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Ambiguity vs risk: An experimental study of overconfidence, gender and trading activity

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ABSTRACT

In this paper, we investigate the effect of overconfidence and gender on trading activity in experimental asset markets under a symmetric information setting. We measure the degree of overconfidence in three forms—miscalibration, a better-than-average effect, and the illusion of control, and design two treatments (Ambiguity and Risk) that differ by the prior information available about the distribution of the dividend in the asset market. Our results indicate that traders who think they are on average better in terms of trading ability trade more only in the Ambiguity Treatment where prior information about the distribution is omitted. Males also have a higher degree of overconfidence in the better-than-average effect and trade significantly more than females in the Ambiguity Treatment. Both overconfidence and gender do not appear to play a role in increasing trading volume in the Risk Treatment including information on distribution.

1. Introduction

In the light of the fact that high trading volume is evident in financial markets worldwide, the overconfidence literature suggests that given the assumption of asymmetric information, overconfident investors overestimate the precision of their private information, trading more than rational investors (Benos, 1998; Kyle and Wang, 1997; Odean, 1998; Scheinkman and Xiong, 2003). Besides, previous studies use gender as a measure for overconfidence and assume that males have a higher degree of overconfidence and trade more than females in financial markets (Lundeberg et al., 1994; Barber and Odean, 2001).

In this paper, we present experimental evidence investigating the link between the degrees of overconfidence, gender and trading activity in a symmetric information setting. We adopt the method used in Glaser and Weber (2007) and Deaves et al. (2009) to measure each subject's overconfidence in three forms: miscalibration-based overconfidence (MICA), the better-than-average (BTA) effect, and the illusion of control (IOC). To observe the trading activity, we implement a double-auction experimental asset market with two treatments that differ in the prior information available about the distribution of the dividend in the market. The first of these is a risky market where all traders know the distribution of the dividend. The second is an ambiguous market where the distribution of the dividend is unknown to everyone. The design of the

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ambiguous market therefore captures the characteristics of actual trading markets, which usually lack precise information about the distributional properties of asset values.

Our study differs from previous papers in two respects. Firstly, we compare the effect of overconfidence on trading activity across risky and ambiguous conditions. Secondly, we examine gender differences in overconfidence, as well as in trading behavior. In particular, we investigate whether the role of gender in trading differs between markets given risk or ambiguity.

2. Experimental design

We conducted the experiment at Zhejiang University in Hangzhou, China in March and June 2013 after recruiting 110 participants (44 male and 66 female) from different majors by posting an announcement on an electronic university bulletin board. We programmed and conducted the experiment using *z*-Tree software (Fischbacher, 2007).

Following Deaves et al. (2009), we obtained three measures of overconfidence for each subject using pre- and post-experimental questionnaires (see Appendix A). These are miscalibration-based overconfidence (MICA), the better-than-average (BTA) effect, and the illusion of control (IOC). For MICA, we instructed subjects to construct 90% confidence intervals for the 20 questions appearing in a pre experimental questionnaire. We measured BTA using the post-experimental questionnaire. Subjects were required to answer the following question: *Of the ten people (including you) doing this asset market experiment, how many do you think will end up making more money than you?* We calculated the BTA as nine minus the response to this question. To measure IOC, we included two questions in the pre-experimental questionnaire. Subjects were required to assign a number from 1 to 5 (totally disagree to totally agree) to each question: *Q1: I never buy stocks that will underperform in the future. Q2: I am not able to identify stocks with above-average performance in the future.* We measured the IOC variable, by subtracting the value assigned to Q2 from the value assigned to Q1. According to the definitions of MICA, IOC and BTA, a subject who is neither overconfident nor underconfident should have a value of 0.10, 0.00 and 4.50, respectively.

In order to observe trading behavior, we used a double-auction experimental asset market based on the classic approach proposed by Smith and Williams (1988), in which each of ten subjects joined one session and traded stocks in one market lasting for ten periods. Subjects were able to bid and ask or act as price-takers in accepting the bids and asks posted by others. At the end of each period, we announced the dividend to everyone, increasing each subject's cash according to the dividend for the period and the number of units he or she was holding at the time.

We conducted two treatments, which differed from each other in the information available about future dividends. In the Risk Treatment, all the subjects knew that in each period the dividend could be 0, 8, 28, or 60 tokens. The probability for each possible dividend was 25%. However, in the Ambiguity Treatment, the public information was that the dividend would also be 0, 8, 28, or 60 tokens, but with a probability of a, b, c, or d, respectively. The sum of a, b, c, and d is one, meaning that the distribution of future dividends was unknown to all subjects. We include six sessions with 60 subjects in the Risk Treatment and five sessions with 50 subjects in the Ambiguity Treatment. We mixed genders in all of the sessions.

3. Hypotheses

Our experiment aimed to test this effect under the condition of information symmetry. When subjects receive common information in the asset market, they need to interpret this information to estimate the value of assets using their own models. We assume that overconfident traders believe that their models are more valid, and prefer to trade more intensively.

Hypothesis 1. Overconfidence positively affects trading activity.

Compared with traders in the Risk Treatment, without knowing the distribution of the dividends, traders in the Ambiguity Treatment are required to solve a more complex problem in asset pricing. Put simply, they need to update their beliefs about asset return (as in the Risk Treatment) as well as about the variability of the dividend distribution using their own models. Traders who are overconfident in their own models indulge in excessive trading.

Hypothesis 2. Overconfidence plays a more significant role in increases in trading under the condition of ambiguity than under the condition of risk.

It was suggested that men are inclined to feel more competent than women in making financial decisions or in other masculine tasks (Deaux and Farris, 1977; Prince, 1993). As the BTA in our design is measured by asking subjects to evaluate their trading skill or ability compared with others, the task is associated with financial decisions. Accordingly, we formulate a single hypothesis which is relating to gender differences.

Hypothesis 3. Men are more overconfident in the form of the better-than-average effect than women.

The trading task in the Ambiguity Treatment is more complex than that in the Risk Treatment. Therefore, we expect male subjects will trade more in the Ambiguity Treatment.

Hypothesis 4. Males trade more than females under the condition of ambiguity.

4. Experimental results

4.1. Statistical analysis

Table 1 details the correlation coefficients between each of the variables. This shows that none of the correlations