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Conditional and unconditional bidding in takeovers: experimental evidence

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Abstract. The objective of this paper is to use laboratory experiments to test the dynamic theory of free riding among the target shareholders during a takeover attempt. We construct our experiments to reflect the dynamics of unconditional bidding suggested by Harrington and Prokop (1993) and the dynamics of conditional bidding analyzed by Prokop (2003). The experimental results show that the observed tendering probabilities are higher than the theoretically predicted values in the case of unconditional bidding. Thus the actual behavior of shareholders is characterized by much less free riding than predicted by the theory of unconditional tender offers. In the case of conditional offers, the theoretical predictions for the tendering probabilities are confirmed by the laboratory behavior of shareholders in the case of multiple bidding. As suggested by the theory, the tendering probabilities are lower under multiple conditional bids than under unconditional offers.

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INTRODUCTION

Theoretical analysis of corporate takeovers leads to the conclusion that the net profits of raiders are negligible in comparison to the large benefits of the target shareholders. This result is primarily attributed to the free-rider problem among the current shareholders of the takeover target. The initial formal consideration of the problem was provided by Grossman and Hart (1980). Under the assumption of "atomistic" shareholders, they showed that the free riding makes a takeover attempt unprofitable. Bagnoli and Lipman (1988) arrived at a slightly less extreme conclusion by analyzing the behavior of a finite number of target shareholders. However, both of the above models were based on a strong assumption that the raider places

only a single bid to acquire the target company; for a review of research on takeovers see, for example, Tirole (2006, pp. 425-443).

In practice, we observe several bids made by the same raider in a typical takeover attempt. For example, Franks and Harris (1989) identified a significant number of U.K. acquisitions that involved revised bids, which benefited the target shareholders' returns. Bradley et al. (1988) found a similar regularity in the case of U.S. takeovers.

The dynamic framework for the analysis of the free-rider problem was first developed by Harrington and Prokop (1993). They showed that the raider's opportunity to place multiple unconditional bids intensifies the shareholders' incentives to free ride, and significantly reduces the raider's profit in comparison to the predictions of the static theories. Similar results were obtained by Prokop (2003) in the dynamic model of conditional tender offers: even a company owned by a relatively small number of shareholders may not be profitably acquired by the raider.

The objective of this paper is to use laboratory experiments to test the dynamic theory of free riding among the target shareholders during a takeover attempt. In related papers, Kale and Noe (1997) and Hamaguchi et al. (2003) provide experimental testing of the free-rider problem, but they focus on the static approach to the hostile takeovers. In the current paper, we construct our experiments to reflect the dynamics of unconditional bidding suggested by Harrington and Prokop (1993) and the dynamics of conditional bidding analyzed by Prokop (2003).

The remainder of this paper is organized as follows. In the next section, the dynamic model of a takeover attempt is described, and the theoretical predictions are formulated. The following section presents the experimental design. Afterwards, the results of experiments are reported and discussed. A summary and concluding remarks are in the last section.

DYNAMIC MODEL OF TAKEOVER

Consider a firm owned by N shareholders. Each of them holds exactly one share with current market value normalized to 0. A single raider knows how to increase the firm's value to \$1 per share. For the takeover to be successful, the raider must acquire at least 50 percent of existing shares.

The takeover process is modeled as a repeated game with infinite horizon. In the first period, the raider starts bidding for shares. The tender offer could be either unconditional, or conditional. By placing an unconditional bid, the raider stands ready to buy any number of tendered shares at the quoted price. By making a conditional bid, the raider is willing to buy any number of tendered shares at the offered price as long as at least 50 percent of shares are submitted. Given the tender offer, the shareholders simultaneously and independently decide whether to tender their shares. As soon as the raider acquires the minimum amount of shares necessary to take control of the company, the game ends with the payoff of \$1 per share to all remaining shareholders (including the raider). Should the number of tendered shares be not enough to take over the firm, the same game is played in the next period. Shareholders and the raider are assumed to be risk neutral with the common discount factor $\delta \in [0, 1)$.

Harrington and Prokop (1993) used the concept of symmetric Markov perfect equilibrium to solve the repeated takeover game with an unconditional bidding process. Table 1 shows the numerical results of the theoretical model for N=10 shareholders and the discount factor δ=0.9.

Table 1

Unconditional bidding: symmetric Markov perfect equilibrium for δ = 0.9

m	p_m^*	r_m^*
0	0.447	0.929
1	0.470	0.953
2	0.481	0.973
3	0.488	0.987
4	0.492	0.997

δ – discount factor of the raider and shareholders

m – number of shares held by the raider

p_m^* – probability of a shareholder tendering his share when the raider has m shares

r_m^* – tender offer when the raider has m shares

Source: based on Harrington and Prokop (1993, p. 859).

Table 2 contains the numerical results of the unconditional bidding model when there are N=10 shareholders and the raider can only make one tender offer, i.e. δ=0.

Table 2

Symmetric equilibrium in a static model of unconditional bidding for δ = 0

p_u^*	r_u^*
0.500	0.500

δ – discount factor of the raider and shareholders

p_u^* – probability of a shareholder tendering his share when the bid is unconditional

r_u^* – tender offer (shareholder's payoff) when the bid is unconditional

Source: based on Harrington and Prokop (1993, p. 867).

Prokop (2003) considered an equivalent concept of equilibrium to solve the dynamic model of conditional bidding. The numerical results of the theoretical model for N=10 are presented in Table 3.

Table 3

Conditional bidding: symmetric Markov perfect equilibrium

δ	p_c^*	r_c^*
0	0.500	0.670
0.9	0.364	0.804

δ – discount factor of the raider and shareholders

p_c^* – probability of a shareholder tendering his share when the bid is conditional

– tender offer when the bid is conditional

Source: based on Prokop (2003, p. 131).

The above theoretical predictions based on the dynamic framework developed by Harrington and Prokop (1993) and Prokop (2003) were used in our laboratory experiments.

EXPERIMENTAL SETTING

The experiments were conducted in groups of undergraduate economics students attending the Warsaw School of Economics. Each of 80 participants was randomly assigned to one of the eight groups, each consisting of ten people. The subjects were told that the composition of their groups would remain unchanged till the end of the experiment. The identity of the other group members was not revealed to the participant.

At the start of experimental procedure, participants were told that the purpose of the experiment was to test theories of corporate takeovers. The subjects were also told that they would earn actual payoffs in Polish zlotys based on their performance. At the end of the experiment the amount of 1000 Polish zlotys (approx. $300) was divided up among the participants proportionally to their total payoffs.

Next, the experimenter gave a detailed explanation of the decisions that the participants had to make in each experimental treatment (for the exact explanation given to the subjects in the first treatment see Appendix 1). All groups followed four sequential treatments:

(1) unconditional offers with a common discount factor of $\delta = 0.9$,
(2) unconditional offers with a common discount factor of $\delta = 0$,
(3) conditional offers with a common discount factor of $\delta = 0.9$, and
(4) conditional offers with a common discount factor of $\delta = 0$.

In the first treatment (unconditional offers with a common discount factor of $\delta = 0.9$), the subjects were told that each of them is a shareholder of a company. The identity of the other shareholders was not revealed to the participant. Each of eight companies is owned by 10 shareholders, each of whom holds exactly one share. There is a single raider who has proprietary knowledge as to how to increase the value of the company. In order for the raider to obtain this increased value of the given company, he must own at least 5 shares (50 percent of shares is the takeover rule).

The participants were then informed that a bid of Z Polish zlotys (the subjects were told that the value of a tender offer ranges from 0 to 100) would be made to all shareholders and that each of them can either accept (decision A) or reject (decision R) the bid. The subsequent payoffs were described as follows:

a) if the shareholder rejected the tender offer and at least 50 percent of the shareholders of the given company accepted the bid, the participant payoff would be maximal, i.e., 100 Polish zlotys;
b) if the shareholder rejected the tender offer and so did the majority of shareholders of the given company, the participant payoff would be minimal, i.e., 0 Polish zlotys;
c) if the shareholder accepted the tender offer, the payoff would be Z Polish zlotys regardless of the other shareholders' decisions.

Table 4 summarizes the shareholder's payoff structure in a single round of the first experimental treatment.

The subjects were also informed that in the case of unsuccessful takeover attempt following the first bid, the raider with probability 0.9 (the value of a common discount factor in this treatment) would make a new offer to the shareholders that rejected the previous offer and with probability 0.1 would leave the market (no future offers occur). The monetary values of bids (known *ex ante* to the experimenter and not to the subjects) were based on the theoretical tender offers given in Table 1. The subsequent bids dependent on the number of shares of the given company collected by the raider are summarizes in Table 5.

Table 4

The shareholder's payoff structure in a single round: unconditional offers' treatment.

Shareholder's decision	At least 50 percent of the shareholders made decision A	Shareholder's payoff (in Polish zlotys)
A	Yes	Z
A	No	Z
R	Yes	100
R	No	0

Source: own development.

Table 5

The monetary values of subsequent offers in unconditional bidding with a common discount factor of $\delta = 0.9$

m	Tender offer (in Polish zlotys)
0	92.9
1	95.3
2	97.3
3	98.7
4	99.7

δ – discount factor of the raider and shareholders

m – number of shares held by the raider

Source: based on Table 1.

To facilitate recall, the payoff matrix (with the appropriate Z value; see Table 4) was displayed during the entire course of each round. At the completion of each round the outcome of the takeover attempt was communicated to each of the shareholders' group. If some firms remained unsold, the draw took place (with probability 0.9 the raider returned and made a new offer, and with probability 0.1 the raider discontinued bidding). The participants were supplied with the individual record cards where they could write down their decisions in each applicable round. In order to ensure confidentiality in the communication of the subject's decision, each participant was given a private code, known only to the subject and to the experimenter.

The difference between the first and the second treatment was in the value of a common discount factor. In the second treatment, the subjects were told that the raider would make only a single tender offer. At the completion of the first round the raider leaves the market permanently. The payoff structure for the second treatment was the same as in the first one (see Table 4). The value of the single tender offer was based on the theoretical amount shown in Table 2. For 10 shareholders of the given firm and a common discount factor of $\delta = 0$, the tender offer amounted to 50 (Polish zlotys).

The third and fourth treatments dealt with conditional tender offers (the difference between conditional and unconditional bidding was explained to participants in detail). The payoff structure under this setup was as follows:

a) if the shareholder rejected the offer and at least 50 percent of the shareholders of the given company accepted the offer, the participant payoff would be maximal, i.e. 100 Polish zlotys;

b) if the shareholder rejected the offer and so did the majority of shareholders of the given company, the participant payoff would be minimal, i.e. 0 Polish zlotys;
c) if the shareholder accepted the offer and at least 50 percent of the shareholders of the given company accepted the offer, the participant payoff would be Z Polish zlotys;
d) if the shareholder accepted the offer and the majority of shareholders of the given company rejected the offer, the participant payoff would be 0.

Table 6 summarizes the shareholder's payoff structure in a single round of a conditional offers' treatment.

Table 6

The shareholder's payoff structure in a single round: conditional offers' treatment

Shareholder's decision	At least 50 percent of the shareholders made decision A	Shareholder's payoff (in Polish zlotys)
A	Yes	Z
A	No	0
R	Yes	100
R	No	0

Source: own development.

The third experimental treatment tested dynamic model of a takeover in conditional bidding case. The subjects were informed that in the case of an unsuccessful takeover attempt following the first tender offer, the raider would continue bidding with probability 0.9 (the value of a common discount factor in this treatment) and with probability 0.1 would leave the market (no future offers occur). The values of the bids (known *ex ante* to the experimenter and not to the subjects) were based on the numerical results of the theoretical analysis presented in Table 3. For 10 shareholders of the given firm and a common discount factor of $\delta = 0.9$, the value of the tender offer was 80.4 (Polish zlotys) for all applicable rounds.

The difference between the third and the fourth treatment was in the value of a common discount factor. In the fourth treatment, the subjects were told that the raider would place only a single conditional tender offer. At the completion of the first round the raider leaves the market permanently. The payoff structure for the fourth treatment was the same as in the third one (see Table 6). The value of the single tender offer was based on the numerical results of the theoretical model shown in Table 3. For 10 shareholders of the given firm and a common discount factor of $\delta = 0$, we posted the takeover bid at 67 (Polish zlotys).

The entire experiment lasted approximately 90 minutes, of which the first 15 minutes were spent describing the rules, the payoffs, and the procedures to be followed.

EXPERIMENTAL RESULTS

The experimental outcomes (concerning decisions of all subjects and the following payoffs) are presented in the Appendix 2.

In the first experimental treatment (unconditional tender offers with a common discount factor of $\delta = 0.9$), all eight firms were taken over by the raider. Seven out of eight firms (except firm 7) were acquired in the first round (following the first tender offer). Firm 7 was taken over in the second round, which resulted in a slightly higher payoffs for some shareholders of the firm 7 (compare Appendix 2), since the second tender offer was higher than the previous one.

A summary of the results of the first experimental treatment are given in the Table 8. Fifty six shareholders (out of 80 in total) accepted the first tender offer made by the bidder, which can be translated into the observed probability of tendering a share under unconditional bidding (for $\delta = 0.9$) equal to 0.7. This probability is higher than the theoretical prediction of 0.447 (compare Table 1), which may suggest that there is much less free riding among shareholders than forecasted by the theory.

When the raider was in the possession of 4 out of 10 shares (second round), the experimental probability of a shareholder tendering was only 0.333, which is smaller than the theoretically calculated value. However, this result is based on one observation only, so additional experimentation will be needed to test the behavior of shareholders when the number of shares in the possession of the raider increases.

Table 8

Experimental outcomes for the first treatment

Company	Number of A decisions in the first round	Number of A decisions in the second round	Takeover success
1	8	N/A	Yes
2	6	N/A	Yes
3	7	N/A	Yes
4	9	N/A	Yes
5	8	N/A	Yes
6	6	N/A	Yes
7	4	2	Yes
8	8	N/A	Yes
Total	56	2	
Probability of tendering	56/80 (0.700)	2/6 (0.333)	

Source: own development.

In the second experimental treatment (unconditional tender offers with a common discount factor of zero) all eight firms were taken over by the raider (see Table 9). Sixty seven shareholders (out of 80 in total) decided to sell their shares. It means that the observed probability of tendering a share under unconditional bidding in a single-bid case is 0.8375. This probability is higher than the value of 0.5 predicted by the theory (compare Table 2). Thus, we may conjecture that also the static model of unconditional bidding predicts too much free riding among the shareholders in comparison to the experimental results.

Table 9

Experimental outcomes for the second treatment.

Company	Number of A decisions	Takeover success
1	2	3
1	9	Yes
2	8	Yes
3	9	Yes
4	10	Yes
5	8	Yes

1	2	3
6	7	Yes
7	7	Yes
8	9	Yes
Total	67	
Probability of tendering	67/80 (0.8375)	

Source: own development.

Comparing the experimental probability of tendering in the case of a single unconditional bid (0.8375) to the experimental probability of tendering when multiple unconditional bidding is expected (0.700), we may conjecture that the possibility for the raider to make many tender offers generates more free riding among the shareholders. Such prediction was made theoretically by Harrington and Prokop (1993).

In the third experimental treatment (conditional tender offers with a common discount factor of $\delta = 0.9$) only two firms (firm 6 and firm 8) were taken over by the raider (compare Table 10). Firm 6 was acquired in the first round and firm 8 in the second round. The raider made 5 tender offers and at the completion of 5th round the raider left the market permanently (the draw decided that the fifth round was the last one).

Table 10 summarizes the number of shares put up for sale by the shareholders in all consecutive rounds and the corresponding observed probabilities of tendering a share under the third experimental setup. The experimental probabilities of tendering in a given round varied between 0.1333 (in the 5th round) and 0.3857 (in the 2nd round). We shall compare these values to the theoretical prediction of 0.364 (see Table 3).

Table 10

Experimental outcomes for the third treatment

Company	Number of A decisions in the 1st round	Number of A decisions in the 2nd round	Number of A decisions in the 3rd round	Number of A decisions in the 4th round	Number of A decisions in the 5th round	Takeover success
1	4	4	3	2	2	No
2	3	4	4	3	2	No
3	2	2	1	1	1	No
4	4	2	0	0	0	No
5	3	4	3	1	1	No
6	6	N/A	N/A	N/A	N/A	Yes
7	3	3	4	3	2	No
8	4	8	N/A	N/A	N/A	Yes
Total	29	27	15	10	8	
Probability of tendering	29/80 (0.3625)	27/70 (0.3857)	15/60 (0.2500)	10/60 (0.1667)	8/60 (0.1333)	

Source: own development.

In the fourth experimental treatment (conditional tender offers with a common discount factor of zero) all eight firms were taken over by the raider (compare Table 11). Sixty two shareholders (out of 80 in total) decided to sell their shares. It means that the observed probability of tendering a share under conditional

bidding in a single-bid case was 0.775. This probability is higher than the theoretical prediction of 0.5 (compare Table 3), which suggests that the static model of conditional bidding overshoots the probability of shareholder's tendering.

Table 11

Experimental outcomes for the fourth treatment

Company	Number of A decisions	Takeover success
1	6	Yes
2	7	Yes
3	8	Yes
4	7	Yes
5	8	Yes
6	8	Yes
7	9	Yes
8	9	Yes
Total	62	
Probability of tendering	62/80 (0.775)	

Source: own development.

Now, we compare the experimental probability of tendering in the case of a single conditional bid (0.775) to the experimental probability of tendering when multiple conditional bidding is expected (0.1333-0.3857). Based on the above values, we may conjecture that the possibility for the raider to make many tender offers generates more free riding among the shareholders than when only a single offer is expected. Such prediction was made theoretically in a dynamic model of conditional bidding by Prokop (2003).

The maximal potential total payoff from the entire experiment was 400. However, the highest value of the total payoff earned by the participants was 392.9 (the result achieved by 3 subjects; compare Table 12). The highest empirical total payoff corresponds to strategy of accepting the raider's bid in the first experimental treatment and rejecting the raider's tender offers in the other treatments. The most common strategy adopted by the participants (chosen by more than 40 percent) was to accept the raider's tender offers in the first, second and fourth treatment and reject the bid in the third treatment. The most common strategy led to the lowest empirical total payoff.

Table 12

Participants' total payoffs and their frequencies

Total payoff	Number of observations	Frequency
1	2	3
392.9	3	0.0375
367.0	1	0.0125
317.0	2	0.025
300.0	4	0.05
297.4	3	0.0375
292.9	1	0.0125

290.3	11	0.1375
267.0	1	0.0125
262.3	1	0.0125
259.9	1	0.0125
250.0	2	0.025
242.9	5	0.0625
217.0	6	0.075
212.3	1	0.0125
209.9	34	0.425

Source: own development.

In order to compare the experimental outcomes to theoretical predictions, the Pearson's chi-square statistic (PCS) was used. In the test, the observed number of shares put up for sale and not put up for sale by the shareholders are compared to the theoretical values. The null hypothesis is that the shares are tendered according to the theoretical probabilities, which have been sourced from the works of Harrington and Prokop (1993) and Prokop (2003).

The values of the appropriate chi-square test statistics and following decisions concerning the null hypotheses are given in the Table 13. Critical values correspond to the significance level of 0.01. The null hypothesis was not rejected for the third experimental treatment (dynamic case of conditional bidding), but only for the first three rounds of the third treatment. In all other cases the null hypothesis was rejected. It is worth noticing that the dynamic model developed by Prokop (2003) almost flawlessly predicted the first-round probability of tendering a share under conditional bidding with a common discount factor of $\delta = 0.9$.

Table 13

Experimental results versus theoretical predictions

Treatment (Round)	Experimental probability	Theoretical probability	Number of submitted shares	Prediction of submitted shares	χ^2	Null hypothesis
1	0.7000	0.4470	56	36	20.2020	Rejected
2	0.8375	0.5000	67	40	36.4500	Rejected
3 (1)	0.3625	0.3640	29	29	0	Not rejected
3 (2)	0.3857	0.3640	27	25	0.2327	Not rejected
3 (3)	0.2500	0.3640	15	22	3.0721	Not rejected
3 (4)	0.1667	0.3640	10	22	9.0282	Rejected
3 (5)	0.1333	0.3640	8	22	12.2884	Rejected
4	0.7750	0.5000	62	40	24.2000	Rejected

Significance level: 0.01

Source: own calculations.

Next, the hypothesis that in the case of unconditional bidding the observed tendering probabilities are significantly higher than the theoretically predicted values was considered. The one-proportion significance test was used to check the validity of the above hypothesis. The values of the appropriate test statistics are given in the Table 14. The above hypothesis cannot be rejected on the basis of one-proportion significance tests at 0.01 level.

Table 14

Experimental results versus theoretical predictions – continued.

Treatment (Round)	Experimental probability	Theoretical probability	Number of submitted shares	Prediction of submitted shares	*U* (test statistic)	Null hypothesis
1	0.7000	0.4470	56	36	4.9381	Rejected
2	0.8375	0.5000	67	40	8.1828	Rejected

Significance level: 0.01

Source: own calculations.

Thus, there is no reason to reject our conjecture that when the tender offer is unconditional, we should observe much less free riding among shareholders than forecasted by the theoretical models.

The same statistical procedure was applied to the case of single conditional bidding. The value of *U* test statistic in this case was 5.8903, so at the significance level of 0.01 the null hypothesis should be rejected. It means that the hypothesis stating that in the case of a one-time conditional bidding the observed tendering probability is significantly higher than the theoretically predicted value cannot be rejected. Thus, when the raider is expected to place only a single conditional tender offer, in practice, we may expect less free riding than theoretically predicted.

Further, the hypothesis that the experimental probability of tendering is higher under multiple unconditional bidding than under multiple conditional offers was considered. The two-proportion significance test was used to check the validity of the above hypothesis. The values of the appropriate test statistics are given in the Table 15. The above hypothesis cannot be rejected on the basis of two-proportion significance tests at 0.01 level. Such property that the probabilities of tendering are lower under multiple conditional bidding than under multiple unconditional offers has been derived theoretically by Prokop (2003). Thus, the theory as well as the experiments show that the level of free riding is smaller under the multiple unconditional bids rather than under the repeated conditional tender offers.

Table 15

Multiple unconditional and conditional bidding – comparison of the observed probabilities.

Treatments	*U (test statistic)*	Null hypothesis
1 and 3(1)	4.2774	Rejected
1 and 3(2)	4.5885	Rejected
1 and 3(3)	6.5241	Rejected
1 and 3(4)	7.3872	Rejected
1 and 3(5)	7.7460	Rejected

Source: own calculations.

In addition, the hypothesis that in the case of single bids the experimental probabilities of tendering under unconditional and conditional settings do not differ was considered. Again, the two-proportion significance test was used to check its validity. The value of U test statistic in this case is 2.063. It means that the null hypothesis should be rejected at the significance level of 0.02. So, the hypothesis stating that in the case of single bids the experimental probabilities of tendering under unconditional and conditional set-

tings do not differ cannot be rejected. This result is in line with the basic theoretical predictions discussed by Holmström and Nalebuff (1992), and Prokop (2003). However, as mentioned above, the experimental probabilities of tendering are higher than the theoretically forecasted levels.

Next, our conjecture that the experimental probability of tendering in the case of a single unconditional bid is higher than the experimental probability of tendering when multiple unconditional bidding is expected was considered. The two-proportion significance test was used to check the validity of the above conjecture. The value of *U* test statistic in this case is 2.063. It means that the null hypothesis should be rejected at the significance level of 0.01. Thus the hypothesis stating that the experimental probability of tendering in the case of a single unconditional bid is higher than the experimental probability of tendering when multiple unconditional bidding is expected cannot be rejected.

Finally, the hypothesis that the experimental probability of tendering in the case of a single conditional bid is higher than the experimental probability of tendering when multiple conditional bidding is expected was taken into consideration. The two-proportion significance test was used to check the validity of the above hypothesis. The values of the appropriate test statistics are given in the Table 16. The null hypotheses should be rejected at the significance level of 0.01. It means that the hypothesis stating that the experimental probability of tendering in the case of a single conditional bid is higher than the experimental probability of tendering when multiple conditional bidding is expected cannot be rejected.

Table 16

Single and multiple conditional bidding – comparison of the observed probabilities.

Treatments	*U (test statistic)*	Null hypothesis
4 and 3(1)	5.2678	Rejected
4 and 3(2)	5.5693	Rejected
4 and 3(3)	7.4366	Rejected
4 and 3(4)	8.2633	Rejected
4 and 3(5)	8.6056	Rejected

Source: own calculations.

These results indicate that the dynamic theory provided by Harrington and Prokop (1993), and Prokop (2003) correctly predicted the increase in the free riding behavior among the target shareholders when the raider is expected to make multiple tender offers.

CONCLUSIONS

In this article, we provided the experimental testing of the dynamic models of takeover developed by Harrington and Prokop (1993), and Prokop (2003). Our experiments focused on the acquisition of companies held by 10 shareholders, each of whom possessed a single share. The comparison of the experimental results and the theoretical predictions of the models show that the observed tendering probabilities are significantly higher than the theoretically expected values in the case of unconditional bidding, no matter whether the raider makes multiple bids, or only a single bid. Thus the actual behavior of shareholders can be characterized by much less free riding than predicted by the theory of unconditional bidding.

In the case of conditional offers, the theoretical predictions for the probabilities of tendering shares are generally confirmed by the laboratory behavior of shareholders in the case of multiple bidding (when δ=0.9). Moreover, as suggested by the theoretical models, the probability of tendering are lower under multiple conditional bids than under unconditional offers. Thus, our experiments confirm that the free riding among the shareholders in the case of multiple conditional bids constitutes a serious problem.

However, in the case of a single conditional bid, the experimental probability of tendering turns out to be higher than the theoretical prediction. Moreover, when the raider is expected to make only a single bid, the shareholder's probability of tendering does not depend on whether the bid is conditional, or unconditional. Thus, similarly to the case of unconditional tender offers, when there is only a single conditional bid, we may expect much less free riding than predicted by the theoretical models.

Despite, a generally lower extent of free riding observed in our experiments, the theoretical predictions that the possibility of multiple tender offers increases the level of free riding among the target shareholders have been confirmed.

Clearly, further testing of the dynamic theory of takeovers is necessary. For example, the shareholders reaction to changes in the size of the raider's bid should be investigated. Again, the experimental methods could be used in the analysis of shareholders' behavior.

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APPENDIX 1.

Participant Instructions

You are about to participate in the experiment testing theories of corporate takeovers. The whole procedure consists of four games. In each game you will choose an action that together with the actions of the other students will generate the outcome and the following payoff. Your total payoff from the experiment will determine your actual payoff (winning) in Polish zlotys.

Students in class are divided into eight groups constituting companies. The composition of groups will be unchanged till the end of the experiment and the identity of the other groups members will be unknown to you. Each of eight companies is owned by 10 shareholders, each of whom holds exactly one share. There is a single raider who has proprietary knowledge as to how to increase the value of the each company. In order for the raider to take over the company and materialize this increased value, he must own at least 5 shares.

Here is what you will have to do in the first game. The game is divided into rounds. In each round you will be made an offer of Z Polish zlotys (Z ranges from 0 to 100) and you have to choose between two actions: accept or reject. Your payoffs from choosing an action are given in table (the appropriate table was projected in class). After the announcement of Z, you will have to decide quickly (in approximately 30 seconds) to either accept or reject the offer (write down your decision in the appropriate round using your individual record card). The payoffs are as follows:

a) if the shareholder rejected the offer and at least 50 percent of the shareholders of the given company accepted the offer, the participant payoff would be maximal, i.e. 100 Polish zlotys;
b) if the shareholder rejected the offer and so did the majority of shareholders of the given company, the participant payoff would be minimal, i.e. 0 Polish zlotys;
c) if the shareholder accepted the offer, the payoff would be Z Polish zlotys regardless of the other shareholders' decisions. Then the round terminates.

In case of unsuccessful takeover attempt following the first offer (and first round), the raider with probability 0.9 will make a new offer to the shareholders that rejected the previous offer and with probability 0.1 will leave the market (no future offers occur). The draw will decide whether there will be a new offer, or not.

Once the experiment begins, remember the following:

(1) Do not talk to others in the class.
(2) Do not reveal your decisions to others.
(3) Make sure that your private code does not become known to others in any way.
(4) Do not leave the room until the experiment is over.

APPENDIX 2

"Subject" column: the first number stands for the firm, the second number denotes the shareholder.

"Decision" column: The sequence of letters stands for the decisions of specific shareholder in subsequent rounds, i.e. the sequence RA means that the given shareholder rejected the first offer of the raider (in the first round) and accepted the second offer of the raider (in the second round).

Subjects' decisions and payoffs in all experimental treatments

Subject	Treatment 1		Treatment 2		Treatment 3		Treatment 4		Total payoff
	Decision	Payoff	Decision	Payoff	Decision	Payoff	Decisions	Payoff	
1	2	3	4	4	5	6	7	8	9
1.1	A	92.9	A	50	AARRR	0	A	67	209.9
1.2	A	92.9	A	50	AAAAA	0	R	100	242.9
1.3	R	100	A	50	RRRRR	0	R	100	250
1.4	A	92.9	A	50	RRRRR	0	A	67	209.9
1.5	A	92.9	A	50	RRRRR	0	A	67	209.9
1.6	R	100	R	100	AAAAA	0	R	100	300
1.7	A	92.9	A	50	RRRRR	0	A	67	209.9
1.8	A	92.9	A	50	RRRRR	0	R	100	242.9
1.9	A	92.9	A	50	RRRRR	0	A	67	209.9
1.10	A	92.9	A	50	AAARR	0	A	67	209.9
2.1	A	92.9	A	50	RAAAR	0	A	67	209.9
2.2	A	92.9	A	50	AAARR	0	A	67	209.9
2.3	R	100	A	50	RAAAA	0	A	67	217
2.4	R	100	R	100	RRRRR	0	R	100	300
2.5	A	92.9	A	50	AAAAA	0	A	67	209.9
2.6	R	100	R	100	ARRRR	0	R	100	300
2.7	A	92.9	A	50	RRRRR	0	A	67	209.9
2.8	R	100	A	50	RRRRR	0	R	100	250
2.9	A	92.9	A	50	RRRRR	0	A	67	209.9
2.10	A	92.9	A	50	RRRRR	0	A	67	209.9
3.1	A	92.9	A	50	AARRR	0	A	67	209.9
3.2	R	100	A	50	RRRRR	0	A	67	217
3.3	A	92.9	A	50	RRRRR	0	A	67	209.9
3.4	R	100	A	50	RRRRR	0	R	100	250
3.5	A	92.9	A	50	RRRRR	0	A	67	209.9
3.6	A	92.9	A	50	RRRRR	0	A	67	209.9
3.7	A	92.9	A	50	RRRRR	0	A	67	209.9
3.8	R	100	R	100	AAAAA	0	R	100	300
3.9	A	92.9	A	50	RRRRR	0	A	67	209.9
3.10	A	92.9	A	50	RRRRR	0	A	67	209.9
4.1	A	92.9	A	50	RRRRR	0	A	67	209.9
4.2	A	92.9	A	50	RRRRR	0	A	67	209.9
4.3	A	92.9	A	50	AARRR	0	A	67	209.9
4.4	R	100	A	50	ARRRR	0	A	67	217
4.5	A	92.9	A	50	AARRR	0	R	100	242.9
4.6	A	92.9	A	50	RRRRR	0	R	100	242.9

1	2	3	4	4	5	6	7	8	9
4.7	A	92.9	A	50	ARRRR	0	R	100	242.9
4.8	A	92.9	A	50	RRRRR	0	A	67	209.9
4.9	A	92.9	A	50	RRRRR	0	A	67	209.9
4.10	A	92.9	A	50	RRRRR	0	A	67	209.9
5.1	A	92.9	A	50	RRRRR	0	A	67	209.9
5.2	A	92.9	A	50	RRRRR	0	A	67	209.9
5.3	A	92.9	A	50	RRARR	0	A	67	209.9
5.4	A	92.9	R	100	AARRR	0	R	100	292.9
5.5	R	100	A	50	RRRRR	0	R	100	250
5.6	A	92.9	R	100	AAAAA	0	A	67	259.9
5.7	R	100	A	50	RRRRR	0	A	67	217
5.8	A	92.9	A	50	AARRR	0	A	67	209.9
5.9	A	92.9	A	50	RAARR	0	A	67	209.9
5.10	A	92.9	A	50	RRRRR	0	A	67	209.9
6.1	A	92.9	A	50	A	80.4	A	67	290.3
6.2	A	92.9	A	50	A	80.4	A	67	290.3
6.3	A	92.9	R	100	R	100	R	100	392.9
6.4	A	92.9	A	50	A	80.4	A	67	290.3
6.5	R	100	R	100	R	100	A	67	367
6.6	R	100	A	50	R	100	A	67	317
6.7	R	100	A	50	A	80.4	A	67	297.4
6.8	A	92.9	R	100	R	100	R	100	392.9
6.9	A	92.9	A	50	A	80.4	A	67	290.3
6.10	R	100	A	50	A	80.4	A	67	297.4
7.1	RA	95.3	R	100	RRAAR	0	A	67	262.3
7.2	A	92.9	A	50	AAAAA	0	A	67	209.9
7.3	RA	95.3	A	50	AAARR	0	A	67	212.3
7.4	A	92.9	A	50	RRRRR	0	A	67	209.9
7.5	RR	100	A	50	RRRRR	0	A	67	217
7.6	RR	100	A	50	RRAAR	0	A	67	217
7.7	A	92.9	R	100	AARRR	0	A	67	259.9
7.8	RR	100	A	50	RRRRR	0	R	100	250
7.9	RR	100	R	100	RRRRA	0	A	67	267
7.10	A	92.9	A	50	RRRRR	0	A	67	209.9
8.1	A	92.9	A	50	AA	80.4	A	67	290.3
8.2	A	92.9	A	50	AA	80.4	A	67	290.3
8.3	A	92.9	A	50	RA	80.4	A	67	290.3
8.4	R	100	A	50	RA	80.4	A	67	297.4
8.5	R	100	A	50	RR	100	A	67	317
8.6	A	92.9	A	50	AA	80.4	A	67	290.3
8.7	A	92.9	A	50	AA	80.4	A	67	290.3
8.8	A	92.9	A	50	RA	80.4	A	67	290.3
8.9	A	92.9	A	50	RA	80.4	A	67	290.3
8.10	A	92.9	R	100	RR	100	R	100	392.9

Source: own development.