because there are so many types of strategies, indeed, 160 strategies in my experiment. To confirm my estimation, I used the computer software, Excel's Macro, to program and run the tournament.[3]

In this paper, I use these data to run Cournot duopoly game of all possible pairs including herself or himself on the computer. This is a round-robin tournament. What type of strategy or strategies can win in the round-robin tournament in the sense of getting maximum payoffs?

To the best of my knowledge, no this type of experiment has been run for over 100 subjects. I can easily run the virtual round-robin experiment of 160 subjects using MS Excel's Macro. I find that the best strategy is the repetition of the Cournot-Nash outcome (Cournot-Nash equilibrium quantity) of one shot

[3]It makes the simulation of the round-robin tournament relatively simple and very fast.

Cournot duopoly game.

The remainder of the paper is organized as follows. In Section 2 I present a Cournot duopoly model and its property. Section 3 presents the procedure in the in-class experiment. Section 4 presents a summary of results in the in-class experiment. In Section 5 I show the Excel's procedure to exert a round robin tournament using the in-class experimental data. In section 6 the results of round-robin experiment are summarized. Section 7 presents some remarks on my results and other remaining problems. All related materials are gathered in Appendices.

2 Cournot Model and Notation

I consider two firms that produce homogeneous good, or perfect substitutes. The quantity produced by firm 1 is denoted by Q_1 and Q_2 is the quantity produced by firm 2.

Let cost functions of both firms be $C_1(Q_1) = Q_1$ and $C_2(Q_2) = Q_2$, respectively. The market demand function is given by $Q = 37 - p$, where Q denotes the market demand for the good and p its price. Thus the market-clearing price,p, is given by

$$p = 37 - (Q_1 + Q_2) \tag{1}$$

This relation shows the inverse demand function, namely, demand curve.

Then I can calculate profits (π_1 and π_2) accrued by both firms as follows:

$$\pi_1(Q_1, Q_2) = \{36 - (Q_1 + Q_2)\}Q_1 \tag{2}$$

$$\pi_2(Q_1, Q_2) = \{36 - (Q_1 + Q_2)\}Q_2 \tag{3}$$

The payoff matrices in the appendix A are produced by this rule.[4]

The reaction functions for the both firms are

$$Q_1 \equiv r_1(Q_2) = (36 - Q_2)/2 \tag{4}$$

$$Q_2 \equiv r_2(Q_1) = (36 - Q_1)/2 \tag{5}$$

Then, the Cournot-Nash equilibrium quantity is the pairs of (Q_1, Q_2), namely,

$$Q_1 = 12 \tag{6}$$

$$Q_2 = 12 \tag{7}$$

I also get the Cournot-Nash equilibrium profit pairs[5] of $(\pi_1(12, 12), \pi_2(12, 12))$:

$$\pi_1(12, 12) = 144 \tag{8}$$

$$\pi_2(12, 12) = 144 \tag{9}$$

One can easily see that the collusive outcome makes good performance of profit pairs $(162, 162)$ but this case is prohibited by present game rule.[6] The collusive outcome provides more profit pairs than the Cournot-Nash equilibrium pairs of profit $(144, 144)$. However, one can also find that you can do more good

[4]Only part of these figures is listed in the quantities from 7 to 19.

[5]See any standard Industrial Organization text, game theory text or Uzawa[11].

[6]Some pairs seem to be making collusive behavior. However, these are irrelevant to my experiment of round-robin tournament.

performance (182) producing 13 or 14 than making commitment to produce 9 if your partner or opponent commits to produce 9. This game is a type of the Prisoner's Dilemma.[7]

3 On procedures in class room experiment

First I distribute two copies of payoff tables and the form listed in Appendix A. Next, I explain the purpose and content of the experiment and let students read them. I persuade students to keep the following rule, in particular:

Don't talk or negotiate with each other.

I will give you the extra credit points according to your performance.[8]

Students are paired with her or his neighbors in the seat and one student plays as the role of firm 1 and the other student plays as the role of firm 2. For checking the pairs, student writes lower 3 digit number of partner or opponent student's ID in addition of her or his own ID number. Students do not know the number of games they play in advance.[9]

In the first period, student writes a number in her or his sheet and let the number to know her or his opponent by my signal. She or he writes opponent's

[7]See Poundstone[8] for Prisoner's Dilemma and Holt and Capra[7] for treatment with it in experimental economics.

[8]**The real reward is to add the credit points of 1% of accumulated payoffs in the 6 periods.**

[9]Many students expected game would be stopped after 6 periods because there are only six cells in the sheet (see Appendix A).

number in the appropriate place. Payoffs are checked and wrote in the payoffs cell.[10] The first period ends.

The second period starts and proceeds in the same way. I conducted six periods without letting them know the last period. Then, I collected the (possible) paired sheets.

4 Summary of two-players' Cournot Game

I identified the eighty three pairs' sheets for 166 students by checking the lower 3 digits coding. I exclude two pairs' sheets for 4 students in the following analysis because there are many inconsistencies with numbers in the paired sheets. And I exclude one more pair's data for 2 students because they used different payoff table to make her or his decision.[11]

Finally I collected data of eighty pairs for 160 students and basic results are as follows.[12]

Table 1: Two players' performance in paired case

Average period's payoffs	132.4
Standard deviation of payoffs	38.6

[10] In fact, there are more than ten cases in which they did mistakes of counting payoffs. These cases are corrected by MS Excel.

[11] One subject wrote it at the margin of the sheet.

[12] Average is 7.94 and its standard deviation is 1.10 for extra points.

Table 2: Average and standard deviation in quantity(Q) and payoffs(π)

		period 1	period 2	Period 3	period 4	period 5	period 6
Quantity	Average	12.9	13	13.7	14.1	14.1	14.4
	S.D.*	2.7	2.6	2.7	3.1	3	3.1
Profit	Average	139.1	139.7	137.3	125.5	126.9	121.3
	S.D.*	33.8	32.8	30.8	37.6	43.4	46.8

* S.D. means Standard Deviation.

From Table 2, I make Tables 3 and 4 for easy comparison between collusion outcome and the Cournot equilibrium. As expected, students chose best response quantity(14) to the collusive outcome (9) with high probability instead of choosing the collusive outcome (9) or Cournot equilibrium (12) as the period proceeds to expected end period (See the Table 3 or Figure 1). Table 4 and Figure 2 show the comparison between profits of collusive outcome, Cournot equilibrium and classroom experimental outcome. You can find that there remains near the Cournot equilibrium until period 3, but that they diverge from collusive outcome and Cournot equilibrium after period 4.[13]

[13]It can be seen from these data that subjects chose the best response in quantity because she might think this was the only last period of game. The quantity chosen is more than collusive outcome (9) and Cournot equilibrium (12).

Table 3: Quantities(Q) in collusive outcome, Cournot equilibrium and experiment

cases	period 1	period 2	period 3	period 4	period 5	period 6
Collusive outcome	9	9	9	9	9	9
Cournot equilibrium	12	12	12	12	12	12
Experiment Average	12.9	13.0	13.7	14.1	14.1	14.4
S.D.*	2.7	2.6	2.7	3.1	3	3.1

* S.D. means Standard Deviation.

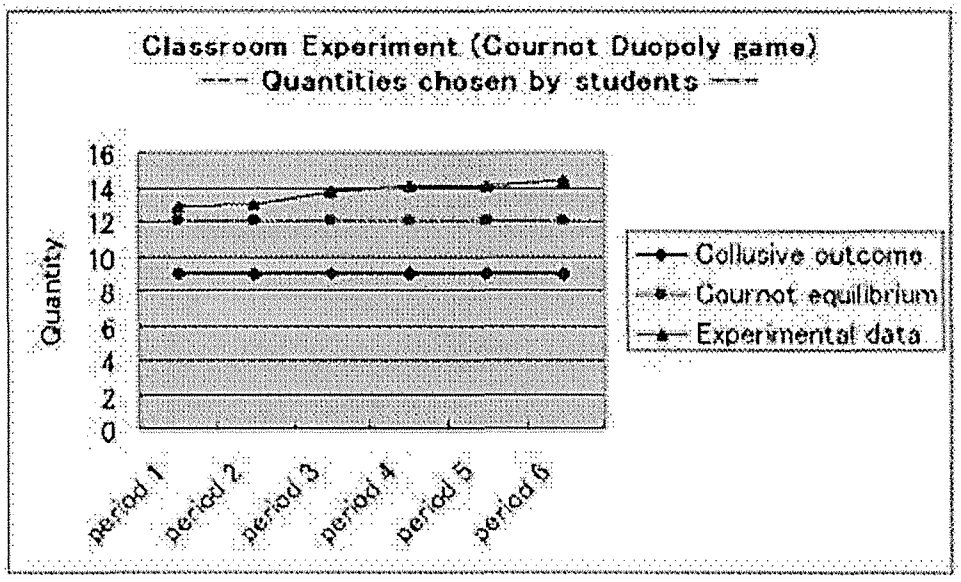

Figure 1: Quantity(Q) in collusive outcome, Cournot equilibrium and experimental data

Table 4: Payoffs of collusion outcome, Cournot equilibrium and experimental data

cases		period 1	period 2	period 3	period 4	period 5	period 6
Collusive profit		162	162	162	162	162	162
Cournot profit		144	144	144	144	144	144
Experiment	Average	139.1	139.7	137.3	125.5	126.9	121.3
	S.D.*	33.8	32.8	30.8	37.6	43.4	46.8

* S.D. means Standard Deviation.

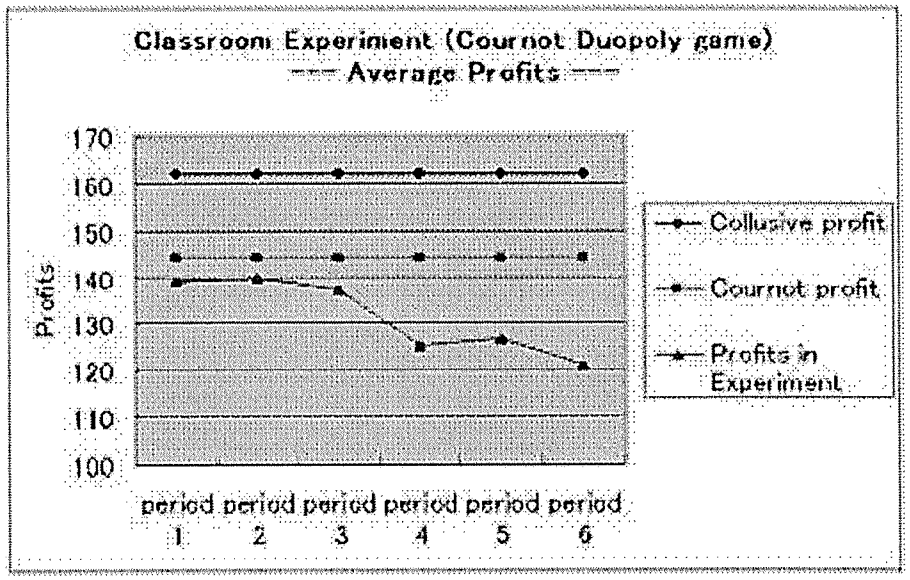

Figure 2: Profits of collusive outcome, Cournot equilibrium and experimental data

5 Excel's Macro for Exerting a Round-robin Experiment on the Computer

You can input numbers of quantities chosen by students as in Table 5. For the first student, you set student's ID[14] in cell A15, and set quantity data in from cells B15 to G15. The same processes proceed until last student. Namely, you set last student's ID in cell A174, and set quantity data in from cells B174 to G174.

Table 5: Input windows for quantities chosen by subjects

	A	B	C	D	E	F	G	H
12								
13		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Result
14	Student I.D.	Q_2	Q_2	Q_2	Q_2	Q_2	Q_2	Average(π)
15		10	11	9	13	7	14	
16		10	13	12	15	14	10	
17		14	15	11	10	12	13	
18		12	13	14	9	8	11	
19		10	12	13	13	12	14	
-		10	10	7	9	11	13	
-		12	16	15	14	11	13	
172		14	13	13	15	14	13	
173		9	10	15	18	7	16	
174		8	11	12	10	9	7	

In the next step, you set items in as Table 6 for explanation.

In cell J14, you set "=AVERAGE(L15:Q174)" for getting her average profits

[14]Of course, it should be secret. Here it is blank in Table 5.

against all students including herself. In cell J15, set "=AVERAGE(L15:Q15)" for getting her average profits against one student.

Then copy cell J15 to cells from J16 to J174.

You set "=(36-(L14 + $B15$)) * $L14$" in cell L15 for getting first period profit against one student.

Copy cell L15 to cells from M15 to Q15.

Copy cells from L15 to Q15 to cells L16 to Q174.[15]

Next step is in order: Copy cells of A15:G15 to cells of K14:Q14, respectively. Table 7 shows the copying process of cells of A15:B15 to cells of K14:L14.[16] It shows profits against 160 subjects in the cells of L15:L174. Her Average profits are shown in the cell of J14.[17]

[15]Because cells from L14 to Q14 in Table 6 contain null data at present, all cells except average show zero. Average is not defined at present, so Excel shows $\#DIV/0!$ which means "divide by zero error occurs." But do not worry about it. If you set all data of your students' choices, you get good results.

[16]It is too fast to see the performance of Excel's Macro.

[17]Note that averages are computed for all periods. In this step, there are all zeros in profits from period 2 to 6.

Table 6: Windows for calculating payoffs

	J	K	L	M	N	O	P	Q
12			period 1	period 2	period 3	period 4	period 5	period 6
13	Average()	student ID	Q1	Q1	Q1	Q1	Q1	Q1
14	# DIV/0!							
15	# DIV/0!		0	0	0	0	0	0
16	# DIV/0!		0	0	0	0	0	0
17	# DIV/0!		0	0	0	0	0	0
18	# DIV/0!		0	0	0	0	0	0
19	# DIV/0!		0	0	0	0	0	0
-	# DIV/0!		0	0	0	0	0	0
-	# DIV/0!		0	0	0	0	0	0
172	# DIV/0!		0	0	0	0	0	0
173	# DIV/0!		0	0	0	0	0	0
174	# DIV/0!		0	0	0	0	0	0

Table 7: Some data for the first student who gets from the round-robin tournament

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
12								Round		134.0		Pd.1	Pd.2	Pd.3	Pd.4	Pd.5	Pd.6
13		Pd.1	Pd.2	Pd.3	Pd.4	Pd.5	Pd.6	Robin		Av.	ID	Q1	Q1	Q1	Q1	Q1	Q1
14	ID	Q2	Q2	Q2	Q2	Q2	Q2	Av.		134.0		10	11	9	13	7	14
15		10	11	9	13	7	14	134.0		145.3		160	154	162	130	154	112
16		10	13	12	15	14	10			134.0		160	132	135	104	105	168
17		14	15	11	10	12	13			131.3		120	110	144	169	119	126
18		12	13	14	9	8	11			145.3		140	132	117	182	147	154
19		10	12	13	13	12	14			131.7		160	143	126	130	119	112
20		10	10	7	9	11	13			156.5		160	165	180	182	126	126
21		12	16	15	14	11	13			119.3		140	99	108	117	126	126
22		10	9	10	9	10	9			164.3		160	176	153	182	133	182

Table 8: Some data for the first student who gets from the round-robin tournament

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
								Round		134.0		Pd.1	Pd.2	Pd.3	Pd.4	Pd.5	Pd.6
		Pd.1	Pd.2	Pd.3	Pd.4	Pd.5	Pd.6	Robin		Av.	ID	Q1	Q1	Q1	Q1	Q1	Q1
167		15	10	7	18	11	16			121.7		110	165	180	65	126	84
168		15	16	10	19	17	14			101.7		110	99	153	52	84	112
169		13	14	12	14	13	13			123.5		130	121	135	117	112	126
170		13	12	15	11	10	14			130.3		130	143	108	156	133	112
171		7	11	18	14	9	16			127.7		190	154	81	117	140	84
172		14	13	13	15	14	13			118.8		120	132	126	104	105	126
173		9	10	15	18	7	16			124.3		170	165	108	65	154	84
174		8	11	12	10	9	7			164.7		180	154	135	169	140	210

Table 8 also shows the partial data for the first student who gets from the round-robin tournament.

Cells J14 and H15 show the average profits of 134.0 for the first subject.

For the next subject, I can proceed in the same way: Copy cells of A16:G16 to cells K14:Q14. Then I get the average profits (cell J14) and copy it to cell H16. The same steps go through until last subject (in this case, line 174). I collect the result and copy it another cells (for example, cell A177). Then I get one result by sorting with profits.

Deleting student ID and sorting with average profits, I obtain the strategies. In the Appendix C, strategies for 160 students are tabulated.

I make these processes using Excel's Macro which is written in the Appendix B.

6 Summary of Round Robin Experiment

From appendix C, I reproduce (in part) strategies sorted by average profits in the top twenties in Table 9.

It is very suggestive that best strategy is a repetition of quantity (12) in Cournot equilibrium. You may check that better strategies are not deviate from the Cournot-Nash equilibrium largely (see Appendix C).

I make regression of average profits with quantity deviation from Cournot equilibrium because this deviation would be a proxy for divergence from the Cournot-Nash equilibrium. The following results are obtained with 1% significant.[18]

$$profits = 141.6756 - 1.05164\ dev \qquad (10)$$

$$(1542.275)(-115.684)$$

where, the number in parenthesis shows the student's t.

[18] I use the "regression" of Excel's tool for analysis.

Table 9: strategies sorted by average profits in the top twenties(in part)

Round-robin tournament		period 1	period 2	period 3	period 4	period 5	period 6	Deviation from Cournot equilibrium	
Average profit	Rank	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	variation	Standard deviation
141.5	1	12	12	12	12	12	12	0.00	0.00
141.4	2	13	12	12	12	11	11	0.50	0.71
141.3	3	11	12	12	12	12	12	0.17	0.41
141.1	4	12	12	12	12	11	13	0.33	0.58
140.4	5	12	13	14	11	13	12	1.17	1.08
140.2	6	11	12	12	12	11	14	1.00	1.00
140.1	7	14	13	10	12	11	11	1.83	1.35
139.9	8	12	10	12	13	13	13	1.17	1.08
139.8	9	13	12	10	14	11	12	1.67	1.29
139.8	10	12	13	11	12	10	14	1.67	1.29
139.7	11	11	11	10	13	11	13	1.50	1.22
139.4	12	13	14	12	14	13	13	1.83	1.35
139.4	13	13	12	14	13	14	13	1.83	1.35
139.4	14	10	12	13	13	12	14	1.67	1.29
139.3	15	13	13	11	14	12	14	1.83	1.35
139.3	16	10	12	11	9	12	11	2.50	1.58
139.2	17	15	12	10	13	11	12	2.50	1.58
139.1	18	12	13	11	15	11	13	2.17	1.47
139.0	19	11	12	15	10	12	13	2.50	1.58
139.0	20	12	11	10	14	10	13	2.33	1.53

where, quantity in the Cournot-Nash equilibrium is 12(=36/3).

Table 10: Result of experimental performance

Maximum of average profits	141.5
Minimum of average profits	113.4
Average profits of all subjects	132.8
Standard Deviation of all subjects	5.88

Table 11: Regression for profits with quantity deviation from the Cournot equilibrium

Regression statistics	
Multiple correlation R	0.994149
R^2	0.988332
Adjusted R^2	0.988258
Standard error	0.637413
Samples	160

7 Concluding remarks

I use the in-class experimental data of Cournot duopoly game and run the virtual round-robin tournament for 160 students' data using MS Excel's Macro. You can expect that these experiments are less time consuming and good performance.

It is estimated that subjects who chose quantity of Cournot outcome could not be defeated largely and ranked top twenties in the large population.

It is desirable that I, experimenter, should let them to choose carefully quantities in the Cournot duopoly game because these data may be used in a round-robin tournament in the future.[19] What and how to play subjects do if they know the final period of game in advance?

[19]In fact, I conducted under these conditions in my undergraduate class of Industrial Organization in 2002 academic year in which the rewards are given 30 % in the pairwise result and 70 % in the round-robin tournament. These results will be reported in another paper.

References

[1] Bodo, Peter,"In-class Simulations of the Iterated Prisoner's Dilemma Game," *The Journal of Economic Education*, Vol.33, No.3 (Summer 2002), pp.207-216.

[2] "Classroom EXPERNOMICS",
URL: http://www.marietta.edu/ delemeeg/expernom.html

[3] Delemeester, Greg and Jurgen Brauer,"Games Economists Play: Non-Computerized Classroom Games for College Economics," 2000.
URL: http://www.marietta.edu/ delemeeg/games/

[4] Fouraker, Lawrence K.,and Sidney Siegel, *Bargaining behavior*, New York: McGraw-Hill, 1963.

[5] Hemenway, David, Robert Moore, and James Whitney,"The Oligopoly Game," *Economic Inquiry*, Vol.25 (Oct. 1987), pp.727-730.

[6] Holt, Charles A.,"Industrial Organization: A Survey of Laboratory Research," in John H. Kagel and Alvin E. Roth (editors),*The Handbook of Experimental Economics*, Princeton U.P., 1995, pp.349-443.

[7] Holt, Charles A. and Monica Capra,"Classrooom Games: A Prisoner's Dilemma," *Journal of Economic Education*, Vol.31, No.3 (Summer 2000), pp.229-236.

[8] Poundstone, William, *Prisoner's Dilemma: Johann von Neumann, Game Theory, and the Puzzle of the Bomb*, New York: Bantam Doubleday Dell Publishing Group, Inc. (1992); Oxford: Oxford U.P., 1993.

[9] Rubinstein, Ariel,"Experience from A Course in Game Theory: Pre and Post-Class Problem Sets as a Didactic Device," *Games and Economic Behavior*, Vol.28 (1999), pp.155 -170.
URL: http://www.princeton.edu/ ariel/99/gt100.html

[10] Shy, Oz, *Industrial Organization Theory and Applications*, The MIT Press, 1996. Fifth Printing in 2000.

[11] Uzawa, Masaru, "Looking at the Cournot-Nash Equilibrium by using MATHEMATICA Graphics — You can choose any value of parameters in the Cournot model —," in Uzawa (ed.), Research report of Grant-in-Aid for Scientific Research: Basic Research (C(2) #10630001), *CAL(Computer Assisted Learning) in Economics Programs and Experimental Economics*(FY 1998-1999), pp.147-173.

Appendices

A Payoff matrices and a student reporting sheet

When firm 1 produces 7 units of quantity and firm 2 produces 19 units of quantity, firm 1 gets 70 units of profit and firm 2 gets 190 units of profit. In the same way, when firm 1 produces 19 units of quantity and firm 2 produces 8 units of quantity, firm 1 gets 171 units of profit and firm 2 gets 72 units of profit.

Table 12: Profit Table for firm 1

		Firm 1's quantity												
		7	8	9	10	11	12	13	14	15	16	17	18	19
Firm2's quantity	19	70	72	72	70	66	60	52	42	30	16	0	-18	-38
	18	77	80	81	80	77	72	65	56	45	32	17	0	-19
	17	84	88	90	90	88	84	78	70	60	48	34	18	0
	16	91	96	99	100	99	96	91	84	75	64	51	36	19
	15	98	104	108	110	110	108	104	98	90	80	68	54	38
	14	105	112	117	120	121	120	117	112	105	96	85	72	57
	13	112	120	126	130	132	132	130	126	120	112	102	90	76
	12	119	128	135	140	143	144	143	140	135	128	119	108	95
	11	126	136	144	150	154	156	156	154	150	144	136	126	114
	10	133	144	153	160	165	168	169	168	165	160	153	144	133
	9	140	152	162	170	176	180	182	182	180	176	170	162	152
	8	147	160	171	180	187	192	195	196	195	192	187	180	171
	7	154	168	180	190	198	204	208	210	210	208	204	198	190

Table 13: Profit Table for firm 2

		Firm 1's quantity												
		7	8	9	10	11	12	13	14	15	16	17	18	19
Firm2's quantity	19	190	171	152	133	114	95	76	57	38	19	0	-19	-38
	18	198	180	162	144	126	108	90	72	54	36	18	0	-18
	17	204	187	170	153	136	119	102	85	68	51	34	17	0
	16	208	192	176	160	144	128	112	96	80	64	48	32	16
	15	210	195	180	165	150	135	120	105	90	75	60	45	30
	14	210	196	182	168	154	140	126	112	98	84	70	56	42
	13	208	195	182	169	156	143	130	117	104	91	78	65	52
	12	204	192	180	168	156	144	132	120	108	96	84	72	60
	11	198	187	176	165	154	143	132	121	110	99	88	77	66
	10	190	180	170	160	150	140	130	120	110	100	90	80	70
	9	180	171	162	153	144	135	126	117	108	99	90	81	72
	8	168	160	152	144	136	128	120	112	104	96	88	80	72
	7	154	147	140	133	126	119	112	105	98	91	84	77	70

This is a student report sheet

Caution:
Please make pairs.

Please determine who plays as Firm 1 and who plays as Firm 2. For example, you play as Firm 2 while your partner or opponent plays as Firm 1.
Do not consult with each other while making decision.
Extra points are added to your grade evaluation according to your performance.
Please write down 3 digits number of student's ID. Your student ID ( )
Player as Firm 1 ( ) Name ( )
Player as Firm 2 ( )

Table 14: A report sheet

	(Firm #)	(Firm #)	(Firm #)	(Firm #)	(Firm #)	(Firm #)
	Your Quantity	Partner's Quantity	Your profit	Your cumulative profit	Partner's profit	Partner's cumulative profit
period 1						
period 2						
period 3						
period 4						
period 5						
period 6						

How do you determine your number of quantity? Please write down your ideas in your (possibly, reverse side of) sheet when you make decision.

B Excel's Macro

```
'saved as "macro-round_robin.txt" on December 8, 2001 by uzawa


Sub round_robin()
'
' round_robin -2 Macro
' revised as " round_robin -2" on August 11, 2001
' saved as " round_robin " on August 10, 2001
' coded on: 2001-8-10  by uzawa
'
' Keyboard Shortcut: Ctrl+a
'
'exert a round_robin experiment

For i = 1 To 160
    Range(Cells(15 + i - 1, 1), Cells(15 + i - 1, 7)).Select
    Application.CutCopyMode = False
    Selection.Copy
    Range("K14").Select
    ActiveSheet.Paste
    Range("J14").Select
    Application.CutCopyMode = False
    Selection.Copy
    Range(Cells(15 + i - 1, 8), Cells(15 + i - 1, 8)).Select
    Selection.PasteSpecial Paste:=xlValues, Operation:=xlNone, SkipBlanks:= _
        False, Transpose:=False
Next i
'
'copy the results and sort them by average profits
    Range("A12:H14").Select
    Selection.Copy
    Range("A177").Select
    ActiveSheet.Paste
    Range("A15:H174").Select
    Application.CutCopyMode = False
    Selection.Copy
    Range("A180").Select
    ActiveSheet.Paste
    Application.CutCopyMode = False
    Selection.Sort Key1:=Range("H180"), Order1:=xlDescending, OrderCustom:=1, _
    MatchCase:=False, Orientation:=xlTopToBottom, _
        SortMethod:=xlPinYin
```

```
'
'delete student's ID and show the strategies after sorting by average profit
    Range("B177:G339").Select
    Selection.Copy

    Range("L177").Select
    ActiveSheet.Paste
    Range("K179").Select
    Application.CutCopyMode = False
    ActiveCell.FormulaR1C1 = "order"
    ActiveCell.Characters(1, 2).PhoneticCharacters = "order"
    Range("K180").Select
    ActiveCell.FormulaR1C1 = "1"
    Range("K180").Select
    Selection.DataSeries Rowcol:=xlColumns, Type:=xlLinear, Date:=xlDay, _
        Step:=1, Stop:=160, Trend:=False
    Range("H177:H339").Select
    Selection.Copy
    Range("J177").Select
    ActiveSheet.Paste
    Range("I177").Select
    Application.CutCopyMode = False
End Sub
```

C Strategies in tabular form by sorting with average profits

Table 15: Strategies in tabular form by sorting with average profits

Round-robin tournament		period 1	period 2	period 3	period 4	period 5	period 6	Deviation from Cournot equilibrium	
Average profit	Rank	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	variation	Standard deviation
141.5	1	12	12	12	12	12	12	0.00	0.00
141.4	2	13	12	12	12	11	11	0.50	0.71
141.3	3	11	12	12	12	12	12	0.17	0.41
141.1	4	12	12	12	12	11	13	0.33	0.58
140.4	5	12	13	14	11	13	12	1.17	1.08
140.2	6	11	12	12	12	11	14	1.00	1.00
140.1	7	14	13	10	12	11	11	1.83	1.35
139.9	8	12	10	12	13	13	13	1.17	1.08
139.8	9	13	12	10	14	11	12	1.67	1.29
139.8	10	12	13	11	12	10	14	1.67	1.29
139.7	11	11	11	10	13	11	13	1.50	1.22
139.4	12	13	14	12	14	13	13	1.83	1.35
139.4	13	13	12	14	13	14	13	1.83	1.35
139.4	14	10	12	13	13	12	14	1.67	1.29
139.3	15	13	13	11	14	12	14	1.83	1.35
139.3	16	10	12	11	9	12	11	2.50	1.58
139.2	17	15	12	10	13	11	12	2.50	1.58
139.1	18	12	13	11	15	11	13	2.17	1.47
139.0	19	11	12	15	10	12	13	2.50	1.58
139.0	20	12	11	10	14	10	13	2.33	1.53
138.7	21	10	12	14	14	13	10	2.83	1.68
138.6	22	11	15	14	13	10	11	3.33	1.83
138.6	23	14	15	11	10	12	13	3.17	1.78
138.5	24	13	12	15	11	10	14	3.17	1.78
138.4	25	13	10	12	13	11	15	2.67	1.63
138.3	26	12	14	13	10	12	15	3.00	1.73
138.3	27	14	9	10	11	13	12	3.17	1.78
138.3	28	13	13	12	13	15	14	2.67	1.63
138.2	29	13	12	10	9	9	12	3.83	1.96
138.1	30	14	13	14	12	15	10	3.67	1.91
138.0	31	11	14	9	12	14	10	3.67	1.91
137.9	32	10	13	15	9	12	11	40.00	2.00
137.8	33	14	13	13	15	14	13	3.33	1.83
137.8	34	13	11	14	8	10	11	4.50	2.12
137.7	35	10	13	12	15	14	10	3.67	1.91
137.6	36	9	10	11	12	13	14	3.17	1.78
137.5	37	12	10	13	10	8	13	4.33	2.08
137.5	38	12	10	10	11	10	8	4.83	2.20
137.4	39	9	9	10	11	12	12	3.83	1.96
137.4	40	12	13	11	15	15	13	3.50	1.87

Table 16: Strategies in tabular form by sorting with average profits (Continued)

Round-robin tournament		period 1	period 2	period 3	period 4	period 5	period 6	Deviation from Cournot equilibrium	
Average profit	Rank	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	variation	Standard deviation
137.3	41	10	12	11	14	10	15	3.67	1.91
137.2	42	12	13	14	9	8	11	5.17	2.27
137.2	43	10	10	10	10	9	13	4.33	2.08
137.1	44	13	15	14	15	13	10	4.67	2.16
137.1	45	13	13	14	12	13	16	3.83	1.96
136.8	46	12	10	16	14	13	10	4.83	2.20
136.7	47	13	12	14	11	16	14	4.33	2.08
136.6	48	9	9	10	10	12	13	4.50	2.12
136.6	49	15	10	14	11	15	13	4.67	2.16
136.4	50	12	16	15	14	11	13	5.17	2.27
136.4	51	12	15	10	9	15	11	5.33	2.31
136.3	52	12	15	11	14	14	15	4.50	2.12
136.3	53	11	13	10	12	14	16	4.33	2.08
136.2	54	13	12	12	12	13	17	4.50	2.12
136.0	55	9	12	10	11	16	12	5.00	2.24
135.9	56	10	9	12	8	10	10	6.17	2.48
135.8	57	9	11	10	13	14	15	4.67	2.16
135.7	58	8	9	11	12	11	9	6.00	2.45
135.7	59	14	16	13	15	12	14	5.67	2.38
135.6	60	10	9	10	9	10	9	6.50	2.55
135.5	61	11	10	11	8	10	8	7.00	2.65
135.4	62	11	13	9	12	14	7	6.67	2.58
135.4	63	12	14	15	16	14	10	6.17	2.48
135.4	64	17	15	13	14	12	11	6.67	2.58
135.3	65	8	11	12	13	14	15	5.17	2.27
135.3	66	14	11	13	9	16	14	5.83	2.42
135.2	67	13	11	14	16	10	15	5.83	2.42
135.2	68	14	7	12	13	14	13	5.83	2.42
135.1	69	10	12	12	7	15	12	6.33	2.52
134.9	70	14	10	16	8	11	13	7.00	2.65
134.9	71	10	8	13	11	15	9	6.67	2.58
134.7	72	11	10	13	12	7	15	6.67	2.58
134.6	73	11	9	7	12	10	13	6.67	2.58
134.5	74	11	10	12	7	13	8	7.83	2.80
134.3	75	14	14	15	12	7	14	7.67	2.77
134.3	76	9	9	9	8	12	11	7.33	2.71
134.1	77	17	13	10	15	12	14	7.17	2.68
134.0	78	10	11	9	13	7	14	7.33	2.71
134.0	79	11	15	12	13	17	14	6.67	2.58
134.0	80	9	13	15	11	14	7	8.17	2.86

Table 17: Strategies in tabular form by sorting with average profits (Continued)

Round-robin tournament		period 1	period 2	period 3	period 4	period 5	period 6	Deviation from Cournot equilibrium	
Average profit	Rank	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	variation	Standard deviation
134.0	81	10	10	7	9	11	13	7.33	2.71
133.6	82	15	14	12	17	9	10	8.50	2.92
133.5	83	14	7	12	10	8	13	8.33	2.89
133.4	84	10	13	16	9	12	7	9.17	3.03
133.4	85	10	9	13	17	11	14	7.33	2.71
133.4	86	8	11	12	10	9	7	9.17	3.03
133.3	87	15	12	14	9	17	13	8.00	2.83
133.2	88	14	7	10	11	8	13	8.50	2.92
133.2	89	9	9	9	9	9	9	9.00	3.00
133.1	90	15	10	9	11	17	12	8.00	2.83
133.1	91	12	14	15	9	15	7	9.33	3.06
132.8	92	7	13	9	10	12	15	8.00	2.83
132.8	93	12	10	15	8	14	16	8.17	2.86
132.4	94	12	14	16	9	17	11	9.17	3.03
132.4	95	8	9	9	11	14	15	8.00	2.83
132.4	96	11	16	13	15	9	16	8.67	2.94
132.2	97	8	14	10	7	13	14	9.00	3.00
132.1	98	10	9	15	16	8	10	9.67	3.11
132.1	99	9	10	7	8	12	13	9.17	3.03
132.0	100	15	14	12	16	17	11	9.17	3.03
132.0	101	14	15	8	9	13	16	9.17	3.03
131.9	102	9	15	12	8	14	16	9.00	3.00
131.8	103	14	16	10	14	15	16	8.83	2.97
131.8	104	7	14	13	15	14	15	8.67	2.94
131.7	105	14	11	14	13	9	18	9.17	3.03
131.7	106	13	11	8	9	10	17	9.33	3.06
131.5	107	8	10	13	12	9	17	9.17	3.03
131.5	108	8	10	13	15	9	16	9.17	3.03
131.4	109	18	13	14	12	10	7	11.67	3.42
131.3	110	13	7	11	15	10	16	9.33	3.06
131.1	111	11	9	17	15	14	8	10.67	3.27
130.9	112	7	10	13	11	15	16	9.33	3.06
130.9	113	11	13	12	11	14	19	9.33	3.06
130.7	114	13	10	8	14	16	7	11.00	3.32
130.7	115	10	14	7	11	11	17	10.00	3.16
130.6	116	14	8	10	13	18	11	10.33	3.21
130.4	117	7	8	12	15	15	13	10.00	3.16
130.3	118	7	13	10	12	14	17	9.83	3.14
130.2	119	19	13	10	14	12	8	12.33	3.51
129.8	120	7	10	8	11	13	7	12.00	3.46

Table 18: Strategies in tabular form by sorting with average profits (Continued)

Round-robin tournament		period 1	period 2	period 3	period 4	period 5	period 6	Deviation from Cournot equilibrium	
Average profit	Rank	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity	variation	Standard deviation
129.8	121	7	11	16	8	15	13	11.33	3.37
129.6	122	8	17	16	11	10	8	13.00	3.61
129.2	123	15	9	9	17	8	14	12.00	3.46
129.1	124	7	15	14	11	14	17	11.33	3.37
129.0	125	11	12	10	8	19	13	11.83	3.44
128.9	126	9	8	7	10	8	9	13.17	3.63
128.8	127	13	15	17	7	11	16	12.83	3.58
128.8	128	15	18	9	10	13	7	14.00	3.74
128.7	129	11	14	7	17	9	15	12.17	3.49
128.4	130	12	8	10	14	15	18	11.50	3.39
127.7	131	9	16	9	8	7	8	15.17	3.89
127.3	132	13	8	17	18	14	11	13.83	3.72
127.2	133	13	12	16	14	19	15	13.17	3.63
127.0	134	14	19	8	12	16	13	14.33	3.79
126.9	135	14	9	13	16	11	19	13.33	3.65
126.7	136	15	12	8	19	15	10	14.50	3.81
126.4	137	14	7	9	12	18	15	13.83	3.72
125.9	138	9	8	15	19	12	14	14.50	3.81
125.9	139	8	11	9	15	19	10	14.67	3.83
125.7	140	15	8	15	18	10	16	15.00	3.87
125.7	141	7	11	18	14	9	16	15.17	3.89
125.4	142	13	15	10	18	10	18	15.00	3.87
125.3	143	15	10	7	18	11	16	15.17	3.89
124.4	144	11	11	10	7	19	16	16.00	4.00
124.2	145	9	10	15	18	7	16	16.50	4.06
124.1	146	10	8	13	16	7	18	16.33	4.04
123.3	147	7	13	9	18	17	9	17.50	4.18
122.8	148	19	7	10	14	16	8	19.00	4.36
122.7	149	10	15	7	16	11	19	17.33	4.16
122.7	150	15	16	10	19	17	14	17.83	4.22
122.4	151	9	8	8	8	11	19	17.83	4.22
122.4	152	19	8	14	17	16	13	18.50	4.30
121.8	153	12	8	15	7	17	18	18.50	4.30
120.9	154	10	19	16	13	19	13	20.00	4.47
120.6	155	7	12	8	19	12	17	19.17	4.38
117.6	156	18	13	15	19	16	17	22.67	4.76
115.6	157	10	7	17	19	16	17	24.00	4.90
115.6	158	13	18	14	19	19	15	24.67	4.97
113.5	159	7	11	7	14	19	19	25.50	5.05
113.4	160	14	15	19	12	19	19	26.67	5.16

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