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Regret and Topical Accounting: Is Cyclical Bidding the Bases of the Laboratory Winner's Curse?[1]

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Abstrak

Penelitian ini menguji pengaruh siklus pengambilan keputusan pada penawaran individu dalam eksperimen lelang. Eksperimen sebelumnya melibatkan proses pelelangan yang terdiri atas sejumlah sesi dalam jangka waktu yang relatif singkat, dimana informasi tentang nilai sebenarnya dari objek yang dilelang diberikan secara langsung, sehingga jumlah dana yang dipegang oleh peserta lelang dapat disesuaikan seketika. Kemenangan dan kekalahan dalam sebuah lelang dapat menimbulkan emosi positif dan negatif. Karena orang memerlukan waktu untuk menyesuaikan diri dengan pengalaman afektif, siklus keputusan dalam eksperimen dapat berpengaruh dalam keputusan individu pada penawaran berikutnya. Hipotesa yang diajukan adalah bahwa penyesalan dan akuntansi mental dapat menjelaskan arah dari anomali dalam keputusan tersebut. Penyesalan atas kegagalan untuk bertindak dalam putaran tender sebelumnya akan menaikkan tingkat pengambilan resiko pada babak berikutnya; dan akuntansi topikal lebih mendominasi pengambilan keputusan daripada akuntansi minimal dan akuntansi komprehensif. Selain itu, reference dependence utility menyebabkan prefensi resiko berbeda-beda sesuai dengan konteks pengambilan keputusan: risk-seeking dilakukan ketika mengalami kerugian, sementara risk-aversion dilakukan setelah mendapatkan keuntungan. Secara umum penelitian ini mendukung dugaan-dugaan tersebut. Subjek menjadi lebih agresif setelah mengalami kerugian dalam tahap sebelumnya. Sementara penyesalan dapat diamati pada subjek yang mengajukan penawaran kedua tertinggi ketika aspek winner's curse tidak manifes, dana spek penyesalan ini menyebabkan naiknya penawaran pada putaran berikutnya. Akibatnya regret menyebabkan subjek menjadi korban winner's curse. Pada aspek psikologis, akuntansi topical teramati lebih banyak dilakukan individu dari pada akuntansi komprehensif. Temuan ini berimplikasi keraguan atas validitas klaim adanya fenomena winner's curse *dalam eksperimen lelang.*

Keywords: mental accounting, decision making, bidding behaviour.

Although the evidence of the *winner's curse* has appeared robustly in a variety of laboratory contexts (e.g., Kagel & Levin, 1986; Dyer, Kagel & Levin, 1989; Garvin & Kagel, 1994), and support from analysis of real auction data has also been reported (e.g., Capen, Clapp & Campbell, 1971; Roll, 1986; Giliberto & Varaiya, 1989), its existence is still largely questioned. Referring to the complexity and incompleteness of information concerning the present and future values of auctioned objects, such as oil and mineral exploration rights, some ex-

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perts argue that such data allow many interpretations, and the *winner's* curse is just one of them (Roth, 1995). On the other hand, the unanimous claim from many laboratory experiments has been responded by some experts with critical views towards the validity of the design of experiments. In short, *the winner's curse* is still largely perceived as an anomaly which does not generalise outside the laboratory

Criticisms of experimental studies have mostly been addressed at the appropriateness of the subjects of experiment. As a matter of fact, students whom apparently have little real world experience in doing auctions have been the most frequently employed in research. Therefore, the findings that inexperienced bidders were susceptible to the *winner's curse* (Kagel & Levin, 1986) turns to suspicion about the validity of the claim. In addition of being inexperienced, novice bidders in those experiments were given limited liability for losses and were operating at low cash balance (Hansen & Lott, 1991). The combination of lack of experience, inadequate control over sub-optimal actions, and low perceived significance of the task that preceded the observed *winner's curse* may actually mean that it is simply a phenomenon of college students working on a "toy problem" (Thaler, 1992)

In view of the debate, proponent of the *winner's curse* have responded with refined studies to accommodate elements of the criticisms, in one and another way. The experience factor has been controlled by running the experiment in two stages, in which only successful bidders in the first stage played the second one (Kagel & Levin, 1986). An alternative approach has been to recruit business executives as the experiment subjects (Dyer, Kagel & Levin, 1989). These studies concluded that although bidders' susceptibility to the *winner's curse* decreased with the accumulation of experience, the error was not eliminated completely. Relatively experienced bidders were found to commit errors in making judgement about the value of the object, even when the availability of public information was increased (Kagel & Levin, 1986), and even when they are operating at a *private value* auction (Kagel, Harstad & Levin, 1987).

The persistence of judgement errors across different experimental manipulations gives raise to a suspicion that the anomaly might not be caused by error in probabilistic judgement, but by some mental illusion (Thaler, 1992) that was elicited accidentally by the design of experiments. As a matter of fact, most auction experiments can be easily distinguished from one and another, except on the procedure of experiment. Most experiments involved an auction event that consists of several sessions with a relatively short duration, in which a feedback about the true value of the object was given instantly, and bidders' cash balance were adjusted promptly. During the experiment subjects were conditioned to perform a cycle of tasks that consists of receiving and analysing information, submitting a bid, discerning feedback about the true value of the object, and calculating their profit or loss. All of these must be done in a timely sequence that consists of 20 or so repetitions, within 2 hours or so.

This cyclical event, particularly with the availability of instant feedback, is unlikely to represent the real face of auctions. Therefore, if the criticism of field data that bidders normally have to wait for relatively long time to know the true value of the item they have won is accepted (Roth, 1995), the fact that within 5 minutes a bidder in an experiment completed the whole process of auction-related events is then an

anomaly in itself. It is plausible, therefore, to ponder a seemingly weird idea that this structural anomaly may actually breed anomalous behaviour among subjects of experiments.

Affective Experience and Decision-Making

A bidding event imposes gains and loses to every bidder (McAfee & McMilan, 1987). Both of these states of nature have widely been known to induce sensations and emotions among individuals that in turn gives intrinsic value to the individual (Kusser & Spohn, 1992). Hence, two aspects of utility actually emerge from a bidding event: the objective outcome of winning or losing that is measured in monetary equal units and the subjective experience of satisfaction or anguish. While the former has been considered thoroughly in decision-making theory, very little attention has been given to the latter.

The reason for the ignorance is that that because utility is treated as a unitary concept in standard economics and decision-making theory (Luce & Raiffa, 1957; Coombs, Dawes & Tversky, 1970). It is assumed that an individual chooses A over B because the utility of A exceeds that of B, and thus we can assign any two unequal numbers to represent all necessary information about the difference of utility among them. In contrast, behavioural decision-making theorists, such as Kahneman and his associates, argue that decision utility and experienced utility are two different matters (Kahneman & Tversky, 1984; Kahneman, Waker & Sarin, 1997). In conceptual terms, decision utility is defined as the post-hoc inference of the weight of an outcome of a decision, while experienced utility referes to the utility that is actually experienced by decision makers when they consume or experience what they have chosen. Experienced utility captures the hedonic quality of a decision, that is the degree of pleasure or pain, satisfaction or anguish in the actual experience of outcome.

One aspect of experienced utility is its temporal dimension. Pleasure and displeasure are attributes of each moment of experience, but the outcomes that people value are normally extended over time. Two descriptive notions of experienced utility are thus instant utility, the pleasure or distress of the moment, and remembered utility that is the retrospective evaluation of a temporally extended outcome (Kahneman, Waker & Sarin, 1997). The adaptive function of instant utility is to signal to the individual whether or not to take action in a particular moment based on, in most situations, the biologically programmed response choice. A pleasure sensation would normally signal a 'go' to the organism to continue the activities, while pain signals a 'stop'.

The other dimension is the intensity of the affective experience. The experience of pleasure and pain are different in quality, as well as the experience of joy or distress in different occasions. This dimension gives raise to the important of remembered utility (Kahneman, Waker & Sarin, 1997), that is, the utility of an experience as recalled by the decision maker after it has occurred (Read & Loewenstein, 1999). In general, higher intensity of the experience leads to longer retention in individuals' cognition. However, remembered utility is not only a function of intensity. Distractions within the elapsed time played significant role in the elicitation of experienced utility (Read & Loewenstein, 1999).

Both of these dimensions are relevant in discussing the side effect of the design of auction experiments on individuals' behaviour. The temporal dimension implies that certain duration is needed by an individual to adjust his- or herself to the affec-

tive experience of the previous occasion. Subsequently, it will influence her functioning in the forthcoming event. The stronger intensity of affective experience would normally require longer period of adjustment. However, the direction to which an affective experience influences individual, positively or negatively, depends on the type of experience.

Among others, the impact of regret on decision-making is one of most widely researched. Regret is a negative, cognitively based emotion that we experience when realising or imagining that our present situation would have been better, had we decided differently (Zeelenberg, 1999). In other words, regret constitutes a special form of frustration in which the event one would change is an action one has either taken or failed to take. Two state of events thus associated with regret, the one being frustration that is felt over the failure of an action. One may become frustrated by the thinking of another way that he could have taken that would have given him a better result. Regret also occurs following a failure of acting something that lead to a better condition or prevent an adverse situation had the one done in the time. Research shows that the regret associated with failures to act is often less intense than the regret associated with the failure of an action (Kahneman & Tversky, 1982). In addition, anticipated regret can promote risk-averse as well as risk-seeking choice (Zeelenberg, 1999).

Consider the following hypothetical event: Dick and Fred are competing in an experimental bidding session along with some other bidders. In a particular session, they realised that in the previous session, where they had both lost, the bid item was of considerably higher value. If Dick realised that his bid was the second highest, with a narrow difference from the winner, and Fred's was among the lowest bids, we could ask ourselves of who had more intense regret. Subsequently, we could imagine how they would bid on the next session and predict who would take more risks.

Hiphothesis 1: In the absence of the winner's curse, in the subsequent round, the second highest bidder of the previous round bids higher than the lowest bidders of the previous round.

Mental Accounting

One of the cornerstones of optimal bidding theory is the assumption of bidders' risk- neutrality and the linear utility of bids. Further, each bidder is assumed to estimate other bidders' valuations as being drawn from a rectangular distribution that consists of $v_i, \ldots, v_n$, in which any point in the $F(\underline{v}, \overline{v})$ has similar probability of being the true value. The probability of winning the auction, given b_i, is then the function of the probability that b_i is highest among others, that is $F^{n-1}(b_i)$ (Milgrom & Weber, 1982; McAfee & McMilan, 1987). These assumption are formulated because they are required for a simple solution of optimal bidding, not because they capture the natural process of bidding. The optimal bidding follows such a description. Given that bidders are behaving noncooperatively, the optimal strategy for each bidder is to bid as much as his valuation of the object, $b_i=b(v_i)$. If this strategy is adopted by all bidders but one, the latter's best response is to adopt it also (Riley & Samuelson, 1981). The end result is that the auction consists of optimal bids by bidders who think optimally.

But these assumptions seem to fly in the face of evidence from behavioural decision making research. After the seminal work of Kahneman and Tversky (1979), growing evidence has supported the notion that, in contrast to expected utility theory,

the carrier of the utility of a choice is change from a reference point rather than over the state of wealth (Kahneman & Tversky, 1984; Tversky & Kahneman, 1991; Bateman et al., 1997). From the reference dependent utility, it follows that people are loss averse more than risk averse (Tverky & Kahneman, 1991; Kahneman & Tversky, 1982), their decision are susceptible to the framing of choice (Tversky & Kahneman, 1981; Tversky & Kahneman, 1986; Johnson et al., 2000), and weigh chance differently between different points of probability (Tversky & Fox, 1995). These violations of expected utility theory may explain the internal process of the winner's curse.

Tversky and Kahneman (1981) and Kahneman and Tversky (1984), refined by Thaler (1999), propose a construction of mental processes whereby individuals evaluate their financial-related decisions, from which they specify the advantages and disadvantages associated with the options relative to a reference point. This representation, termed mental accounting, refers to the set of cognitive operations used by individuals to organise, evaluate, and keep track of their decisions. They propose three different types of mental accounts that can be used by the individual: *minimal account*, *topical account*, and *comprehensive account* (Thaler, 1999). Under *minimal account*, the utility of decision is calculated from the difference between any two or more options, disregarding the features they share, and thus is indifferent to contexts and intertemporal considerations. *Topical accounting* leads individual to consider the consequence of possible choices with regard to a reference level that is determined by the context within which the decision arises. A *comprehensive account* incorporates all other factors including current wealth, future earnings, possible outcomes of other probabilistic holdings, and so on.

Economic theory generally assumes that people make decisions using the *comprehensive account*. Consequently, comprehensive accounting prevents bidders from falling prey to the winner's curse. However, behavioural research shows that people make decisions piecemeal, influenced by the context of the choice, as evident in the following example.

> Imagine that you are about to purchase a jacket for ($125)[$15] and a calculator for ($15)[$125]. The calculator salesman informs you that the calculator you wish to buy is on sale for ($10)[$120] at the other branch of the store, located 20 minutes drive away. Would you make the trip to the other store?
>
> (Tversky & Kahneman, 1981).

This problem consist of two choices; one with the figures in parentheses and the other with the figures in brackets. Experiments on two separate groups found that on the choice of saving $5 of $15 calculator, 68 percent of the participants were willing to make the 20 minutes journey; while only 29 percent were willing to make the trip to save the same amount on a $125 calculator.

Mental accounting may explain the cognitive processes that lead to the winner's curse in the laboratory context. In experiments that report the winner's curse, e.g., Kagel and Levin (1986) and Knetsch, Tang & Thaler (2001), subjects have to make decision about the amount of bid over a series of bidding session which consist of around 18 bidding rounds within one to three hours. The physiological sensations of winning or losing a bid that are felt by subjects from a previous round may influence the decision in the subsequent round. If the assumption that individuals use topical accounting when bidding is valid, then the value of $v_{ij} - b_{ij}$ of winning bids on a particular session i will significantly correlate with the value of $v_{ij+1} - b_{ij+1}$,

after being adjusted to price and volume difference between sessions. In other words, the physiological sensations elicited in the previous session is carried through, and influences the decision in, the subsequent session. The level of carry-over effect is the function of adjustment to loss or gain in the former session, which, in turn, might be influenced by time lag between bidding sessions. Hence, it can be hypothesised the longer time between session the less carry-over effect. However, this is not the focus of this study.

The lack of significance of the correlation may indicate the use of minimal or comprehensive account, particularly if the average $v_j - b_j$, close to zero, in which $j=1, \ldots, m$ rounds. However, this condition also implies that there is no winner's curse. That is, evidence of the winner's curse may indicate that bidders were not using minimal or comprehensive account.

Minimal accounting can be discriminated from comprehensive accounting by introducing inter-temporal utility of choice. The reason for this is that insensitivity to contexts would prevent individuals from contextual bias in their decisions, so that its effect on a single case decision it can not be distinguished from comprehensive. The introduction of inter-temporal utility will result in stronger correlation with strategic equilibrium bids when bidder use comprehensive account rather than minimal account. However, this research is not aimed at discriminating between the use of mental account of inter-temporal choice.

Hypothesis 2: Subjects use topical account rather than minimal or comprehensive account when making decision about the amount of bid.

The distinctive feature of prospect theory is the *S*-shaped value function, which implies that individuals are loss-averse. It means that the psychological consequence of the prospect of losing $X is felt more intensely than the same prospect of gaining the same amount of dollar. Consequently, individuals are risk-seeking in contexts, that impose them with a probability of loses; while they prefer avoiding risk to assuming higher degree of risk even though it may give them higher expected outcomes (Kahneman & Tversky, 1979; Tversky & Kahneman, 1991).

The evidence of loss-aversion that might be observed in laboratory auctions could arise from two factors. Loss-aversion results from topical accounting, especially if intervals between bidding sessions are not long enough for individuals to make adjustment to physiological arousal following the experience of losses or gains in previous bidding sessions. The emotional spill-over from the previous session implies that the result from the former session is used as the reference point in the subsequent session. Any session implies loss or gain, but loss leads to risk-seeking while gain leads to risk-aversion, therefore the direction of the correlation coefficient of $v_{ij} - b_{ij}$ and $v_{ij+1} - b_{ij+1}$ indicates the evidence of loss-aversion. It can be predicted that a loss in b_j will be followed by higher $v_{ij+1} - b_{ij+1}$, that turns to a positive correlation; while gains in b_j will be followed by lower $v_{ij+1} - b_{ij+1}$, or negative correlation.

Hypothesis 3: Bidders' decision in a particular bidding session is influenced by results of his bid on previous session. Specifically, losses in previous session lead individual to risk-seeking in the next session; while gains leads individual to risk-aversion in the next session.

Method

Subjects

Fifty eight subjects were used in the present experiment. They were recruited among undergraduate students of the Faculty of Psychology, Gadjah Mada University, Indonesia (GMU). Participation in the experiment was voluntary and independent of any class assignment.

Procedure

Prior to the experimental auction rounds, subjects were briefed about the procedure of the experiment. A three rounds auction was also practised, and subjects discussed and confirmed their understanding about the tasks they asked to perform. Subsequently, those who agreed to participate signed an *informed consent form.* However, two subjects withdrew during the session.

The setting was a contract tender for office supplies to GMU. In total 18 contracts for six kinds products were tendered on 18 bidding sessions. Participants were informed about the quantity and production costs for each product that was offered, an +/- 10% from the estimate costs. The real production cost was drawn randomly, by rolling a dice, after subjects submitted their bids. Table 1 summarises the estimate costs and quantity per product in each session.

The tender was organised in three sessions, 6 bidding rounds each, with a short break (10 minutes) between sessions. The minimum incremental offer was 50, and the lowest bid wins. If there were more than one winner, the contract was divided evenly between winning bidders. Loss and gain were computed by the following equation: *(bid - production cost) x quantity.* Positive value means gains, otherwise losses.

The winner of each group was announced along with the amount of its bid. Other bidders' bids were not announced.

At the end of each session, all subjects who gained a positive balance were given a bonus of Rp. 1,000 that was paid in cash. If they could maintain the surplus through the next sessions, they were given another Rp. 1,000 for each session. Apart from that, an extra bonus was given to each subject who booked a surplus by the end of the experiment. The amount was based on the rank in the group. The highest received Rp. 50,000, followed by Rp. 30,000 for the second highest and Rp. 20,000 for the third highest. The rest of the top ten were given Rp. 10,000, and the 11^{th} – 25^{th} highest received Rp. 5,000, and all the other with surplus were given Rp. 1,000.

In every round subjects bid in small groups (3-4 bidders) or large groups (7-8 bidders). Assignments to bidding groups were random, and compositions of bidders

Table 1
Summary of cost estimate and quantity per product per session

Products	Estimate cost / unit			Quantity		
	- 10%	*v*	+ 10%	Session 1	Session 2	Session 3
Photo copy paper	22.500	25.000	27.500	100	200	300
File box	36.000	40.000	44.000	200	300	100
Lined paper	27.000	30.000	33.000	300	100	200
Floppy disk	45.000	50.000	55.000	100	200	300
Board marker	31.500	35.000	38.500	200	300	100
OHP transparency	41.500	45.000	49.500	300	100	200

on groups were reshuffled from round one to another. Participants were informed about the number of competitors in their group in each round, but not about whom she played against. In other words, subjects knew how many people they competed with, but did not know against whom.

After the briefing and practice sessions, subjects were assigned to two separate groups in two rooms, *Group A* and *Group B*, and they were asked to sit at their seat number. The seats were arranged so that there were one chair in between of two seats. The experiment was run separately, so that there are basically two independent sets of data from experiment 1.

Overall, experiment 1 took approximately 2 hours. Almost 1 hour was spent for administrations, briefing and practices. Each session took approximately 2 minutes, plus short break between sessions to announce and eventually to give the bonus.

Results

Some descriptive statistics and significance of between-groups difference are summarised in Table 2. Some terms may need explanations. *V-actual* is the actual production cost of a product on each round, that was obtained by rolling a dice. *Gp. A* refers to subjects with odd-numbered seats that were assigned to Room A, and *Gp. B* are subjects in Room B. All *Av*-s are abbreviation of 'average'.

The table shows that *Group A* and *Group B* did not differ significantly across the first 12 rounds. The highest and the second highest coefficients of significance are .081 (F=3.15, df=1) and .129 (F=2.09, df=1) respectively, and the lowest significant coefficient is .92 (F=0.1, df=1). This indicates the absence of systematic factors that influence bidding behaviours on these rounds, and thus can be treated equally. However, the difference became significant across the last 6 rounds, with the lowest coefficient at .03 (F=4.82, df=1). In these sessions *Group A* consistently bid lower than Group B, that is, they took more risks in their decision than *Group B*. The tendency toward risk-seeking were also showed in the first two sessions, in which *Group A* bid less than *Group B* in 9 of 12 bidding sessions.

Tests to indicate whether there are systematic influence of the number of competitors on bidding decisions were also carried out. The result indicates that there is no systematic differences between group sizes in all round, except round 3. In this round, the small groups bid significantly lower than the large group, with p=.015 (F=6.245, df=1). Similar results were found from the comparison of winning bids in small and large groups. The results indicate that winners of large groups were not likely to suffer more or less curses than the winners of small groups. It can further be concluded that, in general, the size of groups do systematically influence individual decision-making in the context of this experiment.

The presentation of the production cost estimates was intended to help participants to find easily the expected value of the bid, which is v or the middle point of +/- 10% on Table 1. If participants were risk-neutral, they would have consistently chosen this point. However, if they wanted to both consider expected gains and the probability of winning, they would have discounted this valuation, so that it may have laid somewhere between the middle point or v and the +10% value. Although bidding at the area above +10% would promise higher return, but the probability that such a bid would win is considerably lower. Conversely, bids in the area between v and –10% run a considerable risk of losing money.

Table 2
Summary of descriptive statistics

Stats	Round								
	1	2	3	4	5	6	7	8	9
Upper value	27.50	44.00	33.00	55.00	38.50	49.50	27.50	44.00	33.00
Middle value	25.00	40.00	30.00	50.00	35.00	45.00	25.00	40.00	30.00
V-actual gp A	27.50	36.00	27.00	50.00	38.50	49.50	22.50	40.00	30.00
V-actual gp B	25.00	44.00	27.00	50.00	38.50	45.00	22.50	44.00	27.00
Average bids	26.16	39.81	30.94	49.66	35.11	45.04	25.79	39.84	29.97
Av. bid gp. A	26.19	40.38	30.63	49.33	34.76	44.86	26.14	39.23	29.52
Av. bid gp. B	26.13	39.26	31.24	49.99	35.46	45.22	25.44	40.43	30.44
Sign of t-test A-B	*.920*	*.539*	*.274*	*.452*	*.247*	*.515*	*.406*	*.081*	*.129*
Small group	26.01	40.01	30.10	50.08	35.08	44.55	25.55	40.17	30.05
Large group	26.26	39.65	31.45	49.41	35.13	45.32	25.94	39.62	29.93
Sig. of t-test small-large	*.714*	*.847*	***.015***	*.452*	*.939*	*.179*	*.656*	*.433*	*.842*
Av. winner	23.50	39.19	28.98	46.90	33.05	42.82	24.13	37.02	27.96
Winner small	23.05	39.28	28.43	48.04	33.09	42.79	24.43	37.42	28.24
Winner large	23.94	39.13	29.53	45.43	32.99	42.88	23.73	36.62	27.73
Sig. of t-test winner-loser	*.597*	*.858*	***013***	*.054*	*.860*	*.862*	*.176*	*.506*	*.087*

Stats	Round								
	10	11	12	13	14	15	16	17	18
Upper value	55.00	38.50	49.50	27.50	44.00	33.00	55.00	38.50	49.50
Middle value	50.00	35.00	45.00	25.00	40.00	30.00	50.00	35.00	45.00
V-actual gp A	55.00	31.50	45.00	25.00	36.00	30.00	55.00	35.00	41.50
V-actual gp B	50.00	31.50	45.00	25.00	44.00	27.00	45.00	31.50	49.50
Average bids	48.90	34.49	43.75	24.32	38.84	29.18	47.86	33.39	43.74
Av. bid gp. A	48.42	34.19	43.65	23.88	37.70	28.18	47.11	32.85	42.49
Av. bid gp. B	49.37	34.79	43.85	24.76	39.93	30.22	48.63	33.97	45.03
Sig of t-test A-B	*.238*	*.628*	*.762*	***.011***	***.005***	***.014***	***.032***	***.020***	***.000***
Small group	49.31	35.26	44.32	24.67	39.77	28.69	48.26	33.65	44.17
Large group	48.63	34.05	43.43	24.11	38.20	29.47	47.51	33.25	43.50
Sig. of t-test small-large	*.410*	*.352*	*.193*	*.128*	*.058*	*.372*	*.385*	*.438*	*.349*
Av. winner	46.51	30.74	41.47	23.24	36.98	27.55	45.96	32.10	42.31
Winner small	47.00	32.93	42.13	23.58	37.37	27.70	46.28	32.30	42.73
Winner large	46.02	29.09	40.56	22.94	36.64	27.40	45.72	31.95	41.83
Sig. of t-test winner-loser	*.352*	*.362*	*.214*	*.086*	*.276*	*.213*	*.188*	*.255*	*.074*

Fig. 1 visualises data of average and winning bids as compared to upper and middle value. It obvious that while average bids are pretty close to the expected utility of bids, so that the lines are almost indistinguishable excepts on the last session, the winning bids are significantly lower. This indicates that the curse of winning occurred in this experiment. Since private information has been omitted from the design and there is no systematic influence of group sizes, the winner's curse in this data can only be explained by psychological and contextual factors, and the interactions between them.

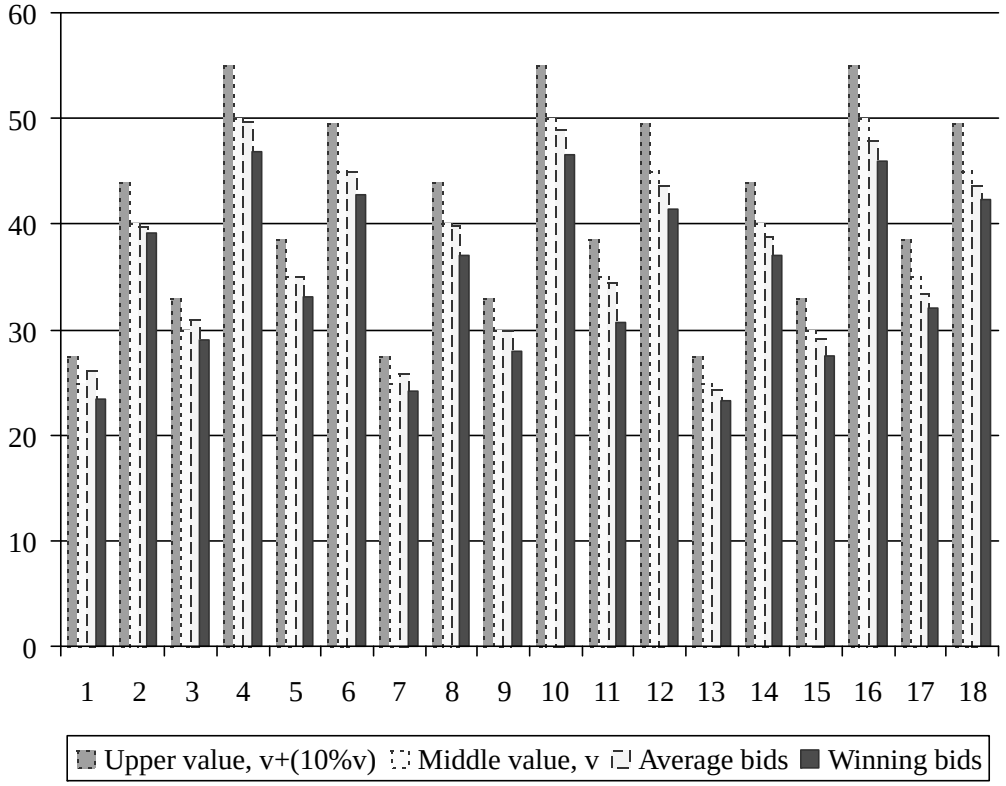

Figure 1. Upper and middle values, average and winning bids

The psychological factor that was hypothesised by this study was *mental accounting*. The evidence of the winner's curse in this data suggests that subjects were using *topical accounts* rather *minimal* or *comprehensive accounts*. Section 2 of this report proposed a method to measure the presence of *mental accounting* from correlations between successive bids. In particular, a *topical accounting* was argued to appear in opposite correlational directions among loses and gains contexts. In other words, profits in previous session would have lead a bidder to take lower risk by bidding more conservatively; while loses encouraged the bidder to take more risks.

To substantiate this hypothesis, gains and loses were calculated by subtracting real production cost c at round i from a bidder's bid b, or $b_i - c_i$. Since price discrepancies between products may cause unequal weights, the value of c was standardised. Correlations between pairs of successive bids with total data result in 10 and 7 positive and negative correlation coefficients respectively. Six of these correlation coefficients were significant or highly significant. Besides, 2 positive correlation coefficients were below .001 and significance coefficients of p above .900. This result indicates that there was no systematic relation between pairs of bids when the topical accounting is not taken into account.

Bivariate analysis to distinguish effect of topical accounting performed subsequently. Within the gains context, 7 correlation coefficients among successive bidding pairs were in the negative directions as predicted, while 9 correlations were positive, and one pair was aborted due to insufficient cases. These results reveal that there were no systematic effects of gains in the previous round to the bidding in the subsequent round.

Table 3
Correlation between pairs of successive bids

Stats	Round								
	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
r total	*-.279*	.009	.257	.260	.177	.003	.161	*-.120*	.774
Sig. *(p)*-total	***.035***	.944	.053	.235	.183	.983	.231	.379	***.000***
r after gains	***-.408***	***-.115***	.257	.171	~~.267~~	.444	.161	.676	.605
Sig. *(p)*-gains	***.011***	.279	***.027***	.188	~~.305~~	***.033***	.115	***.006***	***.000***
N of bidders	31	28	57	29	~~6~~	18	57	13	35
r after loses	***.132***	***.177***	-	***.229***	***.072***	***.042***	-	***.050***	***.461***
Sig. *(p)*-loses	.261	.180	-	.121	.306	.398	-	.376	***.018***
N of bidders	26	29	0	28	52	40	0	43	21

Stats	Round							
	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
r total	.013	*-.081*	*-.015*	*-.142*	*-.493*	.667	.746	*-.552*
Sig. *(p)*-total	.924	.547	.910	.291	***.000***	***.000***	***.000***	***.000***
r after gains	***-.252***	***-.076***	***-.211***	***-.021***	.121	.287	***-.048***	.080
Sig. *(p)*-gains	.165	.288	.217	.463	.262	.074	.407	.337
N of bidders	17	56	16	22	30	27	26	30
r after loses	***.567***	~~-1.00~~	-.153	-.219	***.107***	***.257***	***.208***	***.313***
Sig. *(p)*-loses	***.000***	-	.167	.103	.301	.093	.144	.060
N of bidders	39	2	42	35	26	28	28	26

Analysis on bidding pairs that were preceded by 'loses' gave a better result. After 3 bidding pairs were excluded due to insufficient number of cases, 12 correlation coefficients were found in the positive direction as predicted, while two correlations were in the opposite direction. This finding supports the notion about *loss aversion* and *topical accounting* in loses contexts.

With regard to affective experiences, it was predicted that, in the absent of the *winner's curse,* the second highest bidder would have suffered more regret than the lowest bidder. Consequently, the second highest bidder of this round was predicted to take more risk in the subsequent round than the lowest bidder. Table 1 shows that there were three rounds of the experiment where the *winner's curse* absent, round 3, 7 and 11. However, quite contrary to the prediction, none of the coefficient of difference were significant. Furthermore, the average of second highest bidders' bid was higher than the lowest bidders' bid only in one case, round 8.

Discussion

The research question that this study wanted to answer was whether the temporal aspects of the cycle of decision-making in an experimental auction leads to anomalous decisions. It was argued that since an auction event implies gains and loses and that individuals need a certain duration to adapt to the affective experience, the effect of affective carry-over is ubiquitous in most of standard experimental auctions. It was assumed that regret and mental accounting determine the di-

rection of carry-over effects. Specifically, regret over the failure to act in the previous round was predicted to lead bidders to a higher risk-taking in the subsequent round, and topical accounting more prevalent than minimal and comprehensive accounting. The reference dependence utility leads to prediction that topical accounting leads individual to a different risk preference in different contexts, that is, gains and loses contexts.

With regard to the effect of regret, this study failed to find evidence to prove or disprove the prediction. Statistical analysis resulted in no systematic indication about the evidence of the effect of regret on decision-making. However, this was due to limitations in the design of experiment. Subjects were only informed about the highest value on the bidding groups, with no reference to their position among all other bidders. Therefore, subjects might know the highest bid, but they could not ascertain whether their bid was second highest or the lowest. Therefore, reference about the evidence of regret on the subsequent bidding could not be established.

In general, these predictions about the effect of topical accounting have been confirmed in this study. The winning bidders in this study suffered the winner's curse, although the *private information* effects were omitted and the optimal bidding strategy could easily be identified. Apparently, topical accounting was more prevalent in bidders' cognitive process than minimal and comprehensive accounting. Further predictions were also confirmed. Even though systematic relationship between successive bidding pairs were not found when data were analysed as a whole, close examination to different contexts revealed higher accuracy observation. Subjective experience of loses in a round was found to be correlated positively with risk taking in the subsequent round in 12 out of 14 successive bidding pairs. On the other hand, such a strong relationship was not found in the context of gains. This finding confirmed the reference dependent utility prediction of prospect theory that individual are loss averse rather than risk-averse. Bidders in this experiment seek more risks when they experienced loss in a previous round, and thus they amplified the possibility of being cursed in the auction.

It needs to be emphasised that 'loss' and 'gains' in this context were not actual loses and gains. The data were obtained from all bidders in each round, from which only 12 bidders, or in some cases more than 12, were actually have won the tender. Although this strategy can be defended by the argument that bidders evaluate their bidding strategy round by round, so that they experience the thrill of overbidding or underbidding even though they were not the winners, Kahneman and Tversky (1982) assert that the reference point can be determined by events that are only imagined. The frustration experienced in an unsatisfactory auction round increases when it is easy to imagine a more desirable alternative. An individual's experience of pleasure or frustration may therefore depend on an act of imagination that determines the reference level to which reality is compared.

Nevertheless, there might be difference in emotional intensity between the real profits makers and the real victims with those who are not. It would have been better if this line of thought could be compared to the data from this experiment. However, this was not possible with the data that were available. Since the experiment consisted only of 12 groups, so that there were only 12 winners, of which some may suffered loses while the other gains. Therefore, satisfactory statistical analysis on them would not be possible to obtain.

The possible implication of this finding to research on auctions in particular, and behavioural-decision making in general, are quite extensive. This study indicates that temporal aspects of a cycle of decision induce bias in individual decision-making. Anomalies that might be found in such an event are therefore not related to irrationality of the individual as might be evident in the real world. Rather, it is more likely that the design of experiment failed to control carry-over effects of affective experience in the successive decision tasks.

However, the generalisation of this finding needs to be taken cautiously. The temporal dimension on this study has not been varied, therefore variance among different scales of time can not be established. Consequently, although this study concludes that temporal aspects could be the evil of the laboratory winner's curse, it can not suggest any measure of the how powerful is the evil.

References

Bateman, I., Munro, A., Rhodes, B., Starmer, C., Sugden, R. (1997). Reference-dependent preferences. *The quarter journal of economics,* 112, 479 – 506.

Capen, E., Clapp, R., Campbell, W. (1971). Competitive bidding in high-risk situations. *Journal of Petroleum Technology,* 23, 641 – 653.

Coombs, C.H., Dawes, R.M., Tversky, A. (1970). *Mathematical psychology: An elementary introduction*. Englewood Cliffs: Prentice-Hall.

Dyer, D., Kagel, J.H., Levin, D. (1989). A comparison of naïve and experienced bidders in common value offer auctions: A laboratory analysis. *The Economic Journal,* 99, 108 – 115.

Garvin, S., Kagel, J.H. (1994). Learning in common value auctions: Some initial observations. *Journal of Economic Behavior and Organizatin,* 25, 351- 372.

Giliberto, S.M., Varaiya, N.P. (1989). The winner's curse and bidder competition in acquisitions: Evidence from failed bank auctions. *The Journal of Finance,* 44, 59 – 75.

Hansen, R.G., Lott, Jr., J.R. (1991). The winner's curse and public information in common value auctions: Comment. *The American Economic Review,* 81: 347 – 361.

Johnson, E.J., Hershey, J., Meszaros, J., Kunreuther, H. (2000). Framing, Probability Distortions, and Insurance Decisions. In Tversky, A., & Kahneman, D. (Editors). *Choices, Values, and Frames.* Cambridge, UK: Cambridge University Press.

Kagel, J.H., Harstad, R.M., Levin, D. (1986). Information impact and allocation rules in auctions with affiliated private values: A laboratory study. *Econometrica,* 55, 1275 – 1304.

Kagel, J.H., Levin, D. (1986). The winner's curse and public information in common value auctions. *The American Economic Review,* 76, 894 – 920.

Kahneman, D., Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica,* 47, 263 – 291.

Kahneman, D., Tversky, A. (1982). The psychology of preferences. *Scientific American,* 246, 136 – 142.

Kahneman, D., Tversky, A. (1984). Choice, values, and frames. *American Psychologist*, 39, 341 – 350.

Kahneman, D., Waker, P.P., Sarin, R. (1997). Back to Bentham? Explorations of Experienced Utility. *The Quarterly Journal of Economics,* May, 375 – 405.

Knetsch, J.L., Tang, F., Thaler, R.H. (2001). The endowment effect and repeated market trials: Is the Vickrey auction demand revealing? *Experimental Economics,* 4, 257 – 269.

Kusser, A., Spohn, W. (1992). The utility of pleasure is a pain for decision theory. *The Journal of Philosophy,* 89, 10 –29.

Luce, R.D., Faiffa, H. (1957). Games and Decisions. New York: Dover Publications.

McAfee, R.P., McMillan, J. (1987). Auctions and bidding. *Journal of Economic Literature,* 25, 699 – 738.

Milgrom, P.R., Weber, R.J. (1982). A theory of auction and competitive bidding. *Econometrica,* 50, 1089 – 1122.

Read, D., Loewenstein, G. (1999). Enduring pain for money: Decisions based on the perception and memory of pain. *Journal of Behavioral Decision Making,* 12, 1 – 17.

Riley, J., Samuelson, W. (1981). Optimal auctions. *American Economic Review,* 71, 381 – 392.

Roll, R. (1986). The hubris hypothesis of corporate takeovers. *Journal of Business,* 59, 197 – 216.

Roth, A.E. (1995). Introduction to experimental economics. In J.H. Kagel & A.E. Roth, *Handbook of Experimental Economics.* Princeton: Princeton University Press.

Thaler, R.H. (1992). The Winner's Curse. In R.H. Thaler (ed.). *The Winner's Curse.* Princeton, NJ: Princeton University Press.

Thaler, R.H. (1999). Mental accounting matters. *Journal of Behavioral Decision Making,* 12, 183 – 206.

Tversky, A., Fox, C.R. (1995). Weighing risk and uncertainty. *Psychological Review,* 102, 269 – 283.

Tversky, A., Kahneman, D. (1981). The framing of decisions and the psychology of choice. *Science,* 211, 453 – 458.

Tversky, A., Kahneman, D. (1986). Rational Choice and the Framing Decisions. *Journal of Business.* 59, 5251 – 5278.

Tversky, A., Kahneman, D. (1991). Loss Aversion in Riskless Choice: A Reference-Dependent Model. *The Quarterly Journal of Economics,* 106,, 1039 - 1061.

Zeelenberg, M. (1999). Anticipated regret, expected feedback and behavioral decision making. *Journal of Behavioral Decision Making,* 12, 93 – 106.