[Forthcoming in The Journal of Behavioral Finance]

On the Persistence of Overconfidence: Evidence From Multi-Unit Auctions

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(9/26/2012)

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On the Persistence of Overconfidence: Evidence from Multi-Unit Auctions

We analyze pre and post-task confidence in an experiment in which subjects bid in multi-unit common value auctions. Subjects return for a second session, so we are able to assess how performance affects the evolution of confidence. Those with low confidence prior to the first session underestimate performance while those with high confidence overestimate performance. Although the average change in pre-experiment confidence from session one to session two is close to zero, the dispersion in confidence increases. For those with moderate initial confidence, the change in confidence depends significantly on performance in session one. For those with high initial confidence, the change in confidence does not depend on performance, and the correlation between confidence prior to session two and confidence prior to session one is significantly higher than for those with neutral or low confidence. Subjects with high initial confidence also base their perception of post-experiment relative performance primarily on pre-experiment confidence: an effect not present in the moderate and low confidence groups. Based on a pre-experiment survey, we also find that those with high initial confidence are more likely to have prior experience trading stocks or options.

Keywords: Overconfidence, better than average effect, perceptions of performance, miscalibration, divisible good auctions.

INTRODUCTION

Numerous studies in psychology, economics, and finance have identified overconfidence as a prevalent departure from rationality with potentially important implications for the quality of economic and financial decisions. Recent research, however, has questioned the broad applicability of the assumption of overconfidence and shown that whether it arises depends on both the nature and difficulty of the task (Moore and Healey [2008]). To explore this matter further, in this paper we study the prevalence, evolution, and consequences of overconfidence in a financial context which requires strategic behavior. We accomplish this by analyzing pre and post-task confidence in an experiment in which subjects bid in multi-unit common value auctions with features similar to the auctions used to sell Treasury securities or auction-based equity initial public offerings. Our experimental design includes sessions with subjects that return for a second time so we are able to assess both how performance in a previous session and performance in the current session affect the evolution of confidence.

Our measures of confidence are drawn from a four-treatment experiment with two levels of experience that had as one goal, comparing bidding behavior and auction performance in uniform-price and discriminatory-price auctions when there is either uncertainty (all bidders receive the same noisy signal of intrinsic value) or asymmetric information (each bidder receives an independent signal with equal ex ante precision) concerning the common resale value of the asset.[1]

Multi-unit auctions are exchange institutions that have a number of characteristics that make them a valuable testing ground for economic theory and particularly useful in the study of

the relation between confidence and performance. Auctions have simple rules and well-defined economic environments. Their rules are easily explained to and grasped by subjects, yet the strategic complexity is also quickly apparent since in each auction subjects are permitted to submit bids for units at more than one price. Therefore the task is sufficiently complex to allow subjects to form priors on their anticipated performance based on their perception of their grasp of the setting and their relative skill.

We assess confidence at four different points in time: 1) prior to participating in an initial session; 2) upon completion of the first session; 3) prior to participating in a second session (on a later day); and 4) upon completion of the second session. Prior to each session we elicit from each subject the probability that his performance in the sequence of auctions will exceed the median of the participants in that session, and then after each session, the probability that his performance did in fact exceed the median. Our pre-experiment measure of confidence is therefore used to measure the accuracy with which an individual "places" his performance relative to the other members of his cohort. Deviations are commonly referred to as under placement when an individual's performance is better than his expected relative performance, or overplacement (or the "better than average effect") when actual performance is worse than expected performance. In contrast, our measure of post experiment confidence requires each subject to discern his relative performance, based on his own profit from each of the auctions and on the observed relation between the market clearing price and the intrinsic value (which can be used to infer the performance of the other participants).[2] Post experiment confidence is thus a measure of under or overplacement based on both personal performance and market information.[3]

Our results show that the dispersion of initial confidence is high, although on average we find no evidence of systematic under-placement or overplacement. Initial confidence does have a significant impact, however, on the mapping between confidence and performance. Those with low confidence prior to the first session tend to underestimate their actual performance while those with high confidence overestimate performance. Although on average the change in confidence from the beginning of session one to the beginning of session two is close to zero and insignificant, the dispersion in initial confidence increases. For those with moderate initial confidence, the change in confidence depends significantly on performance in session one. For those with high initial confidence, the change in confidence does not depend on performance, and the correlation between confidence prior to session two and confidence prior to session one is significantly higher than for those with neutral or low initial confidence. The group of participants with high initial confidence seems to base its perception of post-experiment relative performance primarily on pre-experiment confidence: an effect which is not present in the initially moderate and low confidence groups. We therefore find evidence that the overconfident are truly different, with confidence levels invariant to subsequent performance. Based on a pre-experiment survey of subjects' prior investing experience, we also find that those with high initial confidence are more likely to have prior experience trading stocks or options. This association is consistent with the assumption in a number of theoretical models that those who trade stocks are overconfident.

LITERATURE REVIEW

Overconfidence has been considered a pervasive phenomenon with potentially costly

consequences.[4] Moore and Healey [2008, p.502] note that overconfidence has been used by researchers to explain phenomena as diverse as wars, litigation, entrepreneurial failures, and stock market bubbles. Recent research, however, has questioned the generality of the assumption of overconfidence. For example, Moore and Cain [2007] provide evidence that people believe they are below average on skill-based tasks that are difficult. Reconciling this type of evidence with the literature has required distinguishing between different types or manifestations of overconfidence (or under confidence) and understanding the conditions under which they are likely to arise. With this objective Moore and Healy [2008] survey the extant overconfidence literature and distinguish between three types of overconfidence that have been demonstrated: 1) overestimation, where people overestimate their own abilities; 2) overplacement, where people believe they are better than others (sometimes referred to as the "better-than-average effect); and 3) overprecision, where people are excessively certain in the accuracy of their estimates (often referred to as miscalibration).

Where underconfidence has been documented in the literature it is typically due to underestimation when the task is easy or the performer is particularly skilled (Burson, Larrick, and Klayman [2006]), or underplacement when the task is difficult (Moore and Small [2007]). Overprecision is typically studied by asking participants questions with numerical answers and then asking them to estimate confidence intervals around their answers. A wide range of studies employing different frames and subject pools have found that the confidence intervals are on average too narrow, suggesting an overestimate of the accuracy of knowledge or beliefs.[5] However, the degree of miscalibration depends on the confidence interval: with sufficiently wide intervals, underconfidence has been observed (Budescu and Du [2007]).

Moore and Healey [2008] conduct an experiment to distinguish between these distinct manifestations of overconfidence and find a differential effect of task difficulty: while overestimation increases with task difficulty, overplacement decreases. They also find more precise beliefs are associated with less under and overplacement, and better performance.

Models in financial economics that employ overconfidence as a fundamental building block of investor behavior typically begin with the assumption that traders overestimate the precision of their private information.[6] Nevertheless, the evidence that overplacement (the "above average effect") decreases with task difficulty is potentially inconsistent with the assumption that overconfidence is an important determinant of investor behavior since investing is generally regarded as difficult. The relative contribution of over or underplacement and overprecision to investor behavior has not been definitively established.

A number of recent papers have studied the impact of overconfidence on trading activity. While it is not our intention to survey this literature, the following papers are representative of the variety of approaches that have been employed and, in some cases, the differing conclusions that have been drawn.[7] Barber and Odean [2001] use gender as a proxy for overconfidence and using account data from 35,000 households, conclude that overconfidence leads to higher trading and lower returns. Glaser and Weber [2007] survey online broker investors on various dimensions of confidence. From the 215 respondents they show that investors who believe they are above average in terms of investment skills or past performance (but who in fact did not have above average performance) trade more. Interestingly, they find that their measures of miscalibration are (contrary to predictions from theoretical models) unrelated to trading volume. They also find that gender is not a significant determinant of trading volume. Grinblatt and

Keloharju [2009] study how two psychological attributes, overconfidence and "sensation seeking" affect the tendency of investors to trade stocks. They use psychological profiles from Finland that are required of all males upon induction into mandatory military service to construct a measure of confidence that is a measure of the "better than average" effect, and records of traffic infractions to create an index of "sensation seeking." They find the overconfident and those most prone to sensation seeking trade more frequently. Biais, et al [2005] measure miscalibration in 245 subjects using a confidence interval task.[8] They then show that this manifestation of overconfidence results in poorer performance in an experimental financial market. Graham, Harvey and Huang [2009] explain the "better than average" aspect of overconfidence arguing that overconfident investors tend to perceive themselves to be more competent, and thus are more willing to act on their beliefs, leading to higher trading frequency. Deaves, Luders, and Luo [2009] measure three aspects of overconfidence of 64 subjects across eight sessions and then have subjects participate in an experimental asset market. They find that miscalibration-based overconfidence is positively related to trading activity and is its most powerful predictor (in contrast to Biais, et al [2005]). They find the effect of miscalibration on trading performance is weak.

EXPERIMENTAL DESIGN

The data for this paper are drawn from an experimental study that compares bidding behavior and auction performance in uniform-price and discriminatory auctions when there is incomplete information concerning the common value of the auctioned good. We briefly summarize the experimental design here. Complete details are available in the paper (Morales-Camargo, Sade,

Schnitzlein, and Zender (2012)).

Our 235 subjects were drawn from the University of New Mexico (56.8%) and the University of Central Florida (43.2%). Most of these subjects were senior undergraduates (78.7%); the rest were MBA students. All had at least one previous course in finance, as well as courses in statistics and economics. Most of the subjects were males (67.9%) with the percentage of male undergraduate students and male graduate students 66.5% and 72% respectively.

The experiment consisted of 75 experimental sessions in which five subjects participated in a sequence of auctions under two different information structures (symmetric or asymmetric), two different bidding mechanisms (uniform-price or discriminatory) and two levels of experience (first and second-time participants). Sessions were evenly divided across mechanisms. There were 47 sessions with first-time participants. These sessions took approximately 90 minutes. In order to minimize the effect of subjects who did not fully understand the bidding task, after the inexperienced session we dropped from the subject pool subjects with losses in excess of the initial endowment. Analysis shows these were subjects who did not exhibit learning over the course of the inexperienced session.[9]

In each auction, 26 widgets were offered for sale. Subjects were allowed to bid for as much or as little of the supply as they desired. Once all subjects had submitted a bid schedule in a given auction, the computer aggregated the bids and determined the stop-out price for that auction. Auctions were conducted using custom designed software. The software graphed individual bid schedules as subjects initiated the bidding process and provided historical information pertaining to each subject's bidding, matched with the profit and the portion of total supply received for each prior auction in the session.

In the symmetric information sessions it was public knowledge that all subjects received the same signal regarding resale value. Under asymmetric information, prior to each auction each subject observed a private signal that allowed the identification of a posterior distribution governing resale value (depicted numerically and graphically in the instructions). Importantly, it was public information that each subject always held a signal of equal ex ante precision.

At the start of each experimental session, subjects were seated in a conference room, given 30-40 minutes with the written instructions, and an opportunity to ask clarifying questions. The instructions explained the auction rules, the basis on which cash payments would be made, and included images introducing the subjects to the software. Subjects were given a quiz to confirm their understanding of the bidding and allocation rules, and the session only began after all five subjects were able to get a perfect score on the quiz. As part of the quiz, subjects were asked the question: "Please write down, based upon your own judgment, what is the probability (in %) that your performance will exceed the median performance (top 50%) of all those who participated in the experiment today? ____%." Subjects therefore understood the nature and complexity of the task prior to assessing their expected relative performance.

Subjects were not allowed to communicate with each other before or during the sessions. In addition, the layout of the computer lab prevented each subject from seeing the screen of any other subject. After 20 auctions were completed, subjects remained seated at their terminals and were given a post-experiment questionnaire in which they were asked to explain their bidding strategy. They were also asked a question pertaining to their perception of their relative performance: "What is now your assessment of the probability (in %) that your performance will be above the median (top 50%) of all those that participated in the experiment today." It was made clear to the subjects that this question pertained only to the session in which they had just

participated.

Subjects were paid a US$5 upfront participation fee as well as "winnings" based on their total profit from the auctions. Each subject was given an initial endowment in "Lab dollars" of L$250. At the end of the experiment lab dollars were converted to USD at a rate of US$0.05 per L$. Gains and losses from each auction were added to this endowment. Subjects were allowed to go bankrupt, allowed to bid when bankrupt, and encouraged to continue in an attempt to recover their losses. To mitigate extreme behavior in bankruptcy, at the beginning of each session subjects were informed that they would receive an additional random endowment at the end of the session.[10] Payments to subjects averaged US$19.27. Sessions with inexperienced subjects lasted an average of approximately 90 minutes while sessions with experienced subjects lasted an average of 30 - 45 minutes.

RESULTS

We assess the responses to the confidence measures along the following dimensions: the relation between initial confidence and the subjects' characteristics, the relation between initial confidence and performance, how performance affects the updating of confidence, and the relation between confidence and the perception of relative performance.

Subject Pool Characteristics and Initial Confidence

Of the 235 first-time participants, 220 (94%) gave an initial confidence estimate in the questionnaire that followed the experimental instructions. There were no significant differences

in the observed characteristics of these subjects (male vs. female or graduate student vs. undergraduate) relative to all first-time participants.

The average level of pre experiment confidence prior to the first session is 49.7%, which is not significantly different from the neutral prediction of 50%. If we restrict the sample to subjects that participate in two sessions, the confidence measure prior to the first session averages 49.9%. We therefore do not find any indication of systematic over or under pre-experiment confidence in inexperienced subjects.

Although initial confidence is neutral on average, there is substantial variation across subjects: the standard deviation of confidence prior to the first session equals 22.7%. Consistent with many other studies,[11] the initial confidence of male subjects (52.1%) is higher than that of female subjects (44.0%). In Table 1, we assess the significance of this difference and the importance of other subject characteristics and the auction environment by regressing pre experiment confidence on indicators for sex, graduate student status, the use of the uniform-price auction mechanism, and the use of the symmetric information structure. Since Moore and Cain [2007] find confidence is decreasing in the difficulty of skill-based tasks, we include the last two indicators because subjects may perceive the two auction mechanisms (uniform-price and discriminatory) and the two information structures (symmetric and asymmetric) to differ in their level of complexity. We find males have significantly higher initial confidence ($p=0.02$), but there are no significant differences in initial confidence by student type (graduate vs. undergraduate), mechanism (uniform-price vs. discriminatory), or information structure (symmetric vs. asymmetric). Additional untabulated tests also show there are no significant differences in the dispersion of initial confidence estimates within each subject type.

Does Initial Confidence Predict Performance?

We examine the relation between pre-experiment confidence and performance by regressing the payment rank of each subject in each session on his confidence response, and the sex, graduate student, mechanism, and information structure indicators. Results are reported in the first regression of Table 2. Pre-experiment confidence is associated with a lower payment rank (better relative performance), but the relation is not significant (p=0.25). Despite the lack of a significant difference in initial confidence, graduate students outperform undergraduates (p=0.03).

Table 2 presents a regression examining the relation between pre-experiment confidence prior to the second session and second session performance (See regression with experienced subjects). Recall that the experienced subject pool does not include subjects that lost more than their entire initial endowment but does include many subjects with substantial losses in the first session. Prior to the second session, pre-experiment confidence averages exactly 50.0%, and is statistically indistinguishable from confidence prior to sessions with inexperienced subjects in both its level and standard deviation. Again we find the relation between pre-experiment confidence and performance is insignificant (p=0.76). With second time participants, graduate students do not outperform undergraduates.[12]

We therefore find that subjects are poorly calibrated in the sense that after having gained familiarity with a task, they are unable to anticipate their relative performance. This is potentially a matter of practical importance if high initial confidence is motivational in the sense that it induces individuals to engage in activities (or engage in activities with greater intensity) in

which they enjoy little facility.

How does initial confidence affect bidding strategies?

In this section we examine how bidder behavior is affected by initial confidence and changes with experience within a session (recall that each session includes 20 independent auctions). We accomplish this by dividing the sample into three groups based on initial confidence. The low initial confidence group has session one pre-experiment confidence less than or equal to 0.40. The moderate initial confidence group has pre-experiment confidence between 0.40 and 0.60, and the high initial confidence group has initial confidence greater than or equal to 0.60. We chose these thresholds for each group because, with five subjects in each group, the median payment rank in each session pertains to the 40^{th} to 60^{th} percentile. We then regress bidding profits and various measures of bidding strategies on indicator variables for high and low initial confidence. To learn how behavior changes we also include three variables that interact the initial level of confidence (high, moderate, low) with the auction number. Other controls that were employed in each regression but are not tabulated include indicators for graduate students, gender, negative cash balances, signal extremeness, previous cumulative profit, and interactions between the graduate student and gender indicators and previous cumulative profit. Results are reported in Table 3.

At the beginning of sessions with inexperienced subjects both high and low confidence subjects have significant trading losses relative to moderate confidence subjects. These losses are explained by a less appropriate adjustment for the winner's curse (W.C.), as reflected in the significantly negative coefficients on the High and Low Confidence dummies in the

Allowance for W.C. Regression. This dependent variable measures the difference between a bidder's signal and his high bid. In equilibrium a positive adjustment is necessary because a bidder's expected profit conditional on winning units at a price equal to his signal is negative.[13]

We also examine the initial level of each bidder's demand function by using the median bid as the dependent variable. Interestingly, although high and low confidence bidders initially incur losses relative to moderate confidence bidders in inexperienced sessions, only the median bids of high confidence bidders are significantly higher. This indicates that although the highest bids of high and low confidence bidders are comparable, high confidence bidders submit demand curves that are "higher" than both low and moderate confidence bidders. Initial profits are, however, comparable between high and low confidence bidders because only the bids on the highest portions of their bid schedules typically receive allocations.

The positive coefficients on the variables that interact initial confidence with experience within a session (High*Auction No., Mod.*Auction No., and Low*Auction No.) indicate that each type of subject on average increases the adjustment for the winner's curse as they gain experience within a session. However, the increase is only significant for the initially high and low confidence subjects. Other measures of bidding strategy include the number of prices over which a bidder spreads his bids in an auction and the elasticity of the submitted demand curve.[14] There are no significant differences in these variables by level of initial confidence.

With experienced subjects, both high and low confidence subjects again have initially lower profits than moderate confidence subjects, but the difference is insignificant in both cases. In both cases the adjustment for the winner's curse is again less than by moderate initial confidence subjects, but these differences are also not significant. Other measures of bidding

strategies do not differ by initial level of confidence. Finally, untabulated tests of difference between the coefficients of the three interaction variables show that average profits are still insignificantly different across the three levels of initial confidence by the end of the second session.

In summary, inexperienced subjects with both high and low initial confidence levels incur significant losses relative to moderate confidence subjects at the beginning of the first session, apparently because of more "aggressive" initial bidding. That is, because high and low confidence subjects initially submit bid schedules at significantly higher levels, as measured by the highest price on the bid schedules and, in the case of the high confidence subjects, by the median price on the bid schedules. Both high and low confidence inexperienced bidders learn over the course of the first session, though, and by the end of this session there are no significant differences in profits between subjects based on initial confidence levels. Over the course of the second session there are also no significant differences in profits based on initial confidence levels in that session.

How does performance affect the updating of confidence?

Having demonstrated that pre-experiment confidence is not associated with performance, we next consider whether actual performance affects confidence. Although average pre-experiment confidence and its dispersion within the cohorts of inexperienced and experienced subjects is almost identical, 65% of experienced subjects report different pre experiment confidence levels than they reported prior to their first session.

We regress the change in pre-experiment confidence (second session pre-experiment confidence less session one pre-experiment confidence) on the session-one payment rank and the sex, graduate student, mechanism and information structure indicators (Table 4). As Regression 1 shows, the coefficient on the session one payment rank is insignificant (p=0.74). In addition, the subject characteristics, information structure, and mechanism indicators are also insignificant.

At the end of each session, subjects do not observe their actual relative performance (payment rank). We therefore also run this regression using the actual performance payment in session one in place of the payment rank. As Regression 2 shows, this coefficient is positive and significant (p=0.08), indicating a positive response in confidence to the absolute level of session one performance.

The wide dispersion in confidence prior to sessions with inexperienced subjects allows us to examine whether the initial level of confidence affects the way subjects update their level of confidence after observing their performance. We conduct this analysis by repeating the change in confidence regressions on subjects grouped by the initial level of confidence (High, Moderate, or Low) as defined in the previous section.

The effect of initial confidence on the updating process is striking (See Regressions 3 - 8 in Table 4). Using either payment rank or performance payment as the measure of performance, all right-hand side variables (except the Uniform-Price auction type indicator in the high-confidence regressions) are insignificant in both the low initial confidence and high initial confidence groups. Subjects with high and low initial confidence do not adjust their confidence levels based on realized performance.

In sharp contrast, subjects with moderate initial confidence update their confidence based on performance, whether performance is measured using payment rank or performance payments ($p<0.01$ for both measures). Furthermore, these subjects are as likely to increase as decrease confidence prior to the second session. The correlation (16.5%) between session one pre experiment confidence and session two pre experiment confidence for subjects in this group is insignificantly different from zero.

In the moderate initial confidence group, the information structure is also a significant determinant of the change in confidence: subjects bidding in the symmetric information setting increase their confidence significantly, regardless of how we measure performance in the inexperienced session. This is interesting because although the symmetric information setting is "easier," it is easier for all subjects. This result therefore is consistent with the hard-easy effect: confidence is higher on easy tasks (Moore and Cain [2007]).

The lack of relation between performance and subsequent pre experiment confidence in both low and high initial confidence subjects raises the question of how confidence is determined in these groups. High initial confidence subjects on average decrease confidence prior to session two by 0.068, which is significantly less than zero ($p<0.01$). However, one-half of initially high-confidence subjects either maintain or increase their confidence prior to session two. In addition, only one of these 38 subjects has pre experiment two confidence below 50%, while 70.3% remain high-confidence subjects prior to session two. Interestingly, the initially high confidence subjects that maintain or increase their confidence prior to session two have session one payment ranks that on average indicate below average relative performance. In contrast, the initially high confidence subjects that reduce their pre experiment confidence prior to session two have above

average relative performance in session one. Overall, the correlation between pre experiment confidence prior to each session for subjects in this group is 63.6% and significant ($p<0.01$). It appears that for high-confidence subjects, the initial level of confidence is the only significant predictor of pre experiment two confidence, and that below average realized performance does little to alter their assessment of their abilities.

Low initial confidence subjects on average increase confidence prior to session two by 0.091, which is significantly greater than zero ($p<0.01$). However, 42% of initially low-confidence subjects either maintain or decrease their confidence prior to session two. Only two of these 38 subjects have pre experiment two confidence above 50%, and 68.4% remain low-confidence subjects prior to session two. In contrast to the initially high-confidence subjects, the initially low-confidence subjects that maintain or reduce their confidence prior to session two are responding in a way consistent with their actual performance as they have session one payment ranks that indicate below average relative performance. The initially low confidence subjects that increase their pre experiment confidence prior to session two have above average relative performance in session one. Overall, the correlation between pre experiment confidence prior to each session for subjects in this group is 27.0% and marginally significant ($p=0.10$).[15]

The Relation between Confidence and the Perception of Performance

We next consider how pre experiment confidence is related to the accuracy with which subjects assess their relative performance. We accomplish this by regressing post-experiment confidence on pre experiment confidence, the payment rank, the subject characteristics, and auction environment indicators (Table 5). As Regression 1 in Panel A shows, with first-time

participants, post-experiment confidence is strongly related to both pre-experiment confidence ($p<0.01$) and the actual payment rank ($p=0.01$). None of the subject characteristics or the auction environment variables has significant explanatory power. As Regression 2 shows, if we replace the payment rank variable with the actual performance payment, significance increases. Comparable results obtain for post experiment confidence with experienced subjects (See Regression 1 in Panel B. Results for the regression with the actual performance payment variable are untabulated.).

We also examine in Table 5 how the perception of relative performance is affected by the level of pre-experiment confidence by repeating the regression on each of the previously defined groups of low, moderate, and high initial confidence. As Regression 3, 5 and 7 in Panel A show, with inexperienced subjects, relative performance is a marginally significant determinant of post-experiment confidence for the high pre-experiment confidence group ($p=0.07$), highly significant for the moderate pre-experiment confidence group ($p<0.01$), and insignificant for those with low pre-experiment confidence ($p=0.33$). Repeating this analysis with experienced subjects and forming the confidence groups with pre-experiment confidence prior to the second session (See Regressions 3, 5 and 7 in Panel B), the payment rank measure of relative performance is a significant determinant of post-experiment confidence for low pre-experiment confidence subjects ($p=0.03$) and moderate pre experiment confidence subjects ($p=0.01$), but insignificant for high pre-experiment confidence subjects ($p=0.30$).[16]

We further investigate the determinants of post-experiment confidence in the sessions with experienced subjects by adding the pre-experiment confidence measure from prior to the initial session. This allows us to examine how the level of confidence prior to the first session

affects the perception of relative performance after the second session while controlling for the actual level of relative performance (Regressions 2, 4, 6 and 8 in Panel B). In regressions 4 and 6 (subjects with low and moderate pre-session two confidence, respectively), the coefficient on the pre-session one confidence variable is insignificant and the payment rank variable remains significant. In regression 8 (subjects with high pre-session two confidence), the pre-session one confidence variable has a positive and significant coefficient ($p=0.02$) and the payment rank variable remains insignificant. Although the sample size of the high pre-experiment confidence subgroup is small (N=42) and caution is warranted in drawing strong conclusions, these results suggest that those with high initial confidence are more inclined to base their assessment of relative performance on their perception of their relative skill rather than on observables that can be used to infer relative performance.

Previous Investing Experience and Confidence

In the post experiment questionnaire we asked subjects if they had previous experience trading in financial markets, and if so, to briefly describe the experience. Ten percent of the subjects in the sample indicated prior trading experience in stock or options markets. An important assumption in a number of influential papers is that those that trade stocks are overconfident (e.g. Daniel, Hirshleifer and Subrahmanyam [1998]). We therefore examine whether those that have stock trading experience are indeed more confident about their prospects in our bidding experiment than those without such experience.

The level of pre-experiment confidence prior to the first session of those with previous stock trading experience is 58.2%, which is significantly greater than the pre-experiment

confidence of those without such experience (p=0.03). This group has a lower average payment rank (better performance) than the group without trading experience, but the difference is not significant (p=0.29). The difference between the average performance payments of these two groups is also insignificant (p=0.60). With only 23 inexperienced subjects with financial market experience (and only 11 of these subjects that both participate in a second session and report both pre and post-experiment confidence measures) in depth analysis is not possible, but we do consider the relative importance of the determinants of post-experiment confidence in this group by repeating the regression from the previous section. Because of the data limitation, we limit this analysis to first-time participants. Our results are presented in Table 6. As with the other high-confidence subjects, we find pre-experiment confidence is highly significant ($p<0.01$), but actual payment rank is not (p=0.12) (See Regression 1). As Regression 2 shows, if we replace the payment rank with the actual performance payment, the coefficient is also insignificant (p=0.17). With a small sample (N=23) these results are only suggestive, but are consistent with the generalization that those who self-select into stock trading are of high confidence, that their confidence is not warranted based on their actual performance, and that their perception of their performance is not well-grounded.

DISCUSSION AND CONCLUSION

We find that although initial confidence does not predict actual performance and performance does not predict the change in pre-experiment confidence from session one to session two, significant patterns emerge when subjects are grouped by their level of pre-experiment confidence. While those with moderate initial confidence revise their confidence prior to session

two consistent with performance, this is not the case for subjects with high initial confidence. High initial confidence subjects on average remain highly confident, and those that maintain or increase their confidence level, on average, had below median performance in session one.

An analysis of auction level data shows that inexperienced subjects bid differently depending on their initial level of confidence. Over the initial auctions, both high and low confidence subjects incur significant losses relative to moderate confidence subjects because of an inadequate adjustment for the winner's curse. High initial confidence subjects also submit bid schedules that are significantly higher. Both high and low confidence bidders learn over the course of the first session, and by the end of the session (and overall) there are no significant differences in profits between subjects with different levels of initial confidence.

Although overall, the perception of relative performance is strongly related to actual performance, this is primarily due to the responses of subjects with moderate initial confidence. For first-time participants with high initial confidence, relative performance is only a marginally significant determinant of post-experiment confidence, and for second-time participants with high pre-experiment confidence, the perception of relative performance (post-experiment confidence) is unrelated to performance. In this group, the only significant determinant of post-session two confidence is pre-session one confidence. In sharp contrast, for experienced subjects with either low or moderate initial confidence, payment rank is a significant determinant of the perception of relative performance, but confidence prior to the first session is insignificant.

We also find that those subjects with prior experience trading stocks are more confident than those subjects without such experience, although their performance is not significantly better. The weight of our evidence therefore suggests that those with initially high confidence

tend to be overconfident with respect to expected performance, that this overconfidence persists despite experience and feedback that is inconsistent with their initial self-assessment, and that subjects with high initial confidence misinterpret the information implicit in the signals that are generated by market activity. This type of miscalibration (the biased interpretation of market information in a way consistent with the prior expectation of superior performance) is different from miscalibration as it has been addressed in the literature where it typically involves excessive certainty regarding the accuracy of beliefs.

Our results suggest that these errors in judgment are not universal, but rather apply most significantly to individuals with high initial confidence. The large behavioral literature on the importance of context in determining deviations from rational behavior makes us cautious in generalizing our results to other settings. However, we believe it is important that we have derived our results using auctions, a widely employed trading mechanism. We therefore provide further evidence that the assumption of overconfidence as a robust phenomenon that can be useful in interpreting the behavior of asset market participants is useful and appropriate.

NOTES

[1] The optimal set of bidding rules is an unsettled issue in financial economics. In uniform-price auctions, units of the good are awarded for bids at or above the market clearing price, and bidders pay the market clearing price for all units awarded. In discriminatory auctions, units are also awarded for bids at or above the market clearing price, however, the bid price is paid for all units awarded. Results that pertain to the performance of these auction mechanisms are reported in Morales-Camargo, Sade, Schnitzlein, and Zender [2012].

[2] In addition to the market clearing price and the auctioned good's intrinsic value, after each auction each subject learns his cumulative earnings, but not the earnings of the other participants.

[3] Under both information structures, the true value in each auction is equal to 20 plus the sum of five independent draws from a uniform distribution with support on the integers (-2,-1, 0, 1, 2). In the symmetric information setting it is public information that all subjects receive the same signal. In the asymmetric information setting, it is public information that each subject receives one of the independent draws. Because the "true value" is the sum of the five independent signals, each subjects conditional expectation is equal to his signal (e.g. if a subject receives a signal of +2, this implies his conditional expectation is exactly 22, since the other signals are expected to sum to zero). To simplify the task for subjects, for each possible signal subjects receive a histogram with the exact posterior distribution. Since all subjects always hold signals of intrinsic value that are known to be of equal precision we do not consider the potential role of miscalibration (often referred to as over or underprecision) on performance and confidence updating.

[4] Indeed, in his text on judgment and decision making, Plous [1993] writes that "No problem in judgment and decision making is more prevalent and potentially catastrophic." He goes on to note, however, that confidence is hard to measure in part because of the need or advantage to appearing confident in many situations.

[5] See for example Soll and Klayman [2004].

[6] See for example, Daniel, Hirshleifer, and Subrahmanyam [1998] and Odean [1998]).

[7] See Glaser and Weber [2011] for an excellent overview of this literature.

[8] Biais et al [2005] also measure the impact of "self-monitoring." Their measure of calibration is standard in the psychology literature although Moore and Healy [2008] show that it confounds calibration and overestimation.

[9] We excluded exactly nine subjects from the uniform and discriminatory sessions under this information structure, so as not to introduce a bias across mechanisms. We stress that our "experienced" subject pool includes many subjects with bidding losses in the first session.

[10] The random endowment was drawn from a discrete uniform distribution with a mean of L$100.

[11] Croson and Gneezy [2009] is a general survey of experimental studies of gender differences in risk and competitive preferences. They cite numerous studies consistent with this result.

[12] In regressions which are not reported we replaced the payment rank with the actual performance payment as the dependent variable. While the payment rank corresponds directly to the confidence measures, it must be inferred. The performance payment is observed at the end of each session. With both first and second time participants, pre-experiment confidence remains insignificant as a determinant of performance.

[13] This is true even though each bidder's signal is an unbiased predictor of expected value. For example, in the asymmetric information setting, if each bidder were to bid for his entire allocation at his signal, each bidder winning shares would on average have signals above the true value and incur losses, because he would receive large allocations only when his signal

was above the true value. See Wang and Zender (2002) for a discussion of equilibrium bidding strategies in multi-unit auctions with uniform and discriminatory pricing rules.

[14] The Elasticity of individual bid schedules is obtained for each bidder in an auction by dividing the percentage change in cumulative demand exhibited by that bidder over the percentage change in price, as we move from the bidder's signal in that auction to the next higher price available in the price grid.

[15] The median time between the first and second session was seven days. However, there is variation in the time between sessions. Overall the correlation between the time between sessions (in days) and the change in pre-experiment confidence is 4.4% and insignificant. However, this correlation does not capture whether the time between sessions affects the change in pre-confidence differently, depending on the initial level of confidence. We therefore repeat the eight regressions from Table 4 in which we examine the determinants of the change in pre-session confidence for subjects grouped by their initial level of confidence, but using time between sessions as an additional regressor. In every case the coefficient on the time between sessions is insignificant, and the other coefficients are qualitatively unchanged. Importantly, the inclusion of this variable leaves the relation between performance and the updating of confidence unchanged in each case. We appreciate an anonymous referee's suggestion to verify the potential importance of this variable.

[16] We also ran regressions 3, 5 and 7 in Table 5 Panel B using the performance payment variable in place of the actual measure of relative performance. In each regression, the coefficient on this variable is significant. These results are untabulated.

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TABLE 1

Determinants of Pre-Session Confidence

OLS regression of inexperienced subjects' pre-session confidence on subject characteristics and indicator variables for auction mechanism and information environment. The dependent variable, pre-session confidence, is the subject's assessment before the first experimental session begins of the probability (%) that his/her performance will be above the median (top 50%) of all those subjects who participate in that experimental session. Dummies Male Student and Graduate Student take a value of one if the subject is a male and graduate student (respectively) and zero otherwise. Dummies Uniform-Price and Symmetric Information take a value of one when an auction is conducted using a uniform price mechanism and within a symmetric information environment (respectively) and zero otherwise. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. t-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

Independent Variables	
Intercept	0.447 ***
	(13.090)
Dummy Male Student	0.076 **
	(2.350)
Dummy Graduate Student	0.011
	(0.290)
Uniform Pricing Dummy	-0.016
	(-0.520)
Symmetric Information Dummy	0.012
	(0.400)
R-squared	0.025
N	220

TABLE 2

Determinants of Subjects' Relative Performance

Ordered logistic regression of subjects' performance ranking on their pre-session confidence, individual characteristics, and indicator variables for auction mechanism and information environment. The dependent variable, payment rank, measures the performance rank each bidder obtained in a given session. The ranks are measured from 1 to 5, where a rank of 1 is assigned to the top performing bidder in a session and a rank of 5 is assigned to the worse performing bidder in a session. Pre-Confidence Inexperienced Session (Experienced Session) measure the subject's assessment before the first (second) experimental session begins of the probability (%) that his/her performance will be above the median (top 50%) of all those subjects who participate in that session. The rest of the indicator variables are defined in Table 1. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. z-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

Independent Variables	Inexperienced Subjects	Experienced Subjects
Pre-Confidence Inexperienced Session	-0.583	
	(-1.120)	
Pre-Confidence Experienced Session		-0.203
		(-0.300)
Dummy Male Student	0.287	-0.031
	(1.110)	(-0.080)
Dummy Graduate Student	-0.700 **	-0.591
	(-2.190)	(-1.410)
Uniform Pricing Dummy	0.069	0.067
	(0.600)	(0.230)
Symmetric Information Dummy	-0.003	-0.052
	(-0.030)	(-0.190)
Pseudo R-squared	0.011	0.007
N	221	131

TABLE 3

Confidence, Bidder Profits, and Bidding Strategies by Auction Type and Experience

OLS regressions examining the effect of pre-experiment confidence on bidder profits and bidding strategies. Separate regressions are run for each dependent variable with inexperienced and experienced subjects. The dependent variables, presented in rows, are per auction profits (Profit), the difference between the highest bid by a bidder and his signal (Allowance for W.C.), the median bid (Median Bid), the number of different prices at which a bidder submits bids (Number Prices), and the elasticity of the bidder's demand curve, measured at the bidder's signal (Elasticity). The independent variables, presented in columns, are control dummies for the symmetric information structure (Symmetric), the auction mechanism (Uniform Price), both high and low pre-experiment subjects (High Confidence and Low Confidence), and interactions between pre-experiment confidence and the auction number within a session to account for learning effects (High*Auction No., Mod.*Auction No., and Low*Auction No.). Other controls were employed in all the regressions, but are not tabulated due to space consideration. These controls included indicators for graduate students, gender, negative cash balances, signal extremeness, previous cumulative profit, and interactions between the graduate student and gender indicators with previous cumulative profits. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. t-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

	Symmetric	Uniform Price	High Confidence	Low Confidence	High* Auction No	Mod.* Auction No	Low* Auction No
Uniform-Price Inexperienced (N=3,870)							
Profit	2.41***	-2.48**	-16.06***	-15.20***	9.92***	3.50***	9.22***
	(2.83)	(-2.56)	(-2.73)	(-2.92)	(4.72)	(2.92)	(5.08)
Allowance for W.C.	-0.37	-1.64***	-1.25**	-1.30**	0.80***	0.24	0.68**
	(-0.22)	(-9.80)	(-2.04)	(-2.23)	(4.10)	(1.57)	(3.75)
Number Prices	0.15	0.89***	0.78	0.43	-0.61***	-0.55***	-0.51***
	(0.70)	(4.34)	(0.15)	(0.94)	(-3.41)	(-4.55)	(-3.63)
Median Bid	-0.27*	0.49***	1.33***	0.56	-0.58***	-0.09	-0.36**
	(-1.92)	(3.40)	(2.70)	(1.10)	(-3.95)	(-0.65)	(-2.17)
Elasticity	0.62*	1.90***	0.42	1.23	-1.11***	-0.92***	-1.01***
	(1.69)	(5.17)	(0.47)	(1.46)	(-3.46)	(-3.53)	(-3.87)
Experienced (N=2,380)							
Profit	-0.39	1.47*	-3.42	-7.29	4.20***	2.34**	5.42***
	(-0.48)	(1.79)	(-0.93)	(-1.61)	(3.43)	(2.08)	(3.36)
Allowance for W.C.	-0.41*	-0.96***	-0.56	-0.23	0.15	-0.19	-0.03
	(-1.91)	(-4.80)	(-1.02)	(-0.43)	(1.12)	(-1.02)	(-0.25)
Median Bid	0.49**	-0.20	-0.12	-0.51	0.10	0.16	0.25**
	(2.82)	(-1.07)	(-0.35)	(-1.22)	(1.15)	(1.28)	(2.00)
Number Prices	-0.07	0.92***	1.11	0.60	-0.51***	-0.09	-0.26*
	(-0.29)	(3.64)	(1.58)	(1.10)	(-3.78)	(-0.63)	(-1.78)
Elasticity	-1.20**	2.43***	1.50	1.33	-0.53**	-0.11	-0.52
	(-2.36)	(4.70)	(1.36)	(1.14)	(-1.99)	(-0.36)	(-1.50)

TABLE 4

Determinants of Change in Subjects' Pre-Session Confidence

OLS regression of subjects' change in pre-session confidence on their performance in the first session, individual characteristics, and indicator variables for auction mechanism and information environment. Regressions 1 and 2 are conducted using data from all subjects who participated in both Sessions 1 and 2. Regressions 3 through 8 segregate that sample by subjects' confidence level, where subjects with low confidence are subjects who reported pre-probability levels of 40% or below, subjects with moderate confidence reported pre-probability levels between 40% and 60%, and subjects with high confidence reported pre-probability levels of 60% or above. The dependent variable, Change in Pre-Session Confidence, measures subjects' change in pre-session confidence from Session 1 to 2. Payment Rank Inexperienced Session measures (from 1 to 5) the performance rank each bidder obtained in Session 1, where a rank of 1 is assigned to the top performing bidder and a rank of 5 is assigned to the worse performing bidder. Performance Payment Inexperienced Session measures the performance-contingent U.S. dollar payout each subject received in Session 1; that is, not including the show up fee and final random endowment. The rest of the indicator variables are defined in Table 1. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. t-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

	Experienced Subjects		Experienced Subjects					
			Low Confidence		Moderate Confidence		High Confidence	
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Intercept	-0.003	-0.051	-0.042	0.141	0.056	-0.159 ***	-0.121	-0.162
	(-0.060)	(-1.250)	(-0.500)	(1.060)	(1.270)	(-2.980)	(-1.350)	(-1.550)
Payment Rank Inexperienced Session	-0.004		0.037		-0.041 **		-0.012	
	(-0.330)		(1.350)		(-2.630)		(-0.730)	
Performance Payment Inexperienced Session		0.004 *		-0.008		0.013 ***		0.002
		(1.790)		(-0.890)		(3.900)		(1.000)
Dummy Male Student	0.010	0.009	0.056	0.065	0.058 *	0.033	0.047	0.045
	(0.290)	(0.270)	(0.920)	(1.040)	(1.750)	(1.030)	(0.480)	(0.470)
Dummy Graduate Student	-0.044	-0.044	-0.158	-0.143	-0.036	-0.023	-0.006	0.004
	(-1.250)	(-1.240)	(-1.520)	(-1.710)	(-0.700)	(-0.470)	(-0.140)	(0.080)
Uniform Pricing Dummy	0.033	0.040	0.004	-0.018	0.013	0.025	0.085 **	0.082 *
	(1.230)	(1.490)	(0.080)	(-0.260)	(0.420)	(0.960)	(2.300)	(1.900)
Symmetric Information Dummy	0.039	0.033	0.031	0.033	0.089 ***	0.070 **	-0.010	-0.017
	(1.450)	(1.240)	(0.500)	(0.460)	(3.030)	(2.370)	(-0.230)	(-0.430)
R-squared	0.040	0.053	0.157	0.122	0.244	0.289	0.110	0.107
N	131	131	38	38	56	56	37	37

TABLE 5

Determinants of Post-Session Confidence

Panel A - Determinants of Post-Session Confidence in Inexperienced Subjects

OLS regression of subjects' Post-Session 1 confidence on their pre-session confidence, their performance in the session, individual characteristics, and indicator variables for auction mechanism and information environment. Regressions 1 and 2 are conducted using the data of all the subjects who participated in Session 1. Regressions 3 through 8 segregate that sample by subjects' confidence level as done in Table 4. The dependent variable, Post-Session 1 Confidence, is the subject's assessment once the experimental session has concluded of the probability (%) that his/her performance will be above the median (top 50%) of all those subjects who participated in that experimental session. Pre-Confidence Inexperienced Session is defined as in Table 2. Payment Rank and Performance Payment Inexperienced Session are defined as in Table 4. The rest of the indicator variables are defined in Table 1. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. t-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

	Inexperienced Subjects		Inexperienced Subjects					
			Low Confidence		Moderate Confidence		High Confidence	
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Intercept	0.353 ***	0.070	0.554 ***	0.341 **	0.596 ***	0.189 **	0.680 ***	0.383 **
	(3.590)	(0.880)	(3.470)	(2.600)	(8.410)	(2.550)	(3.850)	(2.100)
Pre-Confidence Inexperienced Session	0.395 ***	0.418 ***						
	(2.780)	(2.950)						
Payment Rank Inexperienced Session	-0.053 **		-0.035		-0.081 ***		-0.074 *	
	(-2.690)		(-1.000)		(-3.610)		(-1.980)	
Performance Payment Inexperienced Session		0.015 ***		0.013		0.024 ***		0.014 **
		(3.120)		(1.220)		(3.910)		(2.240)
Dummy Male Student	-0.008	-0.024	-0.048	-0.054	0.026	-0.023	-0.089	-0.093
	(-0.150)	(-0.480)	(-0.610)	(-0.640)	(0.510)	(-0.520)	(-0.560)	(-0.610)
Dummy Graduate Student	0.054	0.065	-0.009	-0.024	-0.012	0.014	0.126	0.177
	(0.870)	(1.070)	(-0.070)	(-0.180)	(-0.180)	(0.230)	(1.020)	(1.520)
Uniform Pricing Dummy	-0.007	0.014	-0.079	-0.051	0.012	0.034	-0.038	-0.047
	(-0.180)	(0.350)	(-1.080)	(-0.700)	(0.240)	(0.790)	(-0.380)	(-0.440)
Symmetric Information Dummy	0.023	0.004	-0.237 ***	-0.258 ***	0.139 ***	0.107 ***	0.127	0.085
	(0.570)	(0.100)	(-2.860)	(-2.990)	(3.130)	(2.870)	(1.230)	(0.860)
R-squared	0.209	0.223	0.225	0.225	0.293	0.328	0.196	0.205
N	131	131	38	38	56	56	37	37

TABLE 5 (Continued)

Panel B - Determinants of Post-Session Confidence in Experienced Subjects

OLS regression of subjects' Post-Session 2 Confidence on their pre-session 2 confidence, their performance in the session, individual characteristics, and indicator variables for auction mechanism and information environment. Regressions 1 and 2 are conducted using the data of all the subjects who participated in Session 2. Regressions 3 through 8 segregate that sample by subjects' pre-session 2 confidence level as done in Table 4. The dependent variable, Post-Session Confidence, is the subject's assessment once Experimental Session 2 has concluded of the probability (%) that his/her performance will be above the median (top 50%) of all those subjects who participated in that experimental session. Pre-Confidence Inexperienced Session and Pre-Confidence Experienced Session are respectively the subject's assessment before the first and second experimental session begins of the probability (%) that his/her performance will be above the median (top 50%) of all those subjects who participate in that experimental session. Payment Rank Experienced Session measures the performance rank each bidder obtained in Session 2. The rest of the indicator variables are defined in Table 1. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. t-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

	Experienced Subjects		Experienced Subjects					
			Low Confidence		Moderate Confidence		High Confidence	
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Intercept	0.378 ***	0.425 ***	0.544 ***	0.524 ***	0.562 ***	0.519 ***	0.794 ***	0.384
	(4.580)	(5.790)	(4.230)	(3.680)	(8.660)	(4.800)	(4.610)	(1.410)
Pre-Confidence Inexperienced Session		0.491 ***		0.267		0.070		0.663 **
		(4.280)		(0.660)		(0.370)		(2.380)
Pre-Confidence Experienced Session	0.538 ***							
	(4.760)							
Payment Rank Experienced Session	-0.054 ***	-0.064 ***	-0.076 **	-0.088 **	-0.037 **	-0.036 **	-0.047	-0.057
	(-3.650)	(-4.250)	(-2.260)	(-2.650)	(-2.740)	(-2.650)	(-1.060)	(-1.480)
Dummy Male Student	0.018	0.024	0.070	0.064	0.088	0.091	-0.061	-0.100
	(0.400)	(0.470)	(0.660)	(0.620)	(1.240)	(1.300)	(-0.580)	(-1.060)
Dummy Graduate Student	0.000	-0.022	-0.072	-0.098	0.140 *	0.137 *	-0.085	-0.103
	(0.010)	(-0.420)	(-0.660)	(-0.720)	(2.010)	(1.980)	(-0.770)	(-1.170)
Uniform Pricing Dummy	0.033	0.047	0.034	0.030	-0.005	0.001	0.094	0.095
	(0.720)	(1.000)	(0.370)	(0.320)	(-0.090)	(0.020)	(0.930)	(1.080)
Symmetric Information Dummy	-0.080 *	-0.063	-0.130	-0.154	-0.054	-0.047	-0.085	-0.006
	(-1.850)	(-1.430)	(-1.430)	(-1.630)	(-0.970)	(-0.800)	(-1.040)	(-0.090)
R-squared	0.298	0.266	0.211	0.252	0.223	0.215	0.123	0.275
N	131	131	35	35	55	54	42	42

TABLE 6

Determinants of Post-Session Confidence in Subjects with Prior Stock Trading Experience

OLS regression of subjects' Post-Session 1 confidence on their pre-session confidence, their performance in Session 1, individual characteristics, and indicator variables for auction mechanism and information environment. Only data from subjects who indicated having prior stock trading experience are used. The dependent variable, Post-Session 1 Confidence is defined as in Panel A of Table 5. Pre-Confidence Inexperienced Session is defined as in Table 2. Payment Rank and Performance Payment Inexperienced Session are defined as in Table 4. The rest of the indicator variables are defined in Table 1. Clustered standard errors are estimated to adjust for correlated residuals amongst observations within the same experimental session. t-statistics are presented in parentheses. Superscripts *, **, and *** denote significance of the coefficients at the 90%, 95%, and 99% significance levels, respectively.

Independent Variables	(1)	(2)
Intercept	0.078	-0.133
	(0.240)	(-0.380)
Pre-Confidence Inexperienced Session	0.997 ***	1.047 ***
	(4.230)	(4.130)
Payment Rank Inexperienced Session	-0.063	
	(-1.700)	
Performance Payment Inexperienced Session		0.007
		(1.440)
Dummy Male Student	-0.021	-0.043
	(-0.080)	(-0.140)
Dummy Graduate Student	0.042	0.068
	(0.450)	(0.730)
Uniform Pricing Dummy	0.008	0.011
	(0.090)	(0.120)
Symmetric Information Dummy	0.031	-0.064
	(0.240)	(-0.440)
R-squared	0.685	0.661
N	23	23