On Price Data Elicitation: a Laboratory Investigation

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Abstract:
There is abundant literature in experimental research on decision making under risk, which compares, and ranks subjects' preferences on the basis of some elicitation method. The present paper performs a similar analysis in order to compare them. Since pricing data lead in many cases to some anomalies (i.e. *status quo* bias, endowment effect) we examine three mechanisms to elicit price preferences: willingness-to-pay in a second price auction, willingness-to-accept in a second price auction, and certainty equivalent elicited with BDM. A Bayesian interpretation of our results suggests that it is not possible to state *ex-ante* the more appropriate elicitation method for a particular subject: for 1/3 of our sample WTP is preferred, for 1/3 of our sample WTA is preferred, and for the remaining 1/3 BDM is preferred.

1 INTRODUCTION

Experimental research on decision making under risk elicits subjects' preferences using different price elicitation methods. Usually, in most practical applications, price elicitation is implemented using matching procedures (Tversky et al., 1988) e.g. willingness-to-pay and willingness-to-accept in contingent valuation studies or the time-trade-off method in health economics. Many empirical studies have shown that matching procedures may lead to fundamentally different results. These phenomena are usually referred to as response mode effects. In general, response mode effects may be caused by errors in the subjects' responses. A well known response mode effect in decision making under risk is the preference reversal phenomenon first observed by Lichtenstein and Slovic (1971). Most prominent in this context seems to be the disparity between willingness-to-pay and willingness-to-accept discussed by Coursey *et al* (1987) and Knetsch and Sinden (1984, 1987).

Coppinger *et al* (1980) and Cox *et al* (1982) showed that when certainty equivalents are elicitated through willingness-to-pay in a second-price auction, there are subjects who deliberately and consistently under-bid. Similarly, in attempts to elicit certainty equivalents through willingness-to-accept in second-price auctions, it would appear that many subjects over-ask. This disparity is often explained by a status-quo bias (Samuelson and Zeckhauser, 1988) and leads to the question which of both measures should be used in contingent valuation studies. A third mechanism, that appears to be neutral in that, is the Becker-DeGroot-Marschak (BDM) but, nevertheless, it may be the case that subjects find the procedure too complicated and adopt some simple heuristic which biases behaviour. In this paper we will address the following question: given a particularly utility function, **which elicitation method should be preferred?**

This is an important question since the results of an experiment can be affected by the elicitation method. Different elicitation methods may induce different behaviour towards risk. Studies of Isaac and James (2000) and Berg et al (2005) show that subjects' risk attitudes usually differ fundamentally across several institutions, including the BDM mechanism as well as first-price and second-price auctions.1 Section 2 describes the experimental design, explains our estimation procedure. Section 4 presents our results and, finally, section 5 contains a concluding discussion.

2 EXPERIMENTAL DESIGN

The experiment was conducted at the Centre of Experimental Economics at the University of York with 24 participants. Each subject had to attend five separate occasions within one week, one per day. The single occasions were called occasion A, B, C, D, and E respectively. Every participant had to register for 5 separate occasions, two times for occasion A/B and one time for occasions C, D, and E respectively (Table 1).

	Mon 1st Nov	Tue 2nd Nov	Wed 3rd Nov	Thu 4th Nov4	Fri 5th Nov
10.00-11.15	Occasion A/B	Occasion C	Occasion D	Occasion E	Occasion A/B
12.30-13.45	Occasion C	Occasion D	Occasion E	Occasion A/B	Occasion C
15.00-16.15	Occasion D	Occasion E	Occasion A/B	Occasion C	Occasion D
17.30-18.45	Occasion E	Occasion A/B	Occasion C	Occasion D	Occasion E

Table 1: Experimental occasions time-table.

During the five days of this week one occasion was offered on every single day with varying chronological order. The participants could choose on which day they attended which session. Since at most six students were allowed in one session the order in which sessions were completed varied sufficiently between participants. Sessions lasted between 25 and 40 minutes. The time varied not only among treatments but also across subjects. After a subject had completed all five treatments one question of one treatment was selected randomly and played out for real. The average payment to the subjects was £34.17 with £80 being the highest and £0 being the lowest payment. There was no show-up fee, but subjects received an initial endowment for willingness-to-pay questions in order to

[1] Related studies include Isaac and Walker (1985), Harrison (1990), Kagel (1995), Schorvitz (1997), and Anderson and Mellor (2009).

prevent losses (see the experimental instructions in the appendix). Only occasions C, D, and E will be analysed in the present paper.

In occasions C, D, and E the subjects were presented the same 60 lotteries[2], 56 risky ones and 4 ambiguous ones (which are not analysed in this paper). The 56 risky lotteries are reported in Table 2. The lotteries were presented as segmented circles on the computer screen (see figure 1).

No.	£0	£10	£30	£40	**No.**	£0	£10	£30	£40	**No.**	£0	£10	£30	£40
1	.000	.000	1.000	.000	**20**	.000	.200	.700	.100	**39**	.000	.500	.000	.500
2	.750	.000	.250	.000	**21**	.000	.000	.500	.500	**40**	.500	.250	.000	.250
3	.300	.600	.100	.000	**22**	.500	.000	.500	.000	**41**	.200	.000	.400	.400
4	.000	.600	.100	.300	**23**	.250	.500	.250	.000	**42**	.100	.000	.200	.700
5	.000	1.000	.000	.000	**24**	.000	.500	.000	.500	**43**	.800	.000	.000	.200
6	.000	.500	.500	.000	**25**	.500	.250	.000	.250	**44**	.400	.000	.500	.100
7	.500	.500	.000	.000	**26**	.000	.250	.500	.250	**45**	.400	.000	.000	.600
8	.000	.000	.700	.300	**27**	.000	.000	.750	.250	**46**	.700	.000	.000	.300
9	.800	.000	.140	.060	**28**	.250	.250	.500	.000	**47**	.200	.000	.000	.800
10	.200	.000	.740	.060	**29**	.200	.000	.000	.800	**48**	.200	.000	.400	.400
11	.000	.200	.800	.000	**30**	.800	.000	.000	.200	**49**	.100	.000	.000	.900
12	.500	.100	.400	.000	**31**	.320	.600	.000	.080	**50**	.600	.000	.000	.400
13	.000	.200	.600	.200	**32**	.020	.600	.000	.380	**51**	.300	.500	.000	.200
14	.000	.100	.300	.600	**33**	.700	.000	.000	.300	**52**	.200	.200	.000	.600
15	.200	.800	.000	.000	**34**	.350	.000	.500	.150	**53**	.600	.100	.000	.300
16	.100	.400	.500	.000	**35**	.850	.000	.000	.150	**54**	.000	.350	.000	.650
17	.000	.400	.600	.000	**36**	.150	.000	.000	.850	**55**	.000	.100	.250	.650
18	.500	.200	.300	.000	**37**	.830	.000	.000	.170	**56**	.250	.350	.000	.400
19	.000	.200	.300	.500	**38**	.230	.000	.600	.170					

Table 2: The Lotteries

In the three occasions subjects have to:

- report a maximal buying price (bid) for each of the 56 lotteries. We call this the WTP session;
- report a minimal selling price (ask) for each of the 56 lotteries. We call this the WTA session;
- report a certainty equivalent (CE) for each of the 56 lotteries. We call this the CE session.

[2] The order of presentation of the lotteries in each treatment was randomized.

For all sessions we used incentive-compatible elicitation mechanisms. Bids (asks) were elicited with second-price sealed-bid (offer) auctions (Coppinger *et all*, 1980), while for the certainty equivalents we employed the Becker-DeGroot-Marschak mechanism. Since subjects participated in the experiment in five different treatments it is important to mention that all recruited subjects had to show up for all sessions.

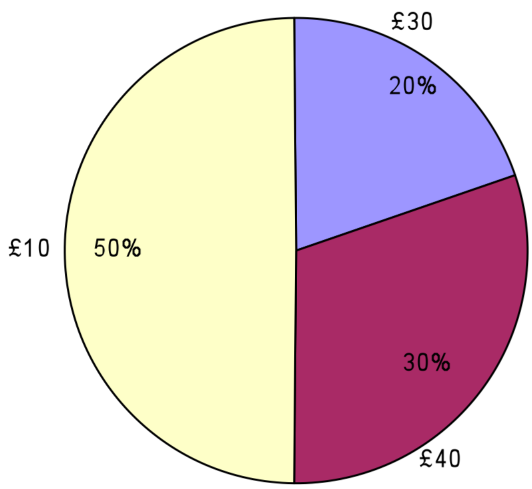

Figure 1: A segmented circles lottery presented to the subjects during the experiment

3 ESTIMATION METHOD

In this section we discuss the main conceptual issues of our estimation method. When we are using certainty equivalent estimation we need to know the value of the utility at outcome values other than x_1, x_2, x_3 and x_4. This requires assuming a particular functional form for subjects' utility. We assume that subjects have a Constant Relative Risk Aversion (CRRA) utility function[3]. We adopt the following specific form: $u(x) = (x/40)^r$. We need to estimate only the parameter r (the relative risk aversion coefficient) as it fully describes the utility function of the individual. If the subject is asked to provide his or her certainty equivalent for some gamble G, we will assume that the subject

[3] We have investigated other specifications – most notably that of CARA. CRRA fits significantly better. Details are available on request.

calculates the Expected Utility[4] of the gamble, according to his or her utility function, and then calculates V – that is, certain amount of money that yields the same utility. We can now write $u(V) = \mathrm{E}U(G)$. However, if we acknowledge the existence of error, then we have $u(V) = \mathrm{E}U(G) + \varepsilon$, and can hence note that the probability density of V being reported as the certainty equivalent of the gamble, is given by $f\{u^{-1}[\mathrm{E}U(G) + \varepsilon]\}$, where $f(.)$ is the probability density function of ε. Let us assume that the measurement error ε is distributed as a $N(0,s^2)$ – we can proceed to the estimation of the parameters by maximum likelihood[5].

4 RESULTS

We estimate individual preferences functions subject by subject as players clearly differ in their preferences. In order to estimate individual preferences we shall calculate the utility function $u(\mathrm{x})$ as defined in section 3. As already mentioned, all we need to estimate in order to define the individual preference function is the parameter r, as it gives a complete account of the utility function of the individual. Subsequently we will estimate the log-likelihood values of our estimates which provide a first measurement of their goodness of fit.

Subjects 20 and 21 are straight-down-the-line risk neutral all the time: their certainty equivalents are always equal to the expected values. Other subjects are not so clear cut.

In table 2 we present the estimations obtained using the three elicitation methods. Looking at these results we can draw some preliminary considerations:

1. in the WTP treatment, r is between 0 and 5.474. 14 subjects are risk averse, 2 subjects are risk neutral (i.e. subjects 20 and 21) and 8 subjects are risk loving

[4] We are aware of the extensive evidence against the descriptive validity of EU (see e.g. Starmer, 2000, for a review), and the study of controversy among alternative theories of risky choice would be rather interesting (see. e.g. Hey and Orme, 1992; Morone and Schmidt, 2008; Morone, 2008) but such an analysis is not within the scope of the present paper.

[5] The method of maximum likelihood for estimation of parameters is based on the assumption that observations are independent from each other. However, in the experiment subjects reported their values for 56 lotteries in each treatment. Poulton (1989) argue that in this kind of elicitation successive value may depend on the previously reported one. In order to avoid this problem we use the random lottery incentive mechanism (where just one of the questions determines the payment to a subject); Starmer and Sugden (1991), Cubitt *et al* (1998), and Hey and Lee (2005) shown that it does work in separating the questions in the subjects' minds. Other relevant references include Beattie and Loomes (1993), Laury (2005), and Baltussen *et al* (2009).

2. in the WTA treatment, r is between 0.145 and 4.227. 9 subjects are risk averse, 2 subjects are risk neutral (i.e. subjects 20 and 21) and 13 subjects are risk loving
3. in the CE treatment, r is between 0.127 and 4.459. 10 subjects are risk averse, 2 subjects are risk neutral (i.e. subjects 20 and 21) and 12 subjects are risk loving

	WTP		WTA		CE	
subject	ll	*r*	ll	*r*	ll	*r*
1	-5.754	0.315	-6.305	2.779	-4.756	0.818
2	-6.855	0	-4.545	0.851	-4.783	0.852
3	-3.437	1.146	-0.544	0.987	-1.434	0.989
4	-6.452	0.001	-4.586	0.961	-4.74	0.833
5	-6.353	0.069	-5.052	0.579	-5.822	2.202
6	-6.504	0	-5.429	0.145	-5.984	0.332
7	-3.032	1.029	-3.469	1.003	-3.228	1.005
8	-6.126	2.191	-6.158	0.438	-7.024	0.127
9	-3.797	1.237	-4.557	1.336	-6.257	4.459
10	-6.591	0	-5.323	1.604	-5.148	1.509
11	-5.537	0	-5.942	0.289	-5.463	0.578
12	-2.425	0.984	-3.529	1.027	-3.065	0.946
13	-7	0	-6.439	6.311	-5.39	3.165
14	-4.172	0	-4.233	0.781	-4.695	0.464
15	-6.195	2.231	-5.388	3.318	-6.101	2.689
16	-6.712	2.105	-6.312	4.227	-6.179	2.61
17	-6.699	5.474	-6.473	3.162	-5.109	2.28
18	-5.967	0	-6.37	0.321	-5.226	0.916
19	-5.748	1.404	-5.949	2.33	-5.821	2.7
22	-1.189	0.987	-0.127	1.005	-0.183	1.002
23	-2.551	0.951	-4.266	1.233	-4.712	1.335
24	-5.881	0.001	-5.763	2.571	-5.492	1.119

Table 3: Estimations of CRRA model with WTP, WTA, and CE

It is interesting to note that only for 12 out of 22 subjects the attitude toward risk does not change with the elicitation methods. This result suggests that choosing one elicitation method instead of another one can dramatically affect the shape of the subjects' preference.

If we adopt a Bayesian interpretation of the results, and start with equal priors on the three elicitation methods, then the posterior probabilities of the WTP, WTA, and CE elicitation method being the most appropriate one are respectively:

$$P(i) = \frac{\exp(\mathrm{ll}(i))}{\sum_{\mathrm{i}} \exp(\mathrm{ll}(\mathrm{i}))} \qquad i = \mathrm{WTP}, \mathrm{WTA}, \mathrm{CE}$$

We have applied this analysis to each subject and present the results graphically in Figure 2.

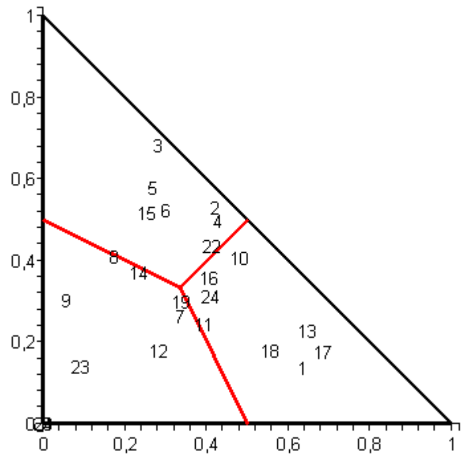

Figure 2: Subjects' categorization.

In these triangles we represent the probability of the CE elicitation method being correct on the horizontal axis, and the probability of the WTA elicitation method being correct on the vertical axis. The probability of the WTP elicitation method being correct is the residual. In the triangle subjects are indicated by a number. The triangles are divided into three areas – the one to the top being where the CE elicitation method is most probable, the one to the right being where the WTA elicitation method is most probable and the one nearest the origin being where the WTP elicitation method is most probable. We note that there are 7 subjects in the "CE most likely area", 8 subjects in the "WTA most likely area" and just 7 subjects in the "WTP most likely" area.

5. CONCLUSION

In this article we have compared three different price elicitation methods. We concerned with the important question: which method is the 'best' one to elicit price preferences? We have analysed three standard elicitation methods, willingness-to-pay, willingness-to-accept, and certainty equivalents obtained by the BDM mechanism. Our experimental data show that none of these is can be considered the 'best' elicitation method. Altogether – we find evidence that – for 1/3 of our subject pool, willingness-to-pay may be the 'best' elicitation method; for another 1/3, willingness-to-accept may be the 'best' elicitation method; and for the last 1/3 of our subject pool, certainty equivalents obtained by the BDM mechanism may be the ‘best’ elicitation method. This is an important result since if one does not know anything about a subject; it may be best first to run a pilot in order to choose the best elicitation method , and then use that method for eliciting subject’s preference. We can conclude that in order to better elicit different subjects price preference can be the case to use different elicitation methods.

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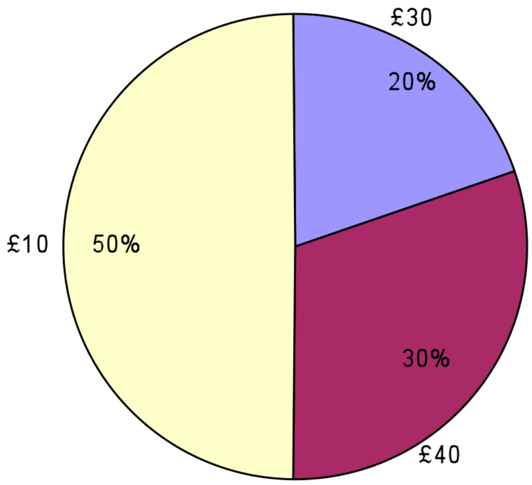
Appendix

Instructions

General Instructions

The purpose of this experiment is to investigate how people behave in risky situations. In particular we ask you to make decisions with respect to 60 lotteries on 5 separate occasions. Please note that your answers shall tell us about your preferences and tastes. Concerning your preferences there are no objectively "right" or "wrong" answers. However, given your preference there are some simple rules how you should behave in the single occasions in order to make yourself off as good as possible. We will make you familiar with these rules in the instructions to the single occasions.

We want to reward you for your participation and hence we give you the possibility receiving a payment of up to £80. Your reward depends partly on the answers you give us and partly on chance. More precisely, at the last occasion we will randomly select one question of the five occasions and play it out for real. The amount you win will be immediately paid out in cash. Depending on your answer and the selected question, you will receive a fixed amount of money, or play out a lottery, or both. Hence, it is important that you think carefully about the answers you give.



A lottery specifies different amounts (up to three) you can win and their corresponding probabilities. In the experiment lotteries will be presented as segmented circles, where each segment represents a given amount of money. If you win a lottery, you will spin a wheel on the corresponding circle. The wheel is clear with an arrow drawn on it. The amount you win is determined by the segment of the circle in which the arrow on the wheel stops. The number in each segment states the probability that the arrow on the wheel will stop in this segment, that is the probability that you will win the amount of money represented by this segment. For instance, the circle above represents a lottery in which you win £10 with a probability of 50%, £30 with a probability of 20%, and £40 with a probability of 30%. For the experiment you should clarify yourself that it is never reasonable to pay more for a lottery than the highest possible amount you can win in this lottery. That is, the opportunity to play out the lottery depicted above can never be worth more than £40. If you remember this, it is impossible that you incur a loss in this experiment.

The single occasions are called occasions A, B, C, D, and E respectively. More precise instructions will be provided by us at the beginning of each occasion.

Every participant has to register for 5 separate occasions, two times for occasion A/B and one time for occasions C, D, and E respectively. At each meeting at most 15 participants are allowed.

	Mon 1st Nov	Tue 2nd Nov	Wed 3rd Nov	Thu 4th Nov4	Fri 5th Nov
10.00-11.15	Occasion A/B	Occasion C	Occasion D	Occasion E	Occasion A/B
12.30-13.45	Occasion C	Occasion D	Occasion E	Occasion A/B	Occasion C
15.00-16.15	Occasion D	Occasion E	Occasion A/B	Occasion C	Occasion D
17.30-18.45	Occasion E	Occasion A/B	Occasion C	Occasion D	Occasion E

Instructions to Occasion C

Introduction

Recall that you have to make decisions with respect to 60 lotteries in all of the five occasions. At the end of the experiment we will randomly select one question from one of the five occasions and play it out for real. In this occasion the 60 lotteries are grouped to 30 pairs and with respect to every pair you are asked three different questions.

What are the questions?

In this occasion a pair of lotteries appears on the screen and, as the first question, you have to state whether you prefer the left lottery, or the right lottery, or whether you do not care which lottery you will receive. After that, the same lottery pair appears again on the screen and, as the second and third question, you are asked for each of both lotteries: ”State the amount of money such that you do not care whether you will receive this amount or the depicted lottery”. All you have to do is to type this amount in the corresponding box.

How is your reward calculated?

If the first question is selected for you reward, you will play out the lottery you preferred. For the case that you have answered ”don’t care”, the experimenter will select randomly one lottery of the given pair and this lottery will be played out.

If the second or third questions is selected for your reward, we will determine randomly a number z between 0 and y, where y is the highest possible prize in the given lottery. If z is greater or equal than the amount you stated, you will receive £z as reward. If z is less than the amount you stated, you can play out the given lottery.

How should you response?

Concerning the preference between and the monetary evaluation of the two lotteries of a given pair, there are obviously no preferences or evaluations which are objectively ”right” or ”wrong”. However, given your personal preference and evaluations according to your own taste, the reward mechanism described above definitely guarantees that it is in your own interest to respond always with your true preference and true evaluation in all three types of questions. In the following we want to explain you why this is true. For the question on the first screen this is immediately comprehensible since your choice determines the lottery you will play out.

Now consider the second question for one of the lotteries. Suppose your true evaluation is £13.66, i.e. you don’t care whether you will receive the given lottery or £13.66. In the following we show you why it is the best for you to type in precisely £13.66. Suppose you type in a higher amount, say £24.21. If z > £24.21 > £13.66, this does not change anything, since you receive a payment of £z in both cases. Analogously, if z < £13.66 < £24.21, this does also not change anything since you receive the given lottery in both cases. Now suppose that £13.66 < z < £24.21. This implies that you receive the lottery. However, if you would have answered truthfully, you would receive a payment of z > £13.66, which is of course better for you, given that you don’t care whether you receive the lottery or £13.66. Suppose, on the other hand, that you type in a lower amount, say £ 7.77. If z < £7.77 < £13.66, or z > £13.66 > £7.77, this does not change anything. If, however, £7.77 < z < £13.66, you receive £z < £13.66. But if you had been truthful, you would receive the given lottery, which you like more than £z < £13.66.

Occasion D

Introduction

Recall that you have to make decisions with respect to 60 lotteries in all of the five occasions. At the end of the experiment we will randomly select one question from one of the five occasions and play it out for real. In this occasion you have to answer exactly one question for every single lottery out of the 60 lotteries.

What are the questions?

In this occasion the lotteries are auctioned by a second-price sealed-bid auction. Sealed-bid means that every bidder submits her/his bid secretly, i.e. you do not know the bids of the other bidders and the other bidders do not know your bid. Second-price means that the bidder with the highest bid receives the auctioned lottery and has to pay a price which equals precisely the second highest bid. In other words, if you have the highest bid among all bidders you do not have to pay your own bid but only the second highest bid in order to receive the lottery. In this occasion a lottery appears on the screen and you are asked: ”Submit your bid for this lottery in a second-price sealed-bid auction”.

How is your reward calculated?

If a question of occasion D is selected for your reward you first receive a constant payment of £y, where y is the highest possible prize of the lottery, which is involved in this question. Moreover, if your are the subject with the highest bid among all subjects in the group you made occasion D, you receive the corresponding lottery and have to pay the second highest bid.

How should you determine your bid?

Obviously the price you are at most willing to pay for a given lottery just depends on your own preferences, it cannot be objectively ”right” or ”wrong”. However, given the price you are personally at most willing to pay for a given lottery it is in your own interest to submit exactly this price as bid for the lottery. In the following we want to explain you why this is true.

Note that your bid has no influence on the price you pay for the lottery, it just decides whether you will receive the lottery for a given price or not. Suppose the price you are at most willing to pay for the given lottery is for example £31.04. Then you should bid, as we show you in the sequel, also £31.04. Suppose you ,would bid a lower amount, say, £23.91. If the highest bid among all other bidders is higher than £31.04, you would not receive the lottery in both case. If the highest bid among the other bidders is lower than £23.91, for example £17.56, you would receive the lottery for a payment of £17.56 in both cases. Now suppose the highest bid among all other bidders is £ 25.53. If you bid £23.91, you do not receive the lottery. However, if you bid your true willingness to pay, i.e. £31.04, you will receive the lottery for the price of £25.53, which is significantly lower than the maximal price you are willing to pay. Therefore, you cannot win by bidding an amount lower than the price you are at most willing to pay. Now suppose you submit a bid higher than £31.04, for example £37.89. If the highest bid among all other bidders is higher than £37.89 or lower than £31.04, this does not change anything. But suppose the highest bid among all other bidders is £36.14. If you have submitted your true maximal buying price as bid, you would not receive the lottery in this case. If you, however, have submitted £37.89 as bid, you receive the lottery but have to pay £36.14, which is strictly higher than the price you are at most willing to pay. Consequently, you can also not win by bidding an amount higher than the price you are at most willing to pay.

Introduction

Recall that you have to make decisions with respect to 60 lotteries in all of the five occasions. At the end of the experiment we will randomly select one question from one of the five occasions and play it out for real. In this occasion you have to answer exactly one question for every single lottery out of the 60 lotteries.

What are the questions?

In this occasion you are endowed with a lottery and you have to make an offer for selling the lottery in a second-price offer auction. In a second-price offer auction every subject submits her/his offer secretly, i.e. you do not know the offers of the other subjects and the other subjects do not know your offer. Now the subject with the lowest offer sells the lottery and receives an amount equal to the second lowest offer. In other words, if you have submitted the lowest offer you will sell the lottery for the second lowest offer, which is higher than your own offer. In this occasion a lottery appears on the screen and you are asked: ”Submit your offer for this lottery in a second-price offer auction.”

How is your reward calculated?

Suppose a question of occasion E is selected for your reward. If you have submitted the lowest offer among all the subjects in the group you made occasion E, you receive as the reward the second lowest offer. If you have not submitted the lowest offer you can play out as reward the given lottery.

How should you determine your offer?

Obviously the price you have to receive at least in order that you are willing to sell a given lottery just depends on your own preferences, it cannot be objectively ”right” or ”wrong”. However, given the price that you have to receive at least in order that you are personally willing to sell the given lottery, it is in your own interest to submit exactly this price as offer for the lottery. In the following we want to explain you why this is true.

Note that your offer has no influence on the price you receive for the lottery, it just decides whether you will sell the lottery for a given price or not. Suppose you are willing to sell the given lottery if you receive at least a compensation of, for example, £19.47. Then you should submit, as we show you in the sequel, also an offer of £19.47. Suppose you would submit a higher offer, for example £ 25.55. If the lowest offer among all other bidders is lower than £19.47, this does not change anything since you will play out the given lottery in both cases. If the lowest offer among all other bidders is higher than £25.55, for instance £27.83, this does also not change anything since you receive £27.83 in both cases. Now suppose the lowest offer among all other bidders is £24.08. If you submit £25.55 as your offer, you will play out the given lottery in this case. However, if you submit your offer honestly, i.e. £19.47, you will receive £24.08, which is better for you since you receive a compensation which is higher than the one you demand. Therefore, you can not win by submitting a higher offer. Now suppose you submit a lower offer, for example £12.69. If the lowest offer among all other bidders is lower than £12.69 or higher than £19.47, this does again not change anything. But suppose the highest offer among all other bidders is £14.02. If you submit your offer honestly, i.e. £19.47, you will play out the lottery. However, if you submit £12.69 as your offer, you will receive £14.02, which is worse for you since you receive a compensation for selling the lottery which is lower than the one you demand. Therefore, you can also not win by submitting a lower offer.