

# **The winner's curse in common value auctions: an experimental study on the Brazilian environment**

**(O fenômeno da maldição do vencedor em leilões: um estudo experimental no ambiente brasileiro)**

Danielle Mendes Vanzan  
Marcos Gonçalves Avila

## **Abstract**

The “winner’s curse” occurs when winning bidders of auctions systematically bid above the actual value of the objects and thereby systematically incur losses. In order to investigate the incidence of the winner’s curse in Brazil, we conducted an experiment consisting of a series of auctions of a fictitious object. The Risk Neutral Nash Equilibrium model was adopted as the benchmark for the performance observed. The results provided partial support to the occurrence of the winner’s curse. No systematic losses occurred but the financial results in the auctions were significantly inferior to those predicted by the equilibrium model.

**Key words:** Winner’s curse; Experimental economics; Common value auctions.

Frequently, economists do not distinguish between normative models and descriptive models of economic agents’ decision behavior . Although economic theorists tend to adopt a normative view (which rational economic agents *should* do), a common claim is that normative models also predict what economic agents will *actually* do. Empirical and experimental evidence collected over past decades, however, has brought to the surface a series of phenomena where the divergence between the two approaches has been systematically confirmed. The object of this study is associated with the discussion and testing of one of those phenomena – the “winner’s curse”.

## **The winner’s curse**

The phenomenon known as the “winner’s curse” was initially identified by Cappen, Clapp and Campbell (1971 *apud* KAGEL; LEVIN, 2001) in the context of auctions held by the American government in the 1960s for the granting of rights to exploit petroleum and gas reserves. Such auctions were generally modeled as common value auctions (KAGEL; LEVIN, 2001). In the common value model, the object at auction is worth the same “true” value for all bidders. However, the bidders have different “signals” or estimates of that value (CHAKRAVARTI *et al.*, 2002). Since the bidders are not certain as to the value of the object for sale, they might bid higher than the object’s real value.

In this study, the winner’s curse is said to occur whenever the winning bidder of the auction systematically acquires objects for sale at a value greater than their real value and,

therefore, incur either systematic financial losses or a lower profit than expected (LIND; PLOTT 1991). In this study, the winner's curse is investigated within the context of auctions where only one object is up for sale.

The occurrence of the winner's curse can be explained as follows. It is assumed that the bidders do not know the real value of the object when they make their bids, but each bidder has an independent signal that provides an unbiased estimate of that value. Some bidders will underestimate the object's value, while others will overestimate it. Since the estimates are unbiased, they represent, on average, the real value of the object. If we assume that all bidders employ the same strategy, the winner of the auction will be the one with the highest estimate of the value of the object. However, the highest estimate among several unbiased estimates tends to be an overestimate. If the bidders do not take this fact into account when deciding on their bids, the winner of the auction may submit a bid that exceeds the expected value of the object for sale, conditioned on having the highest estimate of value (COX; DINKIN; SWARTHOUT, 2001). Assuming that auction participants are either neutral or risk averse, and considering that the holder of the highest signal wins the auction, the result is that the winning bidder bids a value higher than the expected value of the object for sale conditional on having the highest signal. This behavior will insure, on average, a negative financial result (KAGEL; LEVIN, 1986). In a milder version of the phenomenon, the winner of the auction does not incur a loss, but obtains a financial result lower than expected. In this case, the value of the object is lower than the value estimated by the winner, so he/she is disappointed with the financial result (THALER, 1988).

Also, the winner's curse describes an ordinary paradox: someone wins a competition to have priority to buy an object, and then receives disappointing news about the value of that item that has just been bought; such a situation would not only generate poor financial results to the buyers, but also provoke distortions on the market (BAZERMAN, 2004). The psychological urge to win generally creates an overly enthusiastic buyer and, consequently, a seller with huge chances of generating profit (CHUA; LUK, 2005).

Thaler (1988) points out that "the winner's curse cannot occur if all bidders are rational..." (THALER, 1988, p. 192). In the words of Kagel and Levin (1986, p. 894), the incidence of the winner's curse will "imply that bidders repeatedly err, in violation of basic notions of economic rationality." In such context, rationality means that the economic agents will make decisions using available information logically and consistently in order to make the best choices given the available alternatives. It is believed that agents evaluate the state of the economy and process information according to normative statistical principles and following the expected utility theory (VON NEUMANN; MORGENSTERN, 2007). Cox and Isaac (1984)

showed that agents who maximize their expected utility revise their estimates downward and reduce their bids so as to avoid the winner's curse (KAGEL *et al.*, 1989).

The winner's curse is a very persistent phenomenon: even when agents are perfectly aware of the curse, they tend to present many difficulties in keeping their bids low, in order to avoid negative financial results (TIDEMAN, 2004).

There is a greater occurrence of the winner's curse in situations in which the assets of an organization go to auction as a result of bankruptcy, when the subjects involved are women and/or individuals with little experience in similar situations (CASARI; HAM; KAGEL, 2007). Chua and Luk (2005) found evidences that groups are superior to isolated individuals in making acquisition choices that provoke a lessening of the winner's curse effects.

### **Causes and intervening factors**

Two questions of interest in studying the phenomenon are: (1) Why does the winner's curse occur? and (2) What factors increase the frequency and intensity of the winner's curse?

The occurrence of the winner's curse is generally explained by the exclusion of relevant information from the bidders' decision-making process. Bazerman and Samuelson (1983) identify two factors that affect the occurrence of the winner's curse. The first is the degree of uncertainty concerning the value of the object for sale: the greater the uncertainty associated with the object's value, the greater the variance of the estimates of its value. In its turn, an increase in the dispersion of the estimates and bids should increase the probability that the winning bid will exceed the real value of the object. The second factor refers to the number of bidders. An increase in their number would also result in an increase in the variance of the estimates and bids. Thus, the probability of having an excessively high estimate should also increase as the number of competitors at the auction increases. Therefore, in order to avoid the winner's curse in auctions where there is much uncertainty concerning the value of an object, or where there is a large number of bidders, it is necessary to make a greater discount in the estimate of the object's value and, consequently, further reduce the bid to be submitted.

### **Empirical evidence**

Studies carried out using field data have shown evidence of the winner's curse in several contexts: in petroleum industry (CAPEN *et al.*, 1971; LORENZ; DOUGHERTY, 1983 *apud* KAGEL; LEVIN, 2001), in the stock market (MILLER, 1977 *apud* BAZERMAN; SAMUELSON, 1983), in the professional baseball's free agency market (CASSING; DOUGLAS, 1980; BLECKERMAN; CAMERER, 1998 *apud* KAGEL; LEVIN, 2001), in the publishing market (DESSAUER, 1981 *apud* KAGEL; LEVIN, 2001), in corporate takeover

battles (ROLL, 1986 *apud* KAGEL; LEVIN, 2001), and in the real estate market (ASHENFELTER; GENESORE, 1992 *apud* KAGEL; LEVIN, 2001).

Bajari and Hortacsu (2003) measured the extension of the winner's curse for different reference prices in Internet auctions.

The results of these empirical studies are viewed with skepticism by many economists, however, because of the lack of reliability in the data analyzed and due to inherent problems in interpreting them (KAGEL; LEVIN, 1986 and 2001). Field data are frequently complex and incomplete and allow several alternative explanations for the pattern of excessively high bids and unusually low returns found in those studies (KAGEL; LEVIN, 2001).

The ambiguity inherent in the empirical studies and the controversial nature of the allegations related to the winner's curse have motivated the adoption of experimental designs to study the phenomenon (KAGEL; LEVIN, 2001). The first experimental demonstration of the winner's curse was conducted in a classroom setting by Bazerman and Samuelson (1983). They conducted a series of first-price sealed-bid auctions of jars containing coins or paperclips, using MBA students as bidders. Data revealed that the average winning bid was significantly higher than the real value of the auctioned objects. The auctions were generally won by competitors with high estimates, and such estimates were, on average, high enough for the winner to realize a loss (KAGEL; ROTH, 1997).

John Kagel, Dan Levin and their associates conducted several experiments with a similar design, which consisted of a series of auctions of a fictitious object with feedback about the results after each round. They compared the performance observed in the auctions with the performance predicted by a bidding model in which everyone bids rationally: the Risk-Neutral Nash Equilibrium, or RNNE model (KAGEL; LEVIN, 1986).

The series of auctions conducted with inexperienced bidders showed a strong incidence of the winner's curse (KAGEL *et al.*, 1989). However, the results obtained with "semi- or moderately experienced" bidders varied according to the number of participants in the auction (KAGEL; LEVIN, 1986). In groups of 3 to 4 bidders (small groups), the results were generally positive and represented around 65% of the value predicted using the RNNE model. However, in groups of 6 to 7 bidders (which were called "large" groups), there was an average loss of US\$ 0.88 per auction as opposed to an average profit of \$4.68 predicted by the RNNE. In general, although results improved sensibly with respect to those obtained by inexperienced bidders, they continued to be lower than the rational predictions. The bidder with the largest information signal generally won the auction, both in the small and in the large groups. The winning bid exceeded the expected value of the object for sale conditioned on winning the auction in 17.3% of the auctions with a small number of bidders, and in 53.8% of the auctions involving a large

number of bidders. Kagel and Levin (1986) concluded that the judgmental errors responsible for the winner's curse were absent in the small groups but highly present in the large ones.

The results obtained in Kagel, Levin and Harstad (1987 *apud* THALER, 1988) for second-price sealed-bid auctions were similar to those obtained for first-price auctions: on average, there was a profit in the small groups (which represented about 53% of the profit predicted by the RNNE model), and an average loss of \$2.15 per auction in the large groups against a predicted profit of \$3.95 by the RNNE model.

Kagel, Levin and their associates also conducted experiments using English auctions and first-price auctions with insider information. The researchers sought to identify structures capable of eliminating or reducing the winner's curse (KAGEL; LEVIN, 2001). There was evidence for the winner's curse with inexperienced bidders both in first-price sealed-bid auctions and in English auctions. However, the data presented in Levin, Kagel and Richard (1996 *apud* KAGEL; LEVIN, 2001) revealed that the winner's curse was relatively more severe in first-price auctions than in English ones. In first-price sealed-bid auctions with insider information conducted by Kagel and Levin with inexperienced bidders (1999 *apud* KAGEL; LEVIN, 2001), there was an incidence of the winner's curse in at least 47% of all the bids submitted by participants considered both insiders and outsiders. Additionally, there was no significant difference between the results obtained in auctions involving asymmetric information structure in comparison with those involving symmetric information structure.

Kagel and Richard (2001) investigated the behavior of "super-experienced" bidders – individuals who had already participated in at least two prior series of first-price sealed-bid auctions. The average financial results were positive both in the small groups and in the large ones, and, in general, there was no incidence of the winner's curse. Nevertheless, the financial results observed were much lower than those predicted by the Nash equilibrium model (on average, the bidders obtained less than half the results predicted by the RNNE model).

Lind and Plott (1991), and Cox, Dinkin and Swarthout (2001) investigated the winner's curse using experimental designs different than the one developed by Kagel and Levin. Lind and Plott (1991) allowed the participants to have full financial liability for losses likely to occur in the experiments. The results observed by the researchers confirmed the conclusions of Kagel and Levin (1986). Cox, Dinkin and Swarthout (2001) held common value, first-price sealed-bid auctions, with endogenous determination of market size – at an auction with endogenous entry and exit, the potential buyer decides whether or not he/she will bid in the auction. Their experimental design included a profitable alternative activity that established an opportunity cost of bidding in the auction. They reported that the winner's curse occurred among inexperienced

bidders and could be a problem for experienced bidders in auctions with a large number of competitors – auctions with approximately a dozen potential bidders.

Researching Internet transactions, Oh (2002) noticed that in auctions among consumers (C2C) there is a greater risk of winner's curse occurrence than in those from companies to consumers (B2C). The results of this study show that the Internet seems to create a market in which less informed consumers could eventually be penalized: information technology seems to change rapidly the market towards favoring the consumer; however, consumers are still excessively passive to profit from such market conditions.

Amyx and Luehlfing (2006) studied the winner's curse in online auctions and in retail websites that get together to constitute a parallel sales distribution channel. Results showed that the bids offered for the auctioned commodities exceeded the reference prices for similar items commercialized in sales websites, characterizing the existence of the winner's curse. The authors also found out that, in spite of being able to minimize the occurrence of the winner's curse through the manipulation of the reference prices and the size of the auctioned lots, irrational or erratic behavior can also contribute to misinformation.

While studying vertical cross-shareholding, that is, the mutual holding of a minority of shares between vertically related firms, Guth, Nikiforakis and Normann (2007) pointed out that, to avoid the winner's curse, buyers are more prone to accept cross-shareholding than buyers.

## **Research hypotheses**

In this study, the stronger version of the winners curse follows Lind and Plott (1991) according to which the phenomenon occurs if auction winners systematically make bids above the real value of the object for sale, therefore experiencing systematic financial losses. The research hypothesis formulated in order to test the incidence of the winner's curse was set forth as follows:

H<sub>1</sub> - In common value, first-price sealed-bid auctions, the winning bid presents, on average, a value higher than the real value of the auctioned item. As a result, the auction winner has, on average, a negative financial result.

Additionally, we evaluated the percentage of winning bids that exceeded the expected value of the object for sale conditioned on winning the auction, as bidding in excess of the conditional expected value is characteristic of the phenomenon (COX; ISAAC, 1984)

The incidence of the winner's curse opposes the premise of the adoption of rational behavior by auction bidders. The assumption that economic agents make rational decisions and act rationally permeates the standard economic theories that guide the neoclassic paradigm (VAN RAAIJ, 1999). In that context, the most common equilibrium-bidding model in the

economic literature and, therefore, a benchmark for rational behavior in auctions, is the Risk Neutral Nash Equilibrium model or RNNE. The RNNE model assumes that auction bidders recognize the fact that, if a competitor turns out to be the bidding winner, it means that his/her estimate must have been higher than the “true” value of the object for sale. Thus, in the RNNE calculation, each bid is adjusted downward to reflect the information contained in the event that the bid turns out to be the highest among all the others (DAVIS; HOLT, 1992).

Thaler (1988) points out, however, that acting rationally in a common-value auction is a difficult task, because it requires making a distinction between the expected value of the object for sale conditioned only on the information available *a priori* and the expected value conditioned on winning the auction. If auction bidders do not make such a distinction, and consequently do not make the necessary adjustment, they may submit bids, on average, higher than those predicted by the RNNE model. In order to test this proposal, a research hypothesis was formulated as follows:

H<sub>2</sub> – In common value, first-price sealed-bid auctions, the winning bid is, on average, higher than the one predicted by the RNNE model. As a result, the auction winner has, on average, a financial result lower than that predicted by the RNNE.

The hypotheses so-formulated were verified in a laboratory setting through common value auctions involving a fictitious object, utilizing the experimental design proposed by Kagel and Levin (1986).

### **Research methodology**

The experimental group was composed of undergraduate and graduate students from the Federal University of Rio de Janeiro, with the sample selected by accessibility. Two experimental sessions were conducted. Ten Master’s Degree students participated in experimental session No.1, and eleven undergraduate students took part in in experimental session No. 2, . A 5% significance level was adopted for all the statistical tests conducted to test the hypotheses.

The experimental design utilized in this research was employed in numerous studies involving common value auctions (KAGEL; LEVIN, 1986; KAGEL *et al.*, 1989; KAGEL; RICHARD, 2001; among others). The experiment consisted of conducting a series of common-value first-price sealed-bid auctions, in which the bidders acted as buyers of a fictitious object. The auction participants received an initial credit that served to absorb possible losses and establish an opportunity cost for the submission of excessively high bids. The gains (or losses) realized in each auction of the series were credited (or debited) against this initial credit. Bidders

whose accumulated balance turned zero or negative were considered bankrupt and were not allowed to participate in subsequent auctions.

The winner's curse occurs in a context in which bidders make their bids without knowing the real value of the object for sale. In the experiment, the value ( $V$ ) of the auctioned object was chosen randomly from a uniform distribution on a given interval  $[V_L, V_H]$ . The bidders made their bids without knowing, therefore, the real value of the object for sale. Nevertheless, each bidder received a private information signal ( $s_i$ ) drawn randomly from a uniform distribution on the interval  $[V - \varepsilon, V + \varepsilon]$ . Thus, the private signals ( $s_i$ ) constituted unbiased estimates of value  $V$  (or could be utilized together with  $V_L$  and  $V_H$  to calculate unbiased estimates), and  $\varepsilon$  represented the degree of uncertainty related to the value ( $V$ ) of the object (the higher (lower)  $\varepsilon$  the more (less) uncertain the value of the object to the bidder). Both  $V_L$ ,  $V_H$ ,  $\varepsilon$  and the distributions used were known to all the bidders. Given  $s_i$ ,  $\varepsilon$ ,  $V_L$  and  $V_H$ , the lowest and highest possible values for the item at auction in this experimental design were  $\max(s_i - \varepsilon, V_L)$  and  $\min(s_i + \varepsilon, V_H)$ , respectively. Such values were reported to each bidder together with his/her signal  $s_i$ .

The information signals thus obtained satisfied the criterion of positive affiliation described by Milgrom and Weber (1982 *apud* KAGEL; LEVIN, 1986), which roughly means that a high value for a given signal increases the probability that other bidders' signals and the value of the object itself are also high instead of low (KAGEL; LEVIN, 1986).

At the end of each auction, the bidders received substantial feedback with respect to the results. The winning bid and all the other ones, as well as their respective information signals, the real value of the object for sale, and the financial result realized by the winning bidder were all announced.

Initially, several training auctions were held so that the bidders could become familiarized with the dynamics of the experiment. Even when the participants of an experiment have the chance to put forth 100 attempts to gain experience, the occurrence of the winner's curse is observed (SELTEN; ABBINK; COX, 2005).

The results of these auctions were not transferred to the bidders' balances. The financial result was calculated by the difference between the object's value  $V$  and the value of the highest bid. This result was credited (or debited) to the auction winner's balance, while the balances of the other bidders remained unchanged. At the end of the experiment, the participants received their end-of-experiment balance in cash.

The instructions distributed to the participants at the beginning of the experimental sessions are presented in Appendix 1.

Generally, in experiments concerning the winner's curse, the number of bidders in the auction and the uncertainty associated with the auctioned object are manipulated. In this study, we investigated the incidence of the phenomenon solely in auctions of an object with a highly uncertain value and a large number of competitors. We adopted the standard already established in the literature for large groups, which is seven bidders. In order to make provision for the possibility of some bidders going bankrupt, more participants were recruited than the desired number of auction competitors, a procedure also adopted by Kagel and Levin (1986 and 1989), and Kagel and Richard (2001). The uncertainty associated with the object's value, *epsilon* ( $\epsilon$ ), assumed a value equal to R\$30.00. This value was equivalent to the highest level of uncertainty adopted by Kagel and Levin (1986), and it was converted to the Brazilian currency at an exchange rate of US\$ 1.00 = R\$ 1.00. All other monetary values utilized in this study were also taken from Kagel and Levin (1986) and equally converted to the Brazilian currency at the mentioned exchange rate. The adequacy of those values was tested in pilot sessions of the experiment.

## Results

The financial results observed and those predicted by the Risk Neutral Nash Equilibrium model were calculated for each auction. The financial result of an auction was given by the difference between the real value of the auctioned object and the value of the winning bid:

$$(\text{Financial result}) = (\text{Real value of the object}) - (\text{Winning bid})$$

To calculate the observed financial result, the difference between the real value of the object and the value of the observed winning bid was calculated. TAB. 1 of Appendix 2 presents the real value of the object, the value of the winning bid and the financial result observed in each of the 27 valid auctions<sup>1</sup> of experimental session No. 1, and of the 20 auctions of experimental session No. 2.

In order to determine the financial result predicted by the Nash equilibrium model, the difference between the real value of the object and the value of the winning bid predicted by the model was computed. To calculate the value of the winning bid, we utilized the bid function of the RNNE presented by Kagel and Levin (1986):

$$b(s_i) = s_i - \epsilon + Y \quad \text{for } V_L + \epsilon \leq s_i \leq V_H - \epsilon \quad (1)$$

$$b(s_i) = V_L + (s_i + \epsilon - V_L)/(N + 1) \quad \text{for } s_i < V_L + \epsilon \quad (2)$$

where  $Y = [2\epsilon/(N + 1)] \exp[-(N/2\epsilon)(s_i - (V_L + \epsilon))]$ ;

---

<sup>1</sup> Three out of the thirty auctions held in experimental session No. 1 were discarded for analyzing the results. One, due to a trivial error in calculating the total for the auction winner; another, for its result having been considered a clearly discrepant observation with respect to the others; and a third, due to the number of auction participants having been reduced to six.

$b(s_i)$  is the bid predicted by the model;

$s_i$  is the bidder's information signal;

$N$  is the number of auction bidders;

$\varepsilon$  is the value of the signal range [ $s_i \in (V - \varepsilon, V + \varepsilon)$ ];

$V_L$  is the lowest value of the interval from which the value  $V$  of the object was extracted in each auction;

$V_H$  is the highest value of the interval from which the value  $V$  of the object was extracted in each auction.

The Nash equilibrium bid function has no analytical solution for signals greater than  $(V_H - \varepsilon)$ . Consequently, in order to compute the bid predicted for signals on that interval, we employed as an approximation the solution derived for signals contained within the interval  $V_L + \varepsilon \leq s_i \leq V_H - \varepsilon$ . This approximation was also employed by Kagel and Levin (1986).

The parameters adopted in this study were:

- $N = 7$  bidders;
- $\varepsilon = \text{R}\$30.00$ ;
- $V_L = \text{R}\$25.00$ ;
- $V_H = \text{R}\$225.00$ .

Replacing the parameters adopted in equations (1) and (2) and using the approximation previously described for the case of signals greater than  $(V_H - \varepsilon)$ , we get:

$$b(s_i) = s_i - 30.00 + Y \quad \text{for } s_i \geq 55.00 \quad (1')$$

$$b(s_i) = 25.00 + (s_i + 5.00)/8 \quad \text{for } s_i < 55.00 \quad (2')$$

where  $Y = 7.50 * \exp [-(7 / 30.00)(s_i - 55.00)]$

TAB. 2 of Appendix 2 presents the real value of the object, the highest information signal, the value of the predicted winning bid (calculated with equations (1') and (2')), and the financial result predicted for each of the 27 valid auctions in experimental session No. 1 and each of the 20 auctions in experimental session No. 2.

Considering that the two sessions were held under the same experimental conditions, as repetitions of the same experiment, we joined the two sets of observations (27 from experimental session 1 and 20 from experimental session 2) in a single set of 47 sample observations. The mean financial result for this set of 47 observations was R\$1.08. In order to test  $H_1$ , we applied a t-test procedure using a 5% criterion of significance and the results (t statistic=0.912 and p-value=0.820) did not allow us to reject the null hypothesis of a non-negative mean financial

result. Therefore, the research hypothesis ( $H_1$ ) that the winning bidder has, on average, a negative financial result was not confirmed.<sup>2 3</sup>

In order to test  $H_2$ , we compared the mean financial result of R\$1.08 to the mean result predicted by the RNNE model, which was R\$7.34. The hypothesis in its null form was that the winning bidder would have a financial result equal to or greater than the result predicted by the RNNE model. We applied a t-test for paired data and the results (t statistic=-3.750 and p-value=0.001) allowed us to reject the null hypothesis. Therefore, the research hypothesis that the winner bidder has, on average, a financial result lower than the result predicted by the RNNE model ( $H_2$ ) was confirmed.<sup>4 5</sup>

To calculate the expected value of the object for sale conditioned on winning the auction,  $E(V/S_i = s_i)$ , we utilized the equation presented in Kagel and Levin (1986), reproduced as follows.

$$E(V/S_i = s_i) = s_i - \epsilon (N - 1)/(N + 1) \quad \text{for } V_L + \epsilon \leq s_i \leq V_H - \epsilon \quad (3)$$

For the parameters adopted in the experiment:

$$E(V/S_i = s_i) = s_i - 30.00 * (6/8) \quad (3')$$

We opted to calculate  $E(V/S_i = s_i)$  solely for the auction winner. This value served as a standard of comparison for the winning bid presented. Nevertheless, it was only possible to calculate  $E(V/S_i = s_i)$  for the auction winner when the winner's signal was in the range  $[V_L + \epsilon, V_H - \epsilon]$ , since equation (3) is valid only in this signal range. The expected value of the object for sale conditioned on the event of winning the auction for the winning bidder whose information signal was in the range  $[V_L + \epsilon, V_H - \epsilon]$  is presented together with his/her signal in TAB. 1 of Appendix 2.

<sup>2</sup> In experimental session no. 1 (no. 2), the mean financial result observed was R\$0.92 (R\$1.30) for the 27 (20) valid observations. A t-test at the 5% significance level (t statistic=0.621 and p-value=0.730 in session 1 and t-statistic=0.654 and p-value=0.740 in session 2) reaffirmed by a Wilcoxon test (Z statistic=0.577 and p-value=0.718 in session 1 and Z statistic=1.643 and p-value=0.950, in session 2) confirmed, for each experimental session, the results obtained for the aggregated data: we failed to reject the null hypothesis of non-negative financial result.

<sup>3</sup> The normality hypothesis required by the t-test could not be rejected at the 5% significance level in the Kolmogorov-Smirnov test conducted on the sample observations of experimental sessions 1 and 2 (Z statistic=0.568 and p-value=0.904, in session 1 and Z statistic=0.871 and p-value=0.434 in session 2).

<sup>4</sup> In experimental session no. 1 (no. 2), the mean financial result observed represented 10.7% (22.9%) of the mean result predicted by the RNNE model, which was R\$8.56 (R\$5.70) for the 27 (20) valid observations. A t-test at the 5% significance level (t statistic=-6.789 and p-value=0.000 in session 1 and t-statistic= -2.330 and p-value=0.016 in session 2) reaffirmed by a Wilcoxon test (Z statistic=-4.421 and p-value=0.000 in session 1 and Z statistic= -3.024 and p-value=0.001, in session 2) confirmed, for each experimental session, the results obtained for the aggregated data: we rejected the null hypothesis of a financial result equal to or greater than the result predicted by the RNNE model.

<sup>5</sup> The normality hypothesis required by the t-test could not be rejected at the 5% significance level in the Kolmogorov-Smirnov test conducted on the sample observations of experimental sessions 1 and 2 (Z statistic=1.165 and p-value = 0.132 in session 1 and Z statistic=0.968 and p-value=0.306 in session 2).

The analysis of the data obtained in the two experimental sessions revealed that the bidder with the highest information signal was the winner of the auction in approximately 62% of the auctions held, and the winning bid exceeded the expected value of the object for sale conditioned on the event of winning the auction,  $E(V/S_i = s_1)$ , in more than 57% of the auctions.<sup>6</sup>

The fact that more than 50% of the winning bids exceeded  $E(V/S_i = s_1)$  gave evidence of the difficulty of the experiment participants in recognizing the mechanism responsible for the winner's curse and making the necessary adjustment in their bids. As a result, the average pocketed gain in the auctions was quite small when compared to the profit opportunities predicted by the theoretic model. One may suppose that the auction bidders had made a partial, but incomplete, adjustment. Thus, the bidders were able to avoid incurring systematic losses, but their results were very low in comparison with the benchmark given by the RNNE model.

## Conclusions

This research sought to investigate the incidence of the winner's curse in common-value first-price sealed-bid auctions in the Brazilian environment. An experiment was conducted and the results showed no evidence of the winner's curse in the form of systematic financial losses realized by the auction winners for the parameters adopted in the experiment. However, the observed financial results were, on average, much lower than the results predicted by the Risk Neutral Nash Equilibrium model. These results, when compared with the profit possibilities described by the Nash equilibrium, indicate the auction bidders' difficulty in recognizing the mechanism responsible for the winner's curse.

Overall, the results obtained in this study were similar to those presented in the international literature related to the theme, considering the number of auction bidders and the degree of uncertainty associated with the value of the object adopted. They provide partial support to the occurrence of the winner's curse. The equilibrium bidding model failed in describing the participants' behavior in the study. In general, the results of this and other studies indicate that there is a gap between the normative and descriptive approaches related to judgment and decision-making in competitive bidding scenarios.

Common-value auctions represent a market in which the participants are particularly inclined to show suboptimal economic behavior, and this behavior may affect the market results in significant ways (KAGEL; LEVIN, 1986). They will lead to a profit substantially lower than

---

<sup>6</sup> To calculate the proportion of winning bids that exceeded the expected value of the object for sale conditioned on the event of winning the auction, only those auctions in which the winner signal was in the range  $[V_L + \epsilon, V_H - \epsilon]$  were considered.

the one expected at the time the bid was made, and might cause a financial loss depending on the extension through which the participants are ‘cursed’.

The problem of information asymmetry can cause the winner’s curse in many situations. However, Garbarino and Slonim (2007) deduced that many people prefer the uncertainties existing in such situations, even if it is possible to eliminate this problem through lotteries.

When auction participants (first-price, symmetric, common-value auctions) expect strong competition from their competitors, they tend to bid less aggressively, a factor that can lessen the occurrence of the winner’s curse (HENDRICKS; PINKSE; PORTER, 2003).

This study suffers from the usual limitation of the experimental approach – the external validity of the reported results. Further research is needed to evaluate the extent through which the winner’s curse occurs in the “real” world. Do bidders in large-stake auctions make the same mistakes? As already noted, however, field data are frequently complex and difficult to interpret.

Future studies using the experimental design might investigate the degree to which the winner’s curse may occur in its milder version – the auction winner does not reach a financial loss but his performance is below normal or unusually low. In this regard, it would be necessary to adopt an experimental design in which an alternative – and profitable – activity would be introduced in the experimental setting. This activity would establish an opportunity cost to serve as a benchmarking to evaluate the financial result obtained in the auctions. Another possibility would be to investigate the degree to which other factors – such as number of participants and degree of uncertainty about the value of the object being auctioned – might influence the value of the offers advanced by the participants in the auctions.

## APPENDIX 1

### Experiment instructions

This is an experiment in decision-making. You may win some cash if you follow the instructions carefully and make good decisions.

The experiment consists of the simulation of a series of auctions in which you and the other bidders will act as purchasers of a fictitious object. Each round of the experiment corresponds to an auction in which you will make a secret written bid for the object being auctioned. The highest bid will win the auction. In case of a tie, a drawing will determine the winner.

To bid in the auctions, you will receive an initial credit of R\$10. Gains (or losses) realized in each round will be credited (or debited) to that initial credit. The financial result of each round is added only to the auction winner and is calculated by the difference between the value of the auctioned object and that of the winning bid. If the difference is positive (the value of the object is greater than the bid), the auction winner will realize a profit; if the difference is negative (the bid is higher than the object's value), the winner will take a loss. If your accumulated balance drops to zero or becomes negative, you will no longer be allowed to participate in the auctions.

In each auction, the value of the object being auctioned ( $V$ ) will be drawn from a price-range of R\$25 to R\$225, included. Any number within that range has the same chance of being drawn. The value of the auctioned object during a certain round will be independent of the value of that object during previous or later rounds.

In each auction, you will receive some information to help you decide what to bid for the object. The first information is a number called *signal* ( $s_i$ ). These signals are individual (each bidder receives an individual number) and must not be revealed.

The signal ( $s_i$ ) that each bidder will receive will be defined as follows: the experiment coordinator, after determining the value of the object (information unknown to you), will generate a numerical price-range, whose central value is the value of the object ( $V$ ), and whose lower limit is  $(V - 30)$  and upper limit is  $(V + 30)$ . From this price-range, a number of signals ( $s_i$ ) equal to the number of bidders in the auction will be drawn.

For example: Let us say that the value of the object drawn is equal to R\$100. Then, the signals will be drawn from the range [70|130].

Notice that, by the rule for generating the range from which the signals are taken, it is certain that the real value of the object ( $V$ ) will be contained in a price-range that has your signal

$(s_i)$  as its central value, and  $(s_i - 30)$  and  $(s_i + 30)$  as extremes. Let's return to the previous example: Let's say that someone's signal is equal to R\$92. The bidder who received that signal can be certain that the value of the object will be contained within the range [62,122]. In each round and before deciding the value of the bid to be made, you will receive numbers  $(s_i - 30)$  and  $(s_i + 30)$  together with your signal  $(s_i)$ .

Therefore, you may count on two price-ranges to help you define the bid to be made in each auction: the range given by  $[s_i - 30, s_i + 30]$  and the range [25, 225].

It may so happen that you will receive as your signal a number less than R\$25 or higher than R\$225. For example: Let us say that the value of the object drawn is equal to R\$35. In that case, the range from which the signals will be drawn will be [5, 65]. Suppose, still within the context of that example, that you receive a signal equal to R\$22. In this case, you will know that the value of the object will be contained in the range [25, 52], because it cannot be less than R\$25 (or greater than R\$225).

The following rules will be followed for making bids: (1) You cannot make a bid less than zero or greater than your signal plus 30; (2) Your bid can be greater than your capital credit balance, because your balance will only be impacted by the profit/loss that you realize in the round in case you win the auction, and not by the integral value of your bid; (3) The bids must be rounded off to the nearest whole.

After the conclusion of each round, the following information will be given to the participants:

- The value of the object in that auction;
- The financial result for the auction winner;
- The signals provided and the bids posted (without revealing the identity of the one who received the signal or posted the bid);
- The financial result accumulated by each bidder up to that round (personal information).

Initially, a few training rounds will be held so that you may familiarize yourself with the dynamics of the experiment. The result of those rounds will not be computed in your balance. At the end of the experiment, each bidder will receive his/her cumulative financial result in cash.

Dou you have any questions?



APPENDIX 2

TABLE 1

Auction	Value of the object (1)	Winning bid (2)	Observed result (3) =(1)-(2)	Highest signal	Predicted offer (4)	Predicted result (5) =(1)-(4)	Winner´s signal	(R\$) E(V/S <sub>i</sub> = s <sub>1</sub> )
<b>Experimental session №1</b>								
1	76,95	85,00	-8,05	106,56	76,58	0,37	97,96	75,46
2	87,88	96,10	-8,22	102,71	72,74	15,14	102,02	79,52
3	201,31	200,00	1,31	227,57	197,57	3,74	227,57	
4	176,66	169,69	6,97	195,41	165,41	11,26	193,27	170,77
5	166,00	170,00	-4,00	185,83	155,83	10,17	185,83	163,33
6	223,87	215,00	8,87	247,73	217,73	6,14	247,73	
7	131,29	145,00	-13,71	159,76	129,76	1,53	150,96	128,46
8	151,43	150,42	1,01	175,42	145,42	6,01	175,42	152,92
9	93,48	100,00	-6,52	123,13	93,13	0,35	123,13	100,63
10	203,02	200,99	2,03	228,99	198,99	4,03	228,99	
11	202,31	200,47	1,84	225,47	195,47	6,84	225,47	
12	217,83	216,06	1,77	245,09	215,09	2,73	245,09	
13	26,84	36,27	-9,43	48,21	31,65	-4,81	46,27	
14	88,83	90,63	-1,80	110,63	80,64	8,19	110,63	88,13
15	134,01	131,00	3,01	154,71	124,71	9,30	146,26	123,76
16	71,96	74,00	-2,04	92,83	62,92	9,04	92,83	70,33
17	101,08	102,09	-1,01	122,09	92,10	8,98	122,09	99,59
18	215,97	210,00	5,97	236,22	206,22	9,75	236,22	
19	212,18	200,00	12,18	227,99	197,99	14,19	227,99	
20	200,34	192,94	7,40	215,94	185,94	14,40	215,94	
21	96,12	81,39	14,73	104,61	74,64	21,48	104,61	82,11
22	119,72	123,00	-3,28	145,37	115,37	4,35	143,35	120,85
23	118,42	130,29	-11,87	139,03	109,03	9,39	120,29	97,79
24	144,10	133,06	11,04	155,64	125,64	18,46	148,06	125,56
25	117,24	103,00	14,24	125,80	95,81	21,43	116,38	93,88
26	140,60	140,06	0,54	157,56	127,56	13,05	157,56	135,06
27	210,74	208,91	1,83	235,04	205,04	5,70	228,61	

APPENDIX 2

TABLE 2

Auction	Value of the object (1)	Winning bid (2)	Observed result (3) =(1)-(2)	Highest signal	Predicted offer (4)	Predicted result (5) =(1)-(4)	Winner's signal	(R\$)
								$E(V/S_i = s_i)$
<b>Experimental session No. 2</b>								
1	76,95	76,56	0,39	106,56	76,58	0,37	106,56	84,06
2	87,88	81,00	6,88	102,71	72,74	15,14	102,02	79,52
3	201,31	200,00	1,31	227,57	197,57	3,74	227,57	
4	176,66	190,00	-13,34	195,41	165,41	11,26	177,38	154,88
5	166,00	163,53	2,47	191,53	161,53	4,47	191,53	169,03
6	223,87	206,15	17,72	253,72	223,72	0,14	231,15	
7	131,29	132,00	-0,71	159,76	129,76	1,53	159,76	137,26
8	151,43	150,00	1,43	175,42	145,42	6,01	175,42	152,92
9	93,48	115,00	-21,52	123,13	93,13	0,35	101,65	79,15
10	203,02	200,00	3,02	228,99	198,99	4,03	206,88	
11	179,48	180,00	-0,52	201,56	171,56	7,91	201,56	
12	202,31	199,00	3,31	225,58	195,58	6,73	225,58	
13	217,83	218,00	-0,17	245,09	215,09	2,73	245,09	
14	26,84	39,00	-12,16	53,55	32,32	-5,48	29,03	
15	88,83	87,00	1,83	110,63	80,64	8,19	110,63	88,13
16	134,01	125,00	9,01	154,71	124,71	9,30	154,71	132,21
17	71,96	64,80	7,16	92,83	62,92	9,04	92,83	70,33
18	101,08	100,05	1,03	126,11	96,11	4,97	126,11	103,61
19	215,97	201,87	14,10	225,24	195,24	20,74	223,65	
20	212,18	207,35	4,83	239,35	209,35	2,84	239,35	

---

### Resumo

A maldição do vencedor ocorre se os vencedores de leilões sistematicamente adquirem objetos à venda por um valor maior do que o seu valor real. De maneira a investigar a incidência da maldição do vencedor, foi conduzido um experimento que consistiu na realização de uma série de leilões de um objeto fictício. O modelo de equilíbrio de Nash foi adotado como padrão de comparação com o desempenho observado no experimento. Os resultados fornecem suporte parcial à ocorrência da maldição do vencedor: inexistência de prejuízos sistemáticos mas resultados financeiros nos leilões significativamente inferiores aos resultados previstos pelo modelo de equilíbrio de Nash.

**Palavras-chave:** Maldição do vencedor; Economia experimental; Leilões de valor comum.

### References

- AMYX, D. A.; LUEHLFING, M. S. Winner's curse and parallel sales channels - Online auctions linked within e-tail websites. **Information & Management**, v. 43, iss. 8, p. 919-927, Dec. 2006.
- BAJARI, P.; HORTACSU, A. The winner's curse, reserve prices, and endogenous entry: empirical insights from eBay auctions. **The RAND Journal of Economics**, v. 34, n. 2, p. 329-355, Summer 2003.
- BAZERMAN, M. H. The mind of the negotiator: the winner's curse. **Negotiation**, Apr. 2004, p. 3-5.
- BAZERMAN, M. H.; SAMUELSON, W. F. I won the auction but don't want the prize. **Journal of Conflict Resolution**, v. 27, n. 4, p. 618-634, Dec. 1983.
- CASARI, M.; HAM, J. C.; KAGEL, J. Selection bias, demographic effects, and ability effects in common value auction experiments. **American Economic Review**, v. 97, iss. 4, p. 1278-1304, Sept. 2007.
- CHAKRAVARTI, D. *et al.* Auctions: research opportunities in marketing. **Marketing Letters**, v. 13, n. 3, p. 281-296, Aug. 2002.
- CHUA, C.; LUK, P. Be a winner not a loser: experimental evidence of winner's curse. **The Marketing Review**, v. 5, p. 303-314, 2005.
- COX, J. C.; ISAAC, R. M. In search of the winner's curse. **Economic Inquiry**, v. 22, n. 4, p. 579-592, Oct. 1984.

---

COX, J. C.; ISAAC, R. M. In search of the winner's curse: reply. **Economic Inquiry**, v. 24, n. 3, p. 517-520, July 1986.

COX, J. C.; DINKIN, S.; SWARTHOUT, J. T. Endogenous entry and exit in common value auctions. **Experimental Economics**, v. 4, n. 2, p. 163-181, Oct. 2001.

DAVIS, D. D.; HOLT, C. A. **Experimental economics**. Princeton: Princeton University Press, 1992.

DYER, D.; KAGEL, J. H.; LEVIN, D. A comparison of naive and experienced bidders in common value offer auctions: a laboratory analysis. **The Economic Journal**, v. 99, n. 394, p. 108-115, Mar. 1989.

GARBARINO, E.; SLONIM, R. Preferences and decision errors in the winner's curse. **Journal of Risk & Uncertainty**, v. 34, iss. 3, p. 241-157, Jun. 2007.

GUTH, W.; NIKIFORAKIS, N.; NORMANN, H. Vertical cross-shareholding: theory and experimental evidence. **International Journal of Industrial Organization**, v. 25, iss. 1, p. 69-89, Feb. 2007.

HENDRICKS, K.; PINKSE, J.; PORTER, R. H. Empirical implications of equilibrium bidding in first-price, symmetric, common value auctions. **Review of Economic Studies**, v. 70, iss. 1, p. 115-145, 2003.

KAGEL, J. H.; LEVIN, D. The winner's curse and public information in common value auctions. **The American Economic Review**, v. 76, n. 5, p. 894-920, Dec. 1986.

KAGEL, J. H.; LEVIN, D. The winner's curse and public information in common value auctions: reply. **The American Economic Review**, v. 81, n. 1, p. 362-369, Mar. 1991.

KAGEL, J. H.; LEVIN, D. **Common value auctions and the winner's curse**: lessons from the economics laboratory, Oct. 2001. Available at: <http://www.econ.ohio-state.edu/kagel>. Acesso em: jan. 2004.

KAGEL, J. H.; LEVIN, D. BATTALIO, R.; MEYER, D. First-price common value auctions: bidder behavior and the winner's curse. **Economic Inquiry**, v. 27, n. 2, p. 241-258, Apr. 1989.

KAGEL, J. H. ?????????; RICHARD, J. Super-experienced bidders in first-price common-value auctions: rules of thumb, Nash equilibrium bidding, and the winner's curse. **The Review of Economics and Statistics**, v. 83, n. 3, p. 408-419, Aug. 2001.

KAGEL, J. H.; ROTH, A. E. **The handbook of experimental economics**. Princeton: Princeton University Press, 1997.

LIND, B.; PLOTT, C. The winner's curse: experiments with buyers and with sellers. **The American Economic Review**, v. 81, n. 1, p. 335-346, Mar. 1991.

OH, W. C2C versus B2C: a comparison of the winner's curse in two types of electronic auctions. **International Journal of Electronic Commerce**, v. 6, n. 4, p. 115-138, Summer 2002.

---

SELTEN, R.; ABBINK, K.; COX, R. Learning direction theory and the winner's curse. **Experimental Economics**, v. 8, p. 5-20, 2005.

THALER, R. H. Anomalies: the winner's curse. **Journal of Economic Perspectives**, v. 2, n. 1, p. 191-202, Winter 1988.

VON NEUMANN, J; MORGENSTERN, O. **Theory of Games and economic behavior**. Commemorative Edition, Princeton University Press, 2007.

TIDEMAN, N. George on land speculation and the winner's curse. **The American Journal of Economics and Sociology**, v. 63, n. 5, p. 1091-1095, Nov. 2004.

VAN RAAIJ, W.F. The history of economic psychology. In: EARL, P.; KEMP, S. (Ed.). **The Elgar companion to consumer research and economic psychology**. Edward Elgar, 1999.