Investment and financial illiteracy and behavioral biases in trading

Li Liang

ABSTRACT

Unlike most prior research focusing on examining how financial literacy affects people's decision making processes, this paper analyzes the impacts of individuals' investment and financial illiteracy on retail investors' trading behaviors. Using the survey data of the *2021 National Financial Capability Study* and its subsequent *Investor Study*, this study highlights that the more incorrect answers investors get in the investment and financial literacy quizzes, the more likely they are to trade meme stocks and believe in beating the market. On the contrary, the more "don't know" option investors select in the quizzes, the less likely they are to have such trading behavior and belief. These effects are more pronounced in male than in female investors, and among retail investors younger than 75 years old (inclusive).

Not knowing too much about finance is by no means what the paper advocates, however, it does work as a natural protection for the retail investors who select "don't know" responses in the investment and financial literacy quizzes.

Key words: Investment and financial illiteracy, trading, behavioral bias

I. Introduction

Financial literacy has long been recognized as a crucial ability that enables us to make informed economic decisions throughout life. There is an extensive literature showing that people with higher levels of financial literacy realize better financial outcomes. Individuals equipped with financial knowledge and skills are able to manage personal finance well and achieve different life goals.

Most previous research focuses on testing the effects of financial literacy (measured by the number or percentage of correct answers one gets in a financial literacy quiz) on outcome variables. Few studies analyze the impacts of the opposite side of financial literacy, which consists of incorrect answers and "don't know" responses, on dependent variables. The research on financial or investment illiteracy is relatively scant. This paper aims to fill the gap by looking at how investment illiteracy affects investors' trading behavior and belief.

To the best of my knowledge, this study is among the pioneering work that tackles the problem from a different perspective, and it contributes to the literature by showing the effects of incorrect answers and "don't know" responses on investor's behavioral biases in trading. Instrumental variable estimates highlight that investors who give more incorrect answers are more likely to trade meme stocks and believe in beating the market. Those who choose more "don't know" responses are less likely to do so. These effects are more pronounced in male than in female investors, and in the group of people younger than 75 years old.

The paper develops as follows: Section I surveys the literature on financial literacy and investors' behavioral biases; Section II describes data and methodology; Section III reports the results of hypothesis testing; and Section IV concludes.

II. Literature review

In the 2020 OECD Recommendation on Financial Literacy, financial literacy is defined as "A combination of financial awareness, knowledge, skills, attitudes and behaviors necessary to make sound financial decisions and ultimately achieve individual financial well-being"(OECD, n.d., p.6).

When it comes to measuring financial literacy, there are two approaches researchers take: subjective and objective financial literacy. Subjective financial literacy can be derived by using people's ratings of their financial knowledge, while objective financial literacy is determined by the correct answers people get in financial literacy quizzes. Most financial literature use the objective measure rather than the subjective one, as people tend to overestimate their actual financial knowledge (Lusardi & Mitchell, 2014). The difference between subjective and objective financial literacy measures can be used as a proxy of overconfidence (Barber et al. 2019; Xia et al., 2014).

There is a rich literature showing positive impacts of financial literacy on individual's economic decision making. Bellofatto et al. (2018) use survey data and examine the relation between subjective financial literacy and trading. They show that investors with a higher level of self-reported financial literacy achieve higher gross and net returns and excess Sharpe ratios by trading a small set of stocks and simultaneously holding investment funds (Bellofatto et al., 2018). Using objective financial literacy measures, researchers find that financially savvy households plan and save for their retirements and accumulate greater amounts of wealth when they retire (Clark et al. 2016; Hilgert et al., 2003; Kotlikoff & Beinheim, 2001; Lusardi & Mitchell, 2007a, 2007b, 2011a, 2011b). People with higher levels of financial literacy are more likely to participate in stock markets (Bucher-Koenen et al., 2016; Kimball & Shumway, 2006; Rooij et al., 2011; Sivaramakrishnan et al., 2017). Sophisticated investors pay less fees (Jiang et.al, 2019; Müller & Weber, 2008) and achieve better financial outcomes

by holding diversified portfolios (Abreu & Mendes, 2010; Chu et al., 2017; Gaudecker, 2014). Binachi (2017) shows that the portfolios held by the most financially literate households yield 0.4% higher return than those owned by the least literate ones. Financially literate investors actively rebalance their portfolios and keep risk exposures constant over time by switching to the funds that experienced lower return in the past (Binachi, 2017). Guiso & Viviano (2013) find that financially savvy investors are better at timing the market.

Financial literacy also plays an important role in influencing investors' behavioral biases. Ates et al. (2016) analyze the survey data of individual investors in Turkey and show that financial literacy positively correlates with the biases of overoptimism, confirmation, and representativeness, and negatively associates with overconfidence, cognitive dissonance, framing, and loss aversion. Using the survey data of Indian investors, Baker et al. (2018) demonstrate that financial literacy negatively associates with disposition effect and herding bias, positively associates with mental accounting bias, and does not significantly correlate with overconfidence and emotional biases. Bellofatto et al. (2018) suggest that investors with a higher level of subjective financial literacy trade more and are less prone to the disposition effect. Rasool & Ullah (2020) indicate that the probability of financially savvy investors suffering from behavioral biases is low.

In terms of the relation between knowledge and confidence, May (1986) claims that incomplete and wrong knowledge leads to overconfidence. Lackner et al. (2023) analyze the data of four large surveys conducted in Europe and the United States over 30 years and find that people's overconfidence reaches the top at intermediate levels of actual scientific knowledge. Chen and Garand (2018) investigate the gender gap of financial literacy using incorrect and "don't know" responses and point out that compared to men, women are more likely to pick incorrect answers and select "don't know" options. Cucinelli and Soana (2023) examine how incorrect and "don't know" responses affect the likelihood of people becoming victims of financial frauds. They suggest that overconfident individuals are more likely to be deceived.

III. Data and Methodology

Every three years, FINRA Investor Education Foundation conducts a new wave of *National Financial Capability Study* [1]of the US online, in which information such as respondents' demographics, financial situations, behaviors, and their answers to a financial literacy quiz is collected. There are 27,118 participants in the 2021 state-by-state survey. The financial literacy quiz asks seven questions and examines respondents' basic financial knowledge in interest rate, inflation, risk diversification, interest compounding, mortgage, bond pricing, and probability. If respondents indicate that they have non-retirement accounts and are responsible for making investment decisions, they would be invited to a follow-up *Investor Study* [2]. Questions with a focus on investing are asked in the study and respondents need to take an investment literacy quiz. The *2021 Investor Study*, the main data set I use for this paper, consists of 2,824 adult observations. I also obtain several data points from the original state-by-state survey for robustness checks. All of the data in the *National Financial Capability Study* and its subsequent *Investor Study* are self-reported information. Throughout my study, an analytical weighting scheme is employed to ensure that the sample FINRA selected in each state is representative of the total population of the US.

A. Model

The main model used in this study is as follows:

$$\text{Dummy} = \alpha_0 + \alpha_1 \text{Investment illiteracy } + \alpha_2 \text{Controls} + \epsilon \tag{1}$$

For each of the scenarios described in part B Hypothesis testing, the dependent variable equals one if the respondent falls in the specific category, and zero otherwise.

[1]https://finrafoundation.org/sites/finrafoundation/files/NFCS-2021-State-by-State-Questionnaire.pdf
[2]https://finrafoundation.org/sites/finrafoundation/files/NFCS-2021-Inv-Quest.pdf

The investment illiteracy has two categories: incorrect answers and"don't know" responses, measured by the number of the corresponding responses in the investment literacy quiz. Although the focus of this paper lies in investment illiteracy, the effects of investment literacy, measured by the number of correct answers, on the outcome variables are also provided as a benchmark for comparison purposes.

There are several explanations for why investors get incorrect answers. They may think that they know the financial concepts asked in the quiz, but in fact they don't, which is a signal of being overconfident in one's ability. Alternatively, investors do know that they don't fully understand the concepts, but still they would like to attempt the questions by making guesses rather than selecting the "don't know" option. If their guesses turn out to be wrong, they get incorrect answers. In this case, investors are considered to be bold and risk loving.

For the investors who pick "don't know" options, some of them do have no clues about the financial terms asked in the investment literacy quiz. However, others may have the financial knowledge, but they lack confidence and are hesitant to choose an answer in the quiz. Thus, they just select "don't know" options.

Having said that, identifying the motives behind the incorrect answers and "don't know" responses is not the main purpose of the paper, given that such granular information is unavailable and cannot be extracted from the data set used. Instead, this study quantifies investment illiteracy by counting how many questions investors get wrong and pick "don't know" for and investigates the relations between investment illiteracy and investors' behavior and belief.

Regarding the control variables, there are seven demographic variables and one dummy showing whether investors would like to take substantial or above-average risks. The demographics include gender, ethnicity, marital status, age, education, portfolio value, and investment experience. All of these are binary variables, equaling one if the respondent falls

in the specific category, and zero otherwise. The male dummy is set to one for men. For the two ethnicity groups of white and nonwhite, the white dummy is assigned the value of one if the person is white, and zero otherwise. In terms of the martial status, those who are married are treated as dummy. There are three age groups: 18-34, 35-54 and 55+. Each of the first two groups is represented by a dummy variable in the regressions, while the age group of 55+ is treated as the base one. When it comes to the education level, the whole sample is divided into two categories: with college or above degrees vs. without. People without college degrees are set as the reference group. In terms of portfolio values, there are three levels: less than 50K, 50K-250K and 250K+. The dummy variable representing respondents with portfolio values less than 50K is left out. Three groups of investment experience are as follows: less than 2 years, between 2 and 10 years, and more than 10 years. The group of investors with less than 2 years experience is the base one.

B. Hypothesis testing

One aspect of investment and financial illiteracy is getting incorrect answers. There is ample research exploring why people make mistakes. Dunning et al. (2003) point out that there are two reasons behind: 1) people do not have the expertise to give correct answers; 2) they fail to recognize their incompetence, and their self assessment of how they perform is uncorrelated with their actual performance. Individual investors who produce incorrect responses either lack financial knowledge to get correct answers or overestimate their skills when attempting questions. Although their performance turns out to be poor, they believe that they do well.

Another aspect of investment and financial illiteracy is selecting "don't know" options. Confucius said 26 centuries ago: "Real knowledge is to know the extent of one's ignorance." There are two kinds of retail investors choosing "don't know" responses: 1) they know that they have no ideas of what the concepts asked in the quizzes; 2) they don't have too much

confidence in the answers their would like to select, and pick "don't know" options instead. In the former case, it is human nature to avoid something we are unfamiliar with or uncertain about. In the latter scenario, Bucher-Koenen et al. (2021) show that compared to men, women lack confidence and are more likely to select "don't know" responses. However, women often choose correct answers when the "don't know" option is unavailable in the financial literacy quiz (Bucher-Koenen et al.,2021).

1. Trading meme stocks

The *2021 Investor Study* asks respondents whether they bought or sold shares of GameStop, AMC, or Blackberry in 2021. Individual investors who pick wrong answers in the investment literacy quiz might know a little bit of, rather than fully understood, these financially under performing stocks discussed on social media. They probably failed to calibrate the likelihood of making a profit before they traded such stocks. For those who choose "don't know", on the other hand, they are possibly afraid of meme stocks they have no clues about, and prefer to stay away from such investments. Therefore, the following hypothesis is tested:

H1a*: Investors who give more incorrect answers are more likely to trade meme stocks, while those who select more "don't know" are less likely to do so.*

The dummy variable on the left hand side of the regression equals one if the respondent traded meme stocks in 2021. The coefficient α_1 in model (1) is expected to be positive (negative) for those who give more incorrect answer ("don't know" responses).

The testing is first conducted in the full sample and then in the sub samples of male and female retail investors, respectively.

Given that the gender gap exists in financial literacy and men are more likely to take risks than women, the following hypothesis is tested:

H1b*: For male investors, the more incorrect answers ("don't know") they get, the more (less) likely they are to trade meme stocks. The effect is more pronounced in men than in*

women.

2. Believing in beating the market

Holding a belief in beating the market is often considered to be a signal of overconfidence. Although a small number of sophisticated retail investors can outperform the market, the majority of them cannot achieve the goal in the long run (Barber & Odean, 2013). The *2021 Investor Study* asks respondents how well they expect their portfolio of investments to perform. There are five options available for investors to select: worse, about the same as, better than the market, don't know and prefer not to say.

Investors who get incorrect answers probably overestimate their abilities to beat the market, while those choosing "don't know" responses possibly know the boundary of their knowledge or do not have the confidence in themselves when it comes to out returning the market. Accordingly, the hypothesis below is tested:

H2a*: Investors who give more incorrect answers are more likely to believe in beating the market, while those who select more "don't know" are less likely to do so.*

The dummy variable on the left hand side of the regression equals one if the respondent believe that they can beat the market. The coefficient α_1 in model (1) is expected to be positive (negative) for those who give more incorrect answer ("don't know" responses).

A testing on the full sample is performed first, followed by the sub samples testing for male and female retail investors.

H2b*: For male investors, the more incorrect answers ("don't know" responses) they get, the more (less) likely they are to believe in beating the market. The effect is more pronounced in men than in women.*

C. Endogeneity concern

A major concern about model (1) setup is the endogeneity issue. There may be omitted variables that affect both sides of the model. For example, "ability" is the unobserved variable, often thought to affect both the dependent variable and the main independent variables of the numbers of correct, incorrect and "don't know" responses, respectively. Omitted variables would bias the OLS estimate upward. It is also possible that the model suffers from simultaneity bias. When investors participate in the activity denoted by the dummy variable on the left hand side of the model, they are likely to come across a broad range of financial knowledge which they are unfamiliar with but they will learn later either through self education or by other means. This has impacts on the explanatory variable of the number of correct answers they get, which is often referred to the 'learning by doing' process. It is possible that investors misinterpret or do not get the gist of the new financial concept they encounter, although they believe that they fully grasp it. In this case, the number of incorrect answers will be influenced by engaging in the event indicated by the dependent variable. Another scenario is that when investors trade, they are exposed to more financial terms they don't know. All of these scenarios affect the measures of the numbers of correct, incorrect and "don't know" responses. Such potential reverse causalities bias the OLS estimates upward. In addition, the explanatory variables of This is the main data set I use for this paper the numbers of correct, incorrect and "don't know" responses may have measurement errors which bias the OLS estimates downward. Among all kinds of biases OLS estimates may have, the one caused by the measurement error dominates others. Therefore, the OLS estimates are expected to be smaller than the true parameters.

In order to mitigate the concerns on omitted variables, reverse causation and measurement errors, an instrumental variable is used in the regression. Inspired by Card (1993) and Lusardi & Mitchell (2014), the variable showing whether investors have access to financial education either at school or in the workplace is selected as the instrument.

Since investors' access to financial education is related to the endogenous variable of investment literacy and illiteracy, the IV satisfies the relevance condition. On the other hand, whether investors have access to financial education does not directly affect the dependent variables examined in this paper, i.e. whether investors traded meme stocks in 2021, and whether investors believe in beating the market. Therefore, the IV also meets the requirement of being exogenous to the dependent variables. In summary, the IV of investors' access to financial education satisfies both the relevance and exogeneity conditions.

For comparison purposes, a linear probability model is estimated first as the benchmark. Then, the coefficient obtained from the baseline model is compared to that derived from the 2SLS estimation to check whether the sign of investment illiteracy maintains and whether the new coefficient derived using the IV method is stronger, given that the OLS estimate is biased downward primarily by the measurement error. Furthermore, the F statistic will be checked against the typical criterion of 10 to make sure the IV is not a weak instrument.

D. Robustness checks

D.i. New measures

For robustness testing, I use the numbers of correct, incorrect and "don't know" responses from the financial literacy quiz to measure investors' investment literacy and illiteracy instead.

Given that endogeniety concerns still exist in the model (1), the same IV, investors' access to financial education, is used to instrument the endogenous variable of financial literacy and illiteracy. Coefficients derived from the 2SLS regressions will be compared to their counterparts, i.e. the ones derived when the numbers of correct, incorrect and "don't know" responses in the investment literacy quiz are used in the 2SLS estimations, to see whether the findings obtained before still hold.

D.ii. Exclusion of respondents older than 75 years old

Since cognitive decline comes with age, older individuals tend to experience a decrease in financial literacy (Gamble et al., 2015; Finke et al. 2017), leading to negative financial outcomes (Angrisani & Lee, 2019). From the perspective of asset allocation, senior citizens, especially those close to or already in retirement, should lower the proportion of stocks in their investment portfolios. Therefore, the majority of stock participants are the ones with relatively younger ages.

From the summary statistics in Table I, it is noted that 64% of the survey participants are older than 55 years old. A closer look at this group of people reveals that 268 out of the total 2,824 respondents are above 75 years old. A robustness check is performed by excluding the respondents older than 75 years old, making the sample size shrink to 2,568 retail investors.

The measures of the key explanatory variables used are the number of correct, incorrect, and "don't know" responses from the investment literacy quiz. Both H1 & H2 are tested in the sub sample of individuals younger than 75 years old (inclusive) using 2SLS regressions. The corresponding results can be compared to those obtained using the same measures in the full sample testing to check if the preliminary effects observed are still valid, and whether they become even more pronounced for retail investors younger than 75 years old (inclusive).

IV. Results

A. Descriptive Statistics

1. Explanatory variables

There are four categories of responses in the investment literacy quiz: correct, incorrect, don't know, and prefer not to say. As shown in Table I, the average number of correct, incorrect, "don't know", and "prefer not to say" responses are 5.10, 3.21, 2.12 and 0.07 out of 11 investment quiz questions, respectively. The respondents examined by this study are those who have brokerage accounts in addition to their retirement accounts. Although they get 2.39 questions correct of the Big 3 which test individuals' basic financial knowledge, their investment literacy is low: they answer correctly only 46.4% of the 11 investment literacy quiz questions. Since the sum of the average numbers of incorrect and "don't know" responses is greater than the mean of correct answers, this suggests that the opposite side of investment literacy cannot be overlooked. Examining the impacts of incorrect answers and "don't know" responses, rather than focusing on correct answers, provides different angles on behavioral biases. Given that the mean of "prefer not to say" responses is less than 0.1 out of 11 investment quiz questions and such response does not reveal much information on either sides of investment literacy, this category is not within the scope of discussion in the paper.

Among the total 2,824 survey respondents, the demographics are as follows: 61% men, 72% white, 66% married, 12% aged 18-34, 25% aged 35-54, 64% aged more than 55, 56% college educated or above , 29% with a portfolio value below $50,000, 29% with a portfolio value of $50,000-$250,000, and 41% with a portfolio value of more than $250,000, 13% with investment experience less than 2 years, 20% with investment experience between 2-10 years, and 66% with investment experience more than 10 years.

When it comes to investors' risk appetite, 35% of the respondents are willing to take substantial or above-average financial risks.

The instrument variable used in this paper is an dummy variable indicative of whether investors were exposed to financial education offered by their schools or employers. The binary variable has a mean of 0.35, suggesting that 35% of the respondents in the *2021 Investor Study* had access to financial education before.

2. Dependent variables

In terms of the descriptive statistics of the dependent variables shown in Table I , 13% traded meme stocks in 2021 and 26% believe that they could beat the market among all 2,824 retail investors surveyed.

3. Correct, incorrect, and "don't know" responses across demographics

The distributions of correct, incorrect and "don't know" responses across demographics are displayed in Table II. Table IIA demonstrates that, at the 5% level, male, white, people aged 55+, those with a Bachelor's degree or higher and individuals with incomes more than $100K, on average, get more correct answers than their counterparts, respectively. A closer look at the distributions of correct answers for males vs. females suggests that the percentages of men falling in each quartile of the number of correct responses are more or less the same, while there are more women in the first quartile than in the last one. When it comes to ethnicity, the distributions of correct answers for white and nonwhite are relatively even. With regards to age, for those in the age groups of 18-34 and 35-54, the distributions of correct answers are decreasing. For those aged 55+, however, there is an even distribution of correct responses across four quartiles. Similar within-group heterogeneities are also observed in the distributions of correct answers across education and income level. For those without a college degree, more people cluster in the first quartile than the subsequent ones, while for those with a college or higher degree, the number of correct answers follows a quasi-uniform

distribution. Comparisons of distributions in three different income groups indicate that for those with an income level less than $50K or $50K-$100K, fewer people score high in the investment literacy quiz. On the contrary, the scores of those making more than $100K a year are evenly distributed.

Table IIB presents the distributions of incorrect answers across demographics. At the 5% level, investors that are white, aged 55+, with a Bachelor's degree or higher and incomes more than $100K get fewer incorrect answers, on average, than their counterparts, respectively. However, the average numbers of incorrect answers men and women get are indistinguishable given that the p value of the mean equality test is greater than 5%, unlike what happens when comparing the numbers of correct answers by gender in which men score significantly higher than women. Both distributions of incorrect answers for men and women have two peaks in the second and the fourth quartile. Bimodal distributions of incorrect answers are also seen for other demographic groups. Having said that, the highest percentages of investors within each subgroups appear in the fourth quartile of incorrect answers. The dynamics in the last quartiles of age, education and income suggest that as individuals age, receive higher education and earn more incomes, they get fewer incorrect answers in the investment literacy quiz.

The distribution of "don't know" responses across the same demographic variables are shown in Table IIC. At the 5% level, investors that are male, aged 18-34, with a Bachelor's degree or higher and make incomes more than $100K choose fewer "don't know" responses than their counterparts, respectively. Although the average number of "don't know" nonwhite selects is lower than that white picks, the difference is significant at the 10% level. The distribution for men has two peaks that are in the first and the third quartile, respectively. Instead, the distribution for women is increasing with much more respondents in the last two quartiles than in the first two ones. The percentage of women in the highest quartile of "don't know" responses is more than twice that of men, consistent with the finding of prior

literature: women are more likely to indicate that they don't know (Lusardi & Mitchell, 2014). With respect to ethnicity, the "don't know" responses distribute evenly for white, while the responses decline modestly for nonwhite. There is a quasi-uniform distribution for people in the age group of 55+, but the distributions for individuals in the age groups of 18-34 and 35-54 are both decreasing with more (fewer) younger people in the first (fourth) quartile of "don't know" than older ones. The distribution for those without a college degree is almost constant. In contrast, the distribution for the people with a Bachelor's degree or higher drops gradually, which suggests that investors receiving a higher level of education are less likely to select "don't know". Last but not least, for people making less than $50K or $50K-100K a year, the numbers of "don't know" they choose follow a quasi-uniform distribution. For those earning more than $100K, however, the percentage of respondents picking the "don't know" option falls as the number of "don't know" increases, which demonstrates that as people make more money, they are less likely to select the "don't know" response.

4. Consecutive incorrect and "don't know" responses

In order to alleviate the concerns that respondents did not take the investment literacy quiz seriously and picked answers at random, the probabilities of them having consecutive four or more incorrect and "don't know" responses are computed to check whether such investors, if exist, are a small group of people. As table III suggests, 12% of respondents got four consecutive incorrect answers out of 11 questions. This proportion decreases to 6% if someone incorrectly answered five questions in a row. Only 2% of the respondents got six or seven consecutive incorrect answers. No one had more than 7 back-to-back incorrect answers.

For the consecutive "don't know" responses, table IV indicates that 13% of the respondents selected four straight "don't know" options, 8% picked five, and 6% chose six in sequence. The percentages of individuals with a streak of seven or more "don't know" drop to 3% and even lower levels.

Taking into account both scenarios in which investors had six or more (i.e. more than half of the 11 quiz questions) consecutive incorrect or "don't know" responses, the proportion of respondents not making efforts in taking the investment literacy quiz is less than 6%, relieving the worry that the incorrect and "don't know" choices contain unwanted noises.

B. Regression Analyses

1. Trading meme stocks

According to the *2021 Investor Study*, 310 out of 2,824 survey respondents traded meme stocks in 2021. The results of hypothesis testing for H1 in the full sample are discussed first, followed by the analyses in the sub samples of male vs. female investors. The purpose of running OLS baseline regressions is to provide a big picture of the relations between investment illiteracy and trading meme stocks before 2SLS estimates are introduced to address the endogeneity concerns about the model specification.

1.1 Full sample testing

Using the full sample of 2,824 retail investors, the testing of the impacts of investment illiteracy, together with the correct answers as the benchmark for comparison purposes, on trading meme stocks are performed and presented in Table VI.

OLS regressions

At the 1% level, the first OLS estimation result in table VI shows that the coefficient -0.004 of investment literacy measured by the number of correct answers is statistically insignificant. However, when the explanatory variable is replaced by investment illiteracy, quantified respectively by the number of incorrect answers and the number of "don't know" responses, the coefficients turn significant. As the third OLS regression demonstrates, every one additional incorrect answer investors get, on average, is associated with 2.5% points higher in the probability of them trading meme stocks in 2021. Alternatively, a one standard deviation

increase in the number of incorrect answers is correlated with 5.5% points higher for investors to trade meme stocks. On the contrary, the OLS regression in the fifth column reveals that the number of "don't know" responses is negatively correlated with the probability of trading meme stocks. Every one additional "don't know" response investors select is associated with 1.32% points lower in the probability of them trading meme stocks. In other words, a one standard deviation increase in the number of "don't know" responses is correlated with 3.55% points lower for investors to trade meme stocks.

In terms of the demographic variables in column (1), (3) & (5), the coefficients for the dummies of male, married, willingness to take risks, aged 18-34, aged 35-54 and portfolio value 50K-250K are all positively significant, while the ones for the dummy variables of investment experience 2-10 years and more than 10 years are both negatively significant across the three OLS regressions. These relations reveal that investors that are male, married, willing to take risks, younger than 55 years old, have portfolio values between 50K-250K and less than 2 years of investment experience are more likely to trade meme stocks, holding other variables constant.

2SLS estimations

Given that there is an endogeneity issue involved in the model (1) specification, an instrumental variable of investors' access to financial education is employed in the 2SLS estimation. This IV relates to the endogenous variables of investment literacy (measured by the number of correct answers) and illiteracy (measured by the number of incorrect answers and that of "don't know" responses), thus it satisfies the relevance condition. It does not, however, directly affect the dependent variable, i.e. whether investors traded meme stocks in 2021.

Table V reports the results from the first stage regressions in which the endogenous variables i.e. the numbers of correct, incorrect and "don't know" are regressed on the IV, together with control variables. All of the coefficients of the IV in the first stage regressions are statistically significant at the 1% level, confirming that the exposure to financial education

positively correlates with the number of correct and that of incorrect answers, and negatively associates with the number of "don't know" responses. The F statistics of the three first stage regressions are greater than 10: 41.83, 25.41 & 36.24, satisfying the typical rule of thumb when using IVs. Thus, a weak IV is less of a concern in this study.

Since the same IV is used in the testing of the second hypothesis on investors' beliefs in beating the market, the results from the first stage regressions are the same. Discussions about the IV is skipped in the relevant parts for the sake of space.

Compared to the linear probability models, i.e. regression (1), (3) & (5), used in Table VI, 2SLS regressions in column (2), (4) & (6) produce corresponding estimates with a bigger magnitude as expected. Consistent with the OLS result in column (1), the 2SLS estimate 0.158 of the impact of investment literacy on the behavioral bias in column (2) is also insignificant. In contrast, significant results at the 1% level are obtained in column (4) & (6) respectively when regressing the dummy of trading meme stocks on the number of incorrect answers and that of "don't know" responses, both instrumented by the access to financial education, with other control variables. The 2SLS result reported in column (4) confirms that there is a positive causal relationship between the number of incorrect answers and the dependent variable. Every one additional incorrect answer investors get leads to 6.8% points increase in the probability of investors trading meme stocks, which means a one standard deviation increase in incorrect answers causes the dependent variable to go up by 14.89% points. Unlike the positive relation derived for the incorrect answers, the 2SLS estimate for the "don't know" responses in column (6) suggests a negative causal relationship between the explanatory and the dependent variables. Every one additional "don't know" investors pick results in 5.16% points decrease in the probability of investors trading meme stocks. Equivalently, a one standard deviation increase in "don't know" responses brings down the dependent variable by 13.88% points.

Among control variables, the coefficients for the people aged 18-34 are positively significant at

the 1% level across 2SLS regressions (2), (4) & (6), suggesting that younger investors are more likely to trade meme stocks. Another two consistently significant demographic variables, at the 10% level, are investment experience 2-10 years and more than 10 years. Holding other variables constant, individuals with less than two years of investment experience are more likely to trade meme stocks than their counterparts.

In sum, there is no evidence showing that investment literacy, measured by the number of correct answers, meaningfully impacts meme stock trading. However, investment illiteracy, measured by the number of incorrect answers and that of "don't know", significantly influences the dependent variable. Their effects are in opposite directions. The more incorrect answers investors get, the more likely they are to trade meme stocks. By contrast, the more "don't know" investors choose, the less likely they are to trade meme stocks.

1.2 Sub sample testing

According to prior literature, a gender gap exists in investment literacy. In order to examine whether men exhibit different behaviors from women, the same 2SLS testing is conducted in the two sub samples for male and female investors. There are 1,714 male and 1,110 female investors in each data set. Table VII reports similar findings when the investment literacy is used as the main explanatory variable in the first two columns. There is no significant impact of the number of correct answers on trading meme stocks for both men and women. When it comes to the incorrect answers in column (3) & (4), its coefficient is positively significant at the 5% level in the male sample but insignificant in the women group. Every one more incorrect answer male investors get results in 8.47% points higher in the probability of them trading meme stocks. Therefore, a one standard deviation increase in the incorrect answers boost the dependent variable by 18.55% points for men. When comparing the impacts of "don't know" responses on trading meme stocks between men and women, in column (5) the coefficient is negatively significant at the 5% level for men, while in column (6) it is insignificant for women. Every one extra "don't know" response male

investors choose decreases the probability of them trading meme stocks by 7.62% points. Correspondingly, a one standard deviation increase in the "don't know" responses for males lowers the dependent variable by 20.50% points.

For the subgroup of men shown in column (3) & (5), the coefficients of the age groups of 18-34 and 35-54 are both positively significant, while those for investment experience 2-10 years and more than 10 years are both negatively significant at the 10% level. This suggests that male investors who are younger and have less investment experience are more likely to trade meme stocks than their counterparts, controlling for other demographic variables.

For the subgroup of women displayed in column (4) & (6), investors who are willing to take risks and aged between 18-34 are more likely to trade meme stocks.

Overall, instrumental variable estimates highlight that investors who give more incorrect answers are more likely to trade meme stocks. Those who select more "don't know " responses are less likely to do so. These effects are more pronounced in male than in female investors.

2. Believing in beating the market

Among 2,824 retail investors, 734 of them believe that their portfolio would perform better than the market as a whole.

2.1 Full sample testing

Similar to the hypothesis testing for H1, a full sample testing is conducted before moving onto the sub samples of men vs. women to explore the gender differences.

OLS regressions

When the dummy of believing in beating the market is regressed on the numbers of correct, incorrect and "don't know" responses along with control variables, the OLS regressions in Table VIII produce significant coefficients for the main explanatory variables at the 5% level, respectively. As the first column shows, every one additional correct answer investors get is associated with 0.76% points decrease in the probability of them holding such belief, which means a one standard deviation increase in the number of correct answers lowers the dependent variable by 2% points. This suggests that financially savvy investors are less likely to become overconfident in their performances against the market indexes. On the contrary, column (3) indicates that the probability of investors believing in beating the market increases by 2.59% points for every one additional incorrect answer they have. In other words, the dependent variable increases by 5.67% points for a one standard deviation increase in the number of incorrect answers. When it comes to the impact of "don't know" responses on the behavioral bias, column (5) shows that the dependent variable decreases 0.99% points for every one additional "don't know" response. Thus, the probability of investors believing in the beating the market goes down by 2.66% points for a one standard deviation increase in "don't know" responses.

In short, the more correct answers and "don't know" responses investors have, the less likely they are to believe in beating the market. However, the more incorrect answers they get, the more likely they are to hold such belief.

The OLS regressions in column (1), (3) & (5) also reveal that investors that are male, willingness to take risks, with portfolio values more than 250K, and less than 2 years of investment experience are more likely to believe in beating the market.

2SLS estimations

In order to address the endogeneity issue in the model, 2SLS regressions are introduced and

displayed side by side along the OLS regressions in Table VIII. The same IV, investors' access to financial education, is used in the 2SLS estimation given that it satisfies both the relevance and exogeneity requirements. The second stage regressions establish a causal relationship between the endogenous variables of the numbers of correct, incorrect and "don't know" responses and the dependent variable respectively.

According to the results demonstrated in column (2), the coefficient for the number of correct answers is insignificant when the dummy of believing in beating the market is regressed on the main explanatory variable and other controls, similar to the finding when testing the relation between the number of correct answers and trading meme stocks. With respect to the incorrect answers, column (4) shows a positively significant relation instead. As expected, the magnitude of the coefficient for the number of incorrect answers is bigger than that of the OLS estimate. Every one additional incorrect answer investors get increases the probability of them believing in beating the market by 7.52% points. In other words, a one standard deviation increase in the explanatory variable leads to 16.47% points higher in the dependent variable. When it comes to the "don't know" responses in column (6), the relation turns negatively significant. Again, the 2SLS estimate is greater than the corresponding OLS one in the absolute value term. Every one additional "don't know" response investors select lowers the dependent variable by 5.70% points, which translates to a one standard deviation increase in the "don't know" response causing the dependent variable to decline by 15.33% points.

In addition, the 2SLS regressions in column (4) & (6) for the investment illiteracy suggest that investors who are willing to take risks, with portfolio values more than 250K and less than two years of investment experience are more likely to hold a belief in themselves outperforming the market.

Overall, the 2SLS estimates confirm that investors with a higher number of incorrect answers are more likely to believe in beating the market, while those with a larger number of "don't

know" responses are less likely to hold such belief. There is no significant effect of the number of correct answers on the dependent variable.

2.2 Sub sample testing

Table IX compares men vs. women and reports the 2SLS estimates for the impacts of investors' performances in the investment literacy quiz on their belief in beating the market. Consistent with the finding in the OLS estimation, the 2SLS estimates in column (1) & (2) are both insignificant for men and women when the main explanatory variable is the number of correct answers. The coefficient for the number of incorrect answers, however, is statistically positive for men but insignificant for women. Column (3) shows that every one more incorrect answer male investors get increases the probability of them believing in beating the market by 7.45% points, which means a one standard deviation increase in the number of incorrect answers makes the the dependent variable higher by 16.32% points for men. In terms of the "don't know" responses, neither coefficients in column (5) & (6) are significant for men and women.

Moreover, column (3) & (5) reveal that male investors that are willing to take risks, with portfolio values more than 250K and less than two years of investment experience are more likely to believe in beating the market. According to column (4) & (6), women investors that are willing to take risks are also likely to hold such belief.

In short, the more incorrect answers male investors get, the more likely they are to believe in beating the market. There is no evidence showing that female investors suffer from this behavioral bias. Also, the relation between the number of "don't know" and holding such belief is insignificant in the sub samples of both men and women.

C. Robustness tests

In order to check whether the findings documented above still hold, the first strategy I adopt in robustness check is to use the numbers of correct, incorrect, and "don't know" responses investors have in the financial literacy quiz as the main explanatory variables, and re run the 2SLS regressions in the full sample first, before moving onto the sub samples of men and women.

Another robustness test performed in this section is to re run 2SLS regressions on the sub sample of retail investors younger than 75 years old (inclusive). The key explanatory variables used here are the same measures as those used in the preliminary testing: the numbers of correct, incorrect, and "don't know" responses in the investment literacy quiz.

As Table I displays, the average numbers of correct, incorrect, "don't know" and "prefer not to say" responses out of six questions asked in the financial literacy quiz are as follows: 4.17, 0.92, 0.74 and 0.03[3]. The sum of incorrect answers and "don't know" responses equals 1.66, taking up 27.67% of the total number of quiz questions. This proportion cannot be ignored and it also justifies the usage of financial illiteracy rather than the conventional financial literacy in regression analyses.

Given the endogeneity concerns on the model setup, the same IV, i.e. investors' exposure to financial education, is used to instrument the measures of financial illiteracy. The baseline regression examining the relation between financial literacy, measured by the number of correct answers, and behavioral biases is presented for comparison purposes.

1. Trading meme stocks

The dependent variable is the same dummy used before with the average of 0.13 and standard deviation 0.31.

[3]The number of the "prefer not to say" responses is not included in the testing since it is trivial and does not provide much information.

Full sample testing

As column (1) of Table X shows, the 2SLS estimate for the number of correct answers is insignificant, which suggests that being financially literate can hardly explain how likely one traded meme stocks. In contrast, column (2) & (3) tell different stories. The coefficient for the number of incorrect answers ("don't know" responses) is positively (negatively) significant at the 5% level, consistent with the previous findings when the corresponding measures from the investment literacy quiz are used. The probability of investors trading meme stocks increases 16.4% (17.55%) points for every one additional unit (a one standard deviation increase in the number) of incorrect answers investors get in the financial literacy quiz. On the other hand, the dependent variable decreases 13.4% (15.68%) points for every one additional unit (a one standard deviation increase in the number) of "don't know" responses investors choose.

In addition, other significant control variables in column (2) & (3) indicate that investors that are younger than 55 years old, willing to take risks, and with portfolio values between 50K-250K are more likely to trade meme stocks, but those with more than 10 years of investment experience are less likely to do so.

Sub sample testing-men vs. women

When the 2SLS regressions are run in the sub samples of men and women, the findings in the full sample still hold. The first two columns of Table XI report insignificant coefficients for the number of correct answers for both male and female investors, as expected. Therefore, investors' financial literacy has no significant impact on the probability of them trading meme stocks. When it comes to the number of incorrect answers in the next two columns (3) & (4), the coefficient for men is positively significant at the 5% level, but it is insignificant for women. The probability of men trading meme stocks increases 19.9% (21.29%) points for one more (standard deviation increase in the number of) incorrect answer they get in the financial literacy quiz. In the last two columns (5) & (6), the number of "don't know" responses has a negative effect on the dependent variable for men at the 5% level, but no

significant impact is noted for women. The probability of men trading meme stocks decreases 25.4% (35.05%) points for one more (standard deviation increase in the number of) "don't know" response they pick.

The significant control variables for men in column (3) & (5) reveal that male investors that are younger than 55 years old and willing to take risks are more likely to trade meme stocks, but those with more than 10 years of investment experience are less likely to do so. Column (4) & (6) suggest that women are more likely to trade meme stocks if they are willing to take risks, holding other variables constant.

In conclusion, the more incorrect answers ("don't know" responses) male investors get, the more (less) likely they are to trade meme stocks. There is no significant finding between financial illiteracy and the behavioral bias for female investors.

Sub sample testing-investors younger than 75 years old (inclusive)

When individuals older than 75 years old are excluded from the full sample, the 2SLS regressions in column (1)-(3) of Table XIV produce findings consistent with those in column (2), (4) & (6) of Table V. It is noted that the magnitudes of the α_1 coefficients for the numbers of correct, incorrect, and "don't know" responses are all greater than those obtained in the full sample testing, suggesting that the effects observed before are more pronounced for retail investors younger than 75 years old (inclusive). This finding is not surprising, as people aged more than 75 years old are less likely to be active participants in the stock market due to their increasing risk aversion and cognitive decline associated with aging.

In terms of control variables, people with willingness to take substantial risks or aged 18-34 are are more likely to trade meme stocks and to believe in beating the market, while those with more than 2 years investment experience are less likely to do so or to hold such an ambitious belief.

2. Believing in beating the market

The same dummy variable for investors who believe in beating the market is used as the dependent variable. The weighted mean of the dummy is 0.26 and standard deviation 0.43.

Full sample testing

The 2SLS tests in Table XII report consistent findings as before. The coefficient for the number of correct answers is still insignificant in explaining the variations in the dependent variable. On the contrary, there is a positive (negative) relation at the 10% level of significance between the number of incorrect answers ("don't know" responses) and dependent variable. Every one unit increase in the number of incorrect answers ("don't know" responses) leads to 18.2% points higher (14.9% lower) in the probability of investors believing in beating the market. In other words, the dependent variable goes up 19.47% (down 17.43%) points for a one standard deviation increase in the number of incorrect answers ("don't know" responses) investors get in the financial literacy quiz.

Column (2) & (3) also show that investors that are willing to take risks, with portfolio values more than 250K and less than two years of investment experience are more likely to exhibit such behavioral bias.

Sub sample testing-men vs. women

The 2SLS estimates for men and women displayed in Table XIII are similar to those derived above. The number of correct answers is again insignificant for both male and female investors. Financial literacy fails to explain how investors' belief in beating the market would change. The number of incorrect answers ("don't know" responses), however, does have a positive (negative) relation with the dependent variable for men at the 10% level. But these effects are insignificant for women. Column (3) & (5) indicate that the probability of men believing in beating the market increases 17.5% (decreases 22.4%) points for every one additional unit increase in the number of incorrect answers ("don't know" responses). This means that the dependent variable will be 18.73% points higher (26.21% points lower) if there is a one standard deviation increase in the number of incorrect answers ("don't know"

responses).

For men in column (3) & (5), they are more likely to become overconfident if they are willing to take risks, with portfolio values more than 250K and less than two years of investment experience. For women in column (4) & (6), they are more likely to hold a belief in outperforming the market if they are willing to take risks, with other variables unchanged.

Sub sample testing-investors younger than 75 years old

Previous findings hold, when it comes to the testing of beating the market belief. As column (5) of Table XIV demonstrates, the probability of individuals believing in beating the market increases by 9.27% points for each additional question they get wrong in the investment literacy quiz. However, this probability goes down by 7.38% points if investors pick an additional "don't know" response, as shown in column (6) of Table XIV. The magnitudes of the α_1 coefficients are both greater than those derived in the preliminary testing, suggesting that the effects are more pronounced among investors younger than 75 years old.

It is also noted that respondents who are willing to take risks or those with portfolio values above $250K are more likely to have such a belief. In contrast, people with investment experience between 2 and 10 years are less likely to think so.

Overall, the robustness checks conducted above confirm that all the causal relations tested so far hold between investment/financial illiteracy and investors' behavioral biases in trading.

V. Concluding remarks

Unlike most prior research using financial literacy to examine how it affects respondents' decision making, this study is the first one that assesses the impacts of investment illiteracy, measured by the numbers of incorrect answers and "don't know" responses, on individuals' behavioral biases in trading. It contributes to the literature by highlighting that investors

who give more incorrect answers are more likely to trade meme stocks and believe in beating the market. Those who select more "don't know" responses are less likely to do so. These effects are more pronounced in male than in female investors, and among individuals younger than 75 years old.

Although not knowing too much about finance works as a natural preventive barrier for investors who choose "don't know" responses, this paper encourages people to learn more about finance and become financially savvy in order to make wise decisions throughout life.

My results could shed light on designing and implementing financial education programs in the future. The objectives of effective training programs should not be limited to only improving people's financial knowledge. Making individuals aware of their behavioral biases and helping them come up with solutions to alleviate such biases are equally important.

Table I: *Summary statistics (weighted)*

	N	Mean	SD	Min	Max
Explanatory variables					
Investment literacy quiz					
Correct answers	2824	5.10	2.64	0	11
Incorrect answers	2824	3.21	2.24	0	10
Don't know	2824	2.12	2.67	0	11
Prefer not to say	2824	0.07	0.65	0	11
Financial literacy quiz					
Big 3	2824	2.39	0.88	0	3
Correct answers	2824	4.17	1.49	0	6
Incorrect answers	2824	0.92	1.07	0	6
Don't know	2824	0.74	1.17	0	6
Prefer not to say	2824	0.03	0.26	0	6
Demographics					
Male (Dummy)	2824	0.61	0.49	0	1
White (Dummy)	2824	0.72	0.40	0	1
Married (Dummy)	2824	0.66	0.47	0	1
Aged 18-34 (Dummy)	2824	0.12	0.31	0	1
Aged 35-54 (Dummy)	2824	0.25	0.44	0	1
Aged more than 55 (Dummy)	2824	0.64	0.48	0	1
College andor above (Dummy)	2824	0.56	0.49	0	1
Portfolio value below 50K (Dummy)	2824	0.29	0.45	0	1
Portfolio value between 50K-250K (Dummy)	2824	0.29	0.46	0	1
Portfolio value more than 250K (Dummy)	2824	0.41	0.49	0	1
Investment experience less than 2 years(Dummy)	2824	0.13	0.34	0	1
Investment experience 2-10 years (Dummy)	2824	0.20	0.40	0	1
Investment experience more than 10 years(Dummy)	2824	0.66	0.47	0	1
Risk appetite					
Willingness to take above average risks (Dummy)	2824	0.35	0.48	0	1
Instrumental variable					
Access to financial education (Dummy)	2824	0.35	0.48	0	1
Dependent Variables					
Dummy=1 for investors who bought or sold shares of GameStop, AMC, or Blackberry in 2021	2824	0.13	0.31	0	1
Dummy=1 for investors who believe that they could beat the market	2824	0.26	0.43	0	1

Table IIA: *Correct answers across demographics*

	Correct Answers Quartiles						
Gender	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Male	22%	26%	25%	27%	5.72	1714	(p value)
Female	44%	30%	16%	10%	4.13	1110	0.00

	Correct Answers Quartiles						
Ethnicity	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
White	29%	27%	22%	22%	5.19	2276	(p value)
Non white	34%	27%	22%	17%	4.88	548	0.02

	Correct Answers Quartiles						
Age	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Aged 18-34	42%	35%	15%	8%	4.25	294	(p value)
Aged 35-54	38%	25%	19%	18%	4.73	720	0.00
Aged 55 +	26%	27%	24%	24%	5.41	1810	

	Correct Answers Quartiles						
Education	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Some college or less	38%	30%	20%	13%	4.52	1098	(p value)
College grad (Bachelor's) or more	25%	25%	23%	26%	5.56	1726	0.00

	Correct Answers Quartiles						
Income	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Less than $50K	39%	32%	18%	11%	4.38	599	(p value)
$50K-$100K	32%	28%	22%	18%	4.92	1097	0.00
$100K+	25%	24%	23%	28%	5.69	1128	

Table IIB: *Incorrect answers across demographics*

	Incorrect Answers Quartiles						
Gender	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Male	9.33%	36.99%	17.04%	36.64%	3.08	1714	(p value)
Female	9.82%	32.61%	18.02%	39.55%	3.15	1110	0.40
	Incorrect Answers Quartiles						
Ethnicity	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
White	10.11%	36.51%	17.84%	35.54%	3.00	2276	(p value)
Non white	7.12%	30.11%	15.69%	47.08%	3.53	548	0.00
	Incorrect Answers Quartiles						
Age	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Aged 18-34	4.42%	22.79%	12.93%	59.86%	4.04	294	(p value)
Aged 35-54	6.94%	29.86%	15.28%	47.92%	3.71	720	0.00
Aged 55 +	11.38%	39.45%	19.01%	30.17%	2.66	1810	
	Incorrect Answers Quartiles						
Education	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Some college or less	7.83%	31.33%	20.04%	40.80%	3.28	1098	(p value)
College grad (Bachelor's) or more	10.60%	37.78%	15.76%	35.86%	3.00	1726	0.00
	Incorrect Answers Quartiles						
Income	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Less than $50K	8.85%	31.72%	19.20%	40.23%	3.22	599	(p value)
$50K-$100K	8.75%	34.37%	16.77%	40.11%	3.18	1097	0.05
$100K+	10.64%	38.03%	17.11%	34.22%	2.99	1128	

Table IIC: *Don't know across demographics*

	Don't Know Quartiles						
Gender	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Male	33.30%	17.65%	34.30%	14.75%	2.09	1714	(p value)
Female	16.27%	9.79%	43.05%	30.88%	3.55	1110	0.00
	Don't Know Quartiles						
Ethnicity	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
White	27.55%	28.51%	20.30%	23.64%	2.71	2276	(p value)
Non white	31.93%	28.83%	17.88%	21.35%	2.48	548	0.08
	Don't Know Quartiles						
Age	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Aged 18-34	39.12%	25.51%	17.35%	18.03%	2.19	294	(p value)
Aged 35-54	35.42%	26.25%	16.39%	21.94%	2.40	720	0.00
Aged 55 +	23.87%	30.00%	21.60%	24.53%	2.84	1810	
	Don't Know Quartiles						
Education	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Some college or less	22.50%	25.68%	22.22%	29.60%	2.83	1098	(p value)
College grad (Bachelor's) or more	32.16%	30.42%	18.31%	19.12%	2.34	1726	0.00
	Don't Know Quartiles						
Income	1(Low)	2	3	4(High)	Mean	N	Test for mean equality
Less than $50K	21.54%	26.71%	19.53%	32.22%	3.92	599	(p value)
$50K-$100K	24.98%	28.44%	22.42%	24.16%	2.82	1097	0.00
$100K+	35.37%	29.70%	17.46%	17.46%	2.18	1128	

Table III: *Consecutive incorrect answers*

	N	Mean	SD	Min	Max
4 incorrect answers in a row (Dummy)	2824	0.12	0.33	0	1
5 incorrect answers in a row (Dummy)	2824	0.06	0.23	0	1
6 incorrect answers in a row (Dummy)	2824	0.02	0.15	0	1
7 incorrect answers in a row (Dummy)	2824	0.02	0.13	0	1
8 incorrect answers in a row (Dummy)	2824	0.00	0.03	0	1
9 incorrect answers in a row (Dummy)	2824	0.00	0.03	0	1
10 incorrect answers in a row (Dummy)	2824	0.00	0.03	0	1
11 incorrect answers in a row (Dummy)	2824	0.00	0.00	0	0

Table IV: *Consecutive "don't know" responses*

	N	Mean	SD	Min	Max
4 "don't know" in a row (Dummy)	2824	0.13	0.33	0	1
5 "don't know" in a row (Dummy)	2824	0.08	0.27	0	1
6 "don't know" in a row (Dummy)	2824	0.06	0.23	0	1
7 "don't know" in a row (Dummy)	2824	0.03	0.16	0	1
8 "don't know" in a row (Dummy)	2824	0.02	0.13	0	1
9 "don't know" in a row (Dummy)	2824	0.01	0.12	0	1
10 "don't know" in a row (Dummy)	2824	0.01	0.11	0	1
11 "don't know" in a row (Dummy)	2824	0.01	0.10	0	1

Table V: First stage regressions

	(1) (No. of correct)	(2) (No. of incorrect)	(3) (No. of "don't know")
Access to financial education (IV)	0.233**	0.542***	−0.714***
	(0.112)	(0.101)	(0.116)
Male	1.504***	−0.314***	−1.122***
	(0.112)	(0.101)	(0.121)
White	0.033	−0.316**	0.266**
	(0.135)	(0.126)	(0.134)
Married	0.049	0.112	−0.177
	(0.114)	(0.101)	(0.125)
Willing to take risks	0.556***	0.523***	−1.076***
	(0.118)	(0.108)	(0.118)
Aged 18-34	−0.484**	0.872***	−0.500**
	(0.217)	(0.208)	(0.233)
Aged 35-54	−0.578***	0.704***	−0.219
	(0.143)	(0.130)	(0.138)
College or above	0.738***	−0.359***	−0.341***
	(0.111)	(0.101)	(0.117)
Portfolio value 50K-250K	0.172	0.457***	−0.645***
	(0.143)	(0.132)	(0.148)
Portfolio value > 250K	0.316**	0.124	−0.497***
	(0.149)	(0.133)	(0.151)
Investment experience 2-10 years	0.365**	0.046	−0.392*
	(0.185)	(0.202)	(0.214)
Investment experience > 10 years	1.274***	−0.808***	−0.508**
	(0.192)	(0.200)	(0.216)
Constant	2.535***	3.451***	4.972***
	(0.222)	(0.225)	(0.257)
Observations	2824	2824	2824
F statics	41.83	25.41	36.24

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VI: *Estimates of the impacts of incorrect and "don't know" responses on trading meme stocks*

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
No. of correct answers	-0.00400	0.158				
	(0.00307)	(0.104)				
No. of incorrect answers			0.0250***	0.0680**		
			(0.00392)	(0.0284)		
No. of "don't know"					-0.0132***	-0.0516**
					(0.00255)	(0.0221)
Male	0.0619***	-0.183	0.0631***	0.0756***	0.0407***	-0.00354
	(0.0152)	(0.161)	(0.0138)	(0.0163)	(0.0146)	(0.0301)
White	-0.0265	-0.0311	-0.0184	-0.00444	-0.0229	-0.0122
	(0.0195)	(0.0294)	(0.0193)	(0.0229)	(0.0193)	(0.0211)
Married	0.0309**	0.0212	0.0273*	0.0214	0.0279*	0.0199
	(0.0148)	(0.0236)	(0.0146)	(0.0160)	(0.0147)	(0.0160)
Willingness to take risks	0.132***	0.0381	0.115***	0.0904***	0.114***	0.0706**
	(0.0179)	(0.0616)	(0.0176)	(0.0249)	(0.0177)	(0.0306)
Aged 18-34	0.172***	0.241***	0.148***	0.106**	0.165***	0.139***
	(0.0360)	(0.0662)	(0.0348)	(0.0421)	(0.0354)	(0.0374)
Aged 35-54	0.0935***	0.185***	0.0775***	0.0461	0.0924***	0.0826***
	(0.0195)	(0.0669)	(0.0190)	(0.0288)	(0.0195)	(0.0212)
College or above	-0.0264*	-0.148*	-0.0213	-0.00720	-0.0345**	-0.0492***
	(0.0155)	(0.0807)	(0.0153)	(0.0188)	(0.0153)	(0.0176)
Portfolio value 50K-250K	0.0651***	0.0370	0.0529**	0.0332	0.0558***	0.0310
	(0.0215)	(0.0365)	(0.0210)	(0.0263)	(0.0213)	(0.0268)
Portfolio value > 250K	0.0212	-0.0299	0.0169	0.0117	0.0134	-0.00557
	(0.0195)	(0.0459)	(0.0192)	(0.0208)	(0.0194)	(0.0236)
Investment experience 2-10 years	-0.0632*	-0.122**	-0.0655*	-0.0671*	-0.0696*	-0.0841**
	(0.0382)	(0.0619)	(0.0373)	(0.0369)	(0.0378)	(0.0381)
Investment experience > 10 years	-0.185***	-0.392***	-0.170***	-0.136***	-0.197***	-0.217***
	(0.0348)	(0.140)	(0.0340)	(0.0426)	(0.0347)	(0.0360)
Constant	0.140***	-0.279	0.0404	-0.113	0.193***	0.378***
	(0.0394)	(0.274)	(0.0405)	(0.111)	(0.0410)	(0.112)
Observations	2,824	2,824	2,824	2,824	2,824	2,824
R-squared	0.210		0.234	0.161	0.219	0.137

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table VII: *Sub sample testing - 2SLS estimates of the impacts of incorrect and "don't know" responses on trading meme stocks*

VARIABLES	(1) 2SLS Male	(2) 2SLS Female	(3) 2SLS Male	(4) 2SLS Female	(5) 2SLS Male	(6) 2SLS Female
No. of correct answers	0.623	0.0316				
	(1.052)	(0.0421)				
No. of incorrect answers			0.0847**	0.0422		
			(0.0334)	(0.0540)		
No. of "don't know"					-0.0762**	-0.0217
					(0.0309)	(0.0276)
White	-0.108	0.00498	-0.0273	0.0240	-0.0382	0.0142
	(0.143)	(0.0248)	(0.0303)	(0.0351)	(0.0285)	(0.0259)
Married	0.135	0.0231	0.0368	0.0235	0.0492**	0.0209
	(0.180)	(0.0207)	(0.0240)	(0.0212)	(0.0234)	(0.0223)
Willingness to take risks	-0.209	0.109***	0.0872***	0.100**	0.0521	0.0999**
	(0.566)	(0.0375)	(0.0285)	(0.0495)	(0.0383)	(0.0471)
Aged 18-34	0.681	0.175***	0.0977*	0.142**	0.158***	0.156***
	(0.851)	(0.0554)	(0.0528)	(0.0640)	(0.0467)	(0.0572)
Aged 35-54	0.512	0.0411	0.0680*	0.00275	0.115***	0.0221
	(0.655)	(0.0329)	(0.0396)	(0.0361)	(0.0302)	(0.0258)
College or above	-0.549	-0.0165	-0.0251	0.0205	-0.0858***	-0.000831
	(0.855)	(0.0316)	(0.0256)	(0.0284)	(0.0273)	(0.0186)
Portfolio value 50K-250K	-0.103	0.0408	0.0213	0.0327	0.00364	0.0357
	(0.315)	(0.0292)	(0.0363)	(0.0323)	(0.0410)	(0.0299)
Portfolio value > 250K	-0.170	-0.0221	0.0233	-0.0136	-0.00639	-0.0204
	(0.370)	(0.0274)	(0.0293)	(0.0258)	(0.0348)	(0.0256)
Investment experience 2-10 years	-0.311	-0.0899	-0.0851*	-0.0555	-0.112**	-0.0753
	(0.447)	(0.0549)	(0.0502)	(0.0563)	(0.0531)	(0.0495)
Investment experience > 10 years	-1.226	-0.134**	-0.159***	-0.0779	-0.290***	-0.112**
	(1.674)	(0.0614)	(0.0577)	(0.0599)	(0.0502)	(0.0483)
Constant	-2.267	-0.0178	-0.0587	-0.0908	0.506***	0.166
	(4.200)	(0.125)	(0.123)	(0.213)	(0.127)	(0.133)
Observations	1,714	1,110	1,714	1,110	1,714	1,110
R-squared		0.112	0.155	0.152	0.106	0.175

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table VIII: *Estimates of the impacts of incorrect and "don't know" responses on believing in beating the market*

VARIABLES	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
No. of correct answers	-0.00757**	0.175				
	(0.00376)	(0.124)				
No. of incorrect answers			0.0259***	0.0752*		
			(0.00478)	(0.0388)		
No. of "don't know"					-0.00994***	-0.0570*
					(0.00353)	(0.0297)
Male	0.0785***	-0.198	0.0745***	0.0888***	0.0556***	0.00127
	(0.0211)	(0.193)	(0.0195)	(0.0227)	(0.0207)	(0.0407)
White	-0.0314	-0.0366	-0.0232	-0.00712	-0.0288	-0.0157
	(0.0246)	(0.0354)	(0.0242)	(0.0266)	(0.0246)	(0.0261)
Married	-0.0166	-0.0276	-0.0206	-0.0274	-0.0192	-0.0290
	(0.0207)	(0.0295)	(0.0205)	(0.0218)	(0.0206)	(0.0221)
Willingness to take risks	0.190***	0.0843	0.170***	0.142***	0.174***	0.120***
	(0.0227)	(0.0773)	(0.0226)	(0.0316)	(0.0229)	(0.0409)
Aged 18-34	0.00670	0.0852	-0.0158	-0.0650	0.00335	-0.0280
	(0.0398)	(0.0770)	(0.0397)	(0.0546)	(0.0398)	(0.0442)
Aged 35-54	-0.00121	0.102	-0.0158	-0.0518	0.000557	-0.0114
	(0.0249)	(0.0777)	(0.0246)	(0.0383)	(0.0248)	(0.0267)
College or above	-0.0130	-0.150	-0.0102	0.00593	-0.0225	-0.0405*
	(0.0201)	(0.0969)	(0.0198)	(0.0240)	(0.0199)	(0.0234)
Portfolio value 50K-250K	0.0532**	0.0216	0.0400	0.0174	0.0455*	0.0149
	(0.0258)	(0.0428)	(0.0257)	(0.0316)	(0.0258)	(0.0325)
Portfolio value > 250K	0.107***	0.0500	0.102***	0.0960***	0.100***	0.0769**
	(0.0255)	(0.0555)	(0.0252)	(0.0261)	(0.0256)	(0.0304)
Investment experience 2-10 years	-0.114***	-0.180**	-0.117***	-0.119***	-0.120***	-0.138***
	(0.0386)	(0.0702)	(0.0382)	(0.0396)	(0.0384)	(0.0412)
Investment experience > 10 years	-0.138***	-0.371**	-0.127***	-0.0875*	-0.153***	-0.177***
	(0.0387)	(0.169)	(0.0381)	(0.0495)	(0.0381)	(0.0420)
Constant	0.276***	-0.194	0.165***	-0.0106	0.305***	0.533***
	(0.0449)	(0.324)	(0.0463)	(0.143)	(0.0482)	(0.153)
Observations	2,824	2,824	2,824	2,824	2,824	2,824
R-squared	0.071		0.084	0.030	0.072	0.001

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table IX: *Sub sample testing - 2SLS estimates of the impacts of incorrect and "don't know" responses on believing in beating the market*

VARIABLES	(1) 2SLS Male	(2) 2SLS Female	(3) 2SLS Male	(4) 2SLS Female	(5) 2SLS Male	(6) 2SLS Female
No. of correct answers	0.548	0.0621				
	(0.965)	(0.0678)				
No. of incorrect answers			0.0745*	0.0830		
			(0.0443)	(0.0889)		
No. of "don't know"					-0.0670	-0.0427
					(0.0408)	(0.0443)
White	-0.0830	-0.0253	-0.0124	0.0121	-0.0220	-0.00718
	(0.129)	(0.0387)	(0.0338)	(0.0511)	(0.0344)	(0.0390)
Married	0.0523	-0.0225	-0.0344	-0.0218	-0.0235	-0.0268
	(0.163)	(0.0341)	(0.0299)	(0.0340)	(0.0301)	(0.0353)
Willingness to take risks	-0.113	0.152**	0.148***	0.134*	0.117**	0.133*
	(0.523)	(0.0592)	(0.0351)	(0.0724)	(0.0503)	(0.0719)
Aged 18-34	0.430	0.0241	-0.0836	-0.0412	-0.0305	-0.0138
	(0.780)	(0.0659)	(0.0662)	(0.100)	(0.0550)	(0.0751)
Aged 35-54	0.318	0.0562	-0.0726	-0.0191	-0.0315	0.0189
	(0.592)	(0.0514)	(0.0481)	(0.0644)	(0.0362)	(0.0386)
College or above	-0.463	-0.0527	-0.00123	0.0200	-0.0546	-0.0218
	(0.783)	(0.0527)	(0.0300)	(0.0475)	(0.0350)	(0.0298)
Portfolio value 50K-250K	-0.0697	-0.00267	0.0398	-0.0186	0.0243	-0.0127
	(0.287)	(0.0411)	(0.0426)	(0.0462)	(0.0496)	(0.0420)
Portfolio value > 250K	-0.0429	0.0227	0.127***	0.0395	0.101**	0.0261
	(0.343)	(0.0453)	(0.0350)	(0.0391)	(0.0434)	(0.0414)
Investment experience 2-10 years	-0.342	-0.128*	-0.144***	-0.0603	-0.167***	-0.0991*
	(0.416)	(0.0741)	(0.0542)	(0.0687)	(0.0602)	(0.0590)
Investment experience > 10 years	-1.050	-0.145	-0.111*	-0.0362	-0.227***	-0.103*
	(1.542)	(0.0889)	(0.0653)	(0.0795)	(0.0595)	(0.0606)
Constant	-1.842	0.0640	0.100	-0.0794	0.597***	0.426**
	(3.849)	(0.191)	(0.152)	(0.337)	(0.171)	(0.216)
Observations	1,714	1,110	1,714	1,110	1,714	1,110
R-squared			0.030			0.049

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table X: Robustness testing - 2SLS estimates of
incorrect and "don't know" responses on trading meme stocks

VARIABLES	(1)	(2)	(3)
	Trading meme stocks		
No. of correct answers	0.734		
	(1.046)		
No. of incorrect answers		0.164**	
		(0.0713)	
No. of "don't know"			-0.134**
			(0.0619)
Male	-0.465	0.0734***	-0.0128
	(0.744)	(0.0161)	(0.0356)
White	-0.179	-0.00741	-0.0358
	(0.235)	(0.0230)	(0.0223)
Married	0.0226	0.0165	0.0143
	(0.0522)	(0.0168)	(0.0182)
Willingness to take risks	0.160**	0.0892***	0.0990***
	(0.0758)	(0.0261)	(0.0235)
Aged 18-34	0.599	0.0921*	0.190***
	(0.620)	(0.0475)	(0.0390)
Aged 35-54	0.359	0.0535*	0.109***
	(0.384)	(0.0276)	(0.0228)
College and above	-0.407	0.00369	-0.0675***
	(0.544)	(0.0223)	(0.0245)
Portfolio value 50K-250K	0.0815	0.0360	0.0459*
	(0.0724)	(0.0264)	(0.0257)
Portfolio value > 250K	-0.0526	0.0125	0.00637
	(0.129)	(0.0210)	(0.0238)
Investment experience 2-10 years	-0.215	-0.0442	-0.0774*
	(0.234)	(0.0391)	(0.0408)
Investment experience > 10 years	-0.709	-0.117**	-0.223***
	(0.743)	(0.0486)	(0.0397)
Constant	-2.015	-0.0629	0.351***
	(3.052)	(0.0937)	(0.110)
Observations	2,824	2,824	2,824
R-squared		0.131	0.027

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table XI: *Robustness testing in sub samples - 2SLS estimates of the impacts of incorrect and "don't know" responses on trading meme stocks*

VARIABLES	(1) 2SLS Male	(2) 2SLS Female	(3) 2SLS Male	(4) 2SLS Female	(5) 2SLS Male	(6) 2SLS Female
No. of correct answers	-3.153	0.0849				
	(14.89)	(0.123)				
No. of incorrect answers			0.199**	0.126		
			(0.0794)	(0.172)		
No. of "don't know"					-0.254**	-0.0397
					(0.122)	(0.0512)
White	0.655	-0.0112	-0.0344	0.0291	-0.0705**	0.00303
	(3.308)	(0.0375)	(0.0301)	(0.0416)	(0.0359)	(0.0252)
Married	0.0375	0.0262	0.0216	0.0292	0.0115	0.0265
	(0.274)	(0.0208)	(0.0254)	(0.0189)	(0.0320)	(0.0189)
Willingness to take risks	-0.0400	0.131***	0.0794***	0.102**	0.0754**	0.120***
	(0.802)	(0.0306)	(0.0301)	(0.0514)	(0.0347)	(0.0312)
Aged 18-34	-1.387	0.244**	0.0967*	0.109	0.219***	0.185***
	(7.388)	(0.115)	(0.0536)	(0.103)	(0.0570)	(0.0581)
Aged 35-54	-0.930	0.0581	0.0816**	-0.00247	0.151***	0.0313
	(5.032)	(0.0553)	(0.0364)	(0.0438)	(0.0352)	(0.0271)
College or above	1.418	-0.0473	-0.0100	0.0355	-0.111***	-0.00882
	(6.902)	(0.0741)	(0.0290)	(0.0470)	(0.0423)	(0.0236)
Portfolio value 50K-250K	-0.0438	0.0454	0.0126	0.0446	0.00878	0.0451
	(0.671)	(0.0323)	(0.0396)	(0.0320)	(0.0491)	(0.0303)
Portfolio value > 250K	0.274	-0.0225	0.0101	0.000419	-0.00912	-0.0104
	(1.129)	(0.0309)	(0.0316)	(0.0344)	(0.0444)	(0.0260)
Investment experience 2-10 years	0.447	-0.0954	-0.0586	-0.0383	-0.104*	-0.0735
	(2.501)	(0.0617)	(0.0500)	(0.0711)	(0.0613)	(0.0507)
Investment experience > 10 years	2.193	-0.154*	-0.150**	-0.0505	-0.317***	-0.111**
	(11.51)	(0.0883)	(0.0612)	(0.0880)	(0.0633)	(0.0498)
Constant	11.65	-0.183	0.0325	-0.113	0.532***	0.125
	(54.04)	(0.368)	(0.0939)	(0.253)	(0.165)	(0.0877)
Observations	1,714	1,110	1,714	1,110	1,714	1,110
R-squared			0.140	0.066		0.154

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table XII: Robustness testing - 2SLS estimates of
incorrect and "don't know" responses on believing in beating the market

	(1)	(2)	(3)
VARIABLES	Believing in beating the market		
No. of correct answers	0.812		
	(1.130)		
No. of incorrect answers		0.182*	
		(0.0962)	
No. of "don't know"			-0.149*
			(0.0778)
Male	-0.509	0.0863***	-0.00897
	(0.808)	(0.0225)	(0.0463)
White	-0.201	-0.0104	-0.0418
	(0.246)	(0.0266)	(0.0260)
Married	-0.0260	-0.0328	-0.0352
	(0.0571)	(0.0233)	(0.0236)
Willingness to take risks	0.219***	0.141***	0.152***
	(0.0809)	(0.0332)	(0.0287)
Aged 18-34	0.481	-0.0799	0.0283
	(0.669)	(0.0625)	(0.0419)
Aged 35-54	0.294	-0.0436	0.0176
	(0.411)	(0.0356)	(0.0266)
College or above	-0.437	0.0180	-0.0608**
	(0.587)	(0.0289)	(0.0299)
Portfolio value 50K-250K	0.0708	0.0204	0.0314
	(0.0785)	(0.0312)	(0.0293)
Portfolio value > 250K	0.0249	0.0968***	0.0901***
	(0.138)	(0.0272)	(0.0283)
Investment experience 2-10 years	-0.283	-0.0939**	-0.131***
	(0.259)	(0.0436)	(0.0409)
Investment experience > 10 years	-0.721	-0.0667	-0.184***
	(0.807)	(0.0588)	(0.0442)
Constant	-2.115	0.0444	0.502***
	(3.300)	(0.120)	(0.137)
Observations	2,824	2,824	2,824

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table XIII: *Robustness testing in sub samples - 2SLS estimates of the impacts of incorrect and "don't know" responses on believing in beating the market*

VARIABLES	(1) 2SLS Male	(2) 2SLS Female	(3) 2SLS Male	(4) 2SLS Female	(5) 2SLS Male	(6) 2SLS Female
No. of correct answers	-2.773	0.167				
	(13.43)	(0.199)				
No. of incorrect answers			0.175*	0.248		
			(0.106)	(0.286)		
No. of "don't know"					-0.224	-0.0780
					(0.138)	(0.0811)
White	0.588	-0.0570	-0.0187	0.0220	-0.0504	-0.0291
	(2.966)	(0.0594)	(0.0340)	(0.0617)	(0.0367)	(0.0367)
Married	-0.0337	-0.0164	-0.0477	-0.0106	-0.0566	-0.0157
	(0.244)	(0.0335)	(0.0333)	(0.0330)	(0.0378)	(0.0301)
Willingness to take risks	0.0360	0.195***	0.141***	0.138*	0.138***	0.173***
	(0.724)	(0.0435)	(0.0388)	(0.0760)	(0.0401)	(0.0429)
Aged 18-34	-1.390	0.159	-0.0844	-0.107	0.0234	0.0440
	(6.652)	(0.175)	(0.0693)	(0.179)	(0.0579)	(0.0644)
Aged 35-54	-0.950	0.0897	-0.0606	-0.0293	0.000695	0.0370
	(4.529)	(0.0862)	(0.0438)	(0.0772)	(0.0368)	(0.0382)
College or above	1.268	-0.113	0.0120	0.0495	-0.0770*	-0.0375
	(6.220)	(0.127)	(0.0353)	(0.0813)	(0.0444)	(0.0383)
Portfolio value 50K-250K	-0.0175	0.00627	0.0321	0.00471	0.0288	0.00567
	(0.604)	(0.0413)	(0.0456)	(0.0462)	(0.0501)	(0.0389)
Portfolio value > 250K	0.347	0.0220	0.115***	0.0670	0.0983**	0.0457
	(1.014)	(0.0489)	(0.0387)	(0.0557)	(0.0466)	(0.0383)
Investment experience 2-10 years	0.325	-0.139	-0.120**	-0.0264	-0.160***	-0.0956
	(2.265)	(0.0896)	(0.0546)	(0.0997)	(0.0599)	(0.0596)
Investment experience > 10 years	1.958	-0.186	-0.103	0.0178	-0.250***	-0.101*
	(10.38)	(0.134)	(0.0709)	(0.131)	(0.0699)	(0.0587)
Constant	10.40	-0.260	0.181	-0.123	0.620***	0.344**
	(48.74)	(0.585)	(0.113)	(0.407)	(0.182)	(0.137)
Observations	1,714	1,110	1,714	1,110	1,714	1,110
R-squared						0.046

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table XIV: *Robustness testing of H1 & H2 in the sample of respondents younger than 75 years old*

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Trading meme stocks			Believing in beating the market		
No. of correct answers	0.192			0.240		
	(0.136)			(0.169)		
No. of incorrect answers		0.0742**			0.0927**	
		(0.0304)			(0.0412)	
No. of "don't know"			-0.0591**			-0.0738**
			(0.0250)			(0.0331)
Male	-0.216	0.0844***	-0.00120	-0.279	0.0954***	-0.0115
	(0.201)	(0.0178)	(0.0322)	(0.250)	(0.0248)	(0.0424)
White	-0.0283	-0.00812	-0.0135	-0.0251	0.000104	-0.00659
	(0.0343)	(0.0235)	(0.0223)	(0.0431)	(0.0269)	(0.0271)
Married	0.0259	0.0280	0.0258	-0.0335	-0.0309	-0.0336
	(0.0285)	(0.0173)	(0.0175)	(0.0370)	(0.0233)	(0.0236)
Willingness to take risks	0.0240	0.0874***	0.0641*	0.0488	0.128***	0.0989**
	(0.0789)	(0.0279)	(0.0349)	(0.102)	(0.0351)	(0.0461)
Aged 18-34	0.244***	0.0936**	0.127***	0.115	-0.0728	-0.0315
	(0.0777)	(0.0431)	(0.0386)	(0.0961)	(0.0563)	(0.0462)
Aged 35-54	0.194**	0.0355	0.0735***	0.138	-0.0598	-0.0124
	(0.0829)	(0.0299)	(0.0220)	(0.101)	(0.0399)	(0.0281)
College or above	-0.171*	-0.00603	-0.0517***	-0.185	0.0218	-0.0352
	(0.103)	(0.0206)	(0.0195)	(0.129)	(0.0257)	(0.0254)
Portfolio value 50K-250K	0.0248	0.0328	0.0257	-0.00361	0.00632	-0.00249
	(0.0476)	(0.0279)	(0.0297)	(0.0589)	(0.0335)	(0.0360)
Portfolio value>250K	-0.0393	0.0123	-0.00804	0.0241	0.0885***	0.0631*
	(0.0563)	(0.0221)	(0.0253)	(0.0713)	(0.0279)	(0.0326)
Investment experience 2-10 years	-0.141*	-0.0712*	-0.0920**	-0.196**	-0.108***	-0.134***
	(0.0748)	(0.0379)	(0.0392)	(0.0914)	(0.0409)	(0.0431)
Investment experience >10 years	-0.448**	-0.136***	-0.229***	-0.448*	-0.0585	-0.174***
	(0.184)	(0.0451)	(0.0375)	(0.231)	(0.0524)	(0.0439)
Constant	-0.370	-0.132	0.416***	-0.389	-0.0915	0.592***
	(0.360)	(0.118)	(0.125)	(0.445)	(0.151)	(0.168)
Observations	2,556	2,556	2,556	2,556	2,556	2,556
R-squared		0.145	0.109			

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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VI. Appendices

A. Eleven investment literacy questions asked in the *2021 Investor Study*

(Choices to each question are mutually exclusive)

1. If you buy a company's stock...

[You own a part of the company; You have lent money to the company; You are liable for the company's debts; The company will return your original investment to you with; Don't know; Prefer not to say]

2. If you buy a company's bond...

[You own a part of the company; You have lent money to the company; You are liable for the company's debts; You can vote on shareholder resolutions; Don't know; Prefer not to say]

3. If a company files for bankruptcy, which of the following securities is most at risk of becoming virtually worthless?

[The company's preferred stock; The company's common stock; The company's bonds; Don't know; Prefer not to say]

4. In general, investments that are riskier tend to provide higher returns over time than investments with less risk.

[True; False; Don't know; Prefer not to say]

5.The past performance of an investment is a good indicator of future results.

[True; False; Don't know; Prefer not to say]

6. Over the last 20 years in the US, the best average returns have been generated by:

[Stocks; Bonds; CDs; Money market accounts; Precious metals; Don't know; Prefer not to say]

7. What is the main advantage that index funds have when compared to actively managed funds?

[Index funds are generally less risky in the short term; Index funds generally have lower fees and expenses; Index funds are generally less likely to decline in value; Don't know; Prefer not to say]

8. Which of the following best explains why many municipal bonds pay lower yields than other government bonds?

[Municipal bonds are lower risk; There is a greater demand for municipal bonds; Municipal bonds can be tax-free; Don't know; Prefer not to say]

9. You invest $500 to buy $1,000 worth of stock on margin. The value of the stock drops by 50%. You sell it. Approximately how much of your original $500 investment are you left with in the end?

[$500; $250; $0; Don't know; Prefer not to say]

10. Which is the best definition of 'selling short'?

[Selling shares of a stock shortly after buying it; Selling shares of a stock before it has reached its peak; Selling shares of a stock at a loss; Selling borrowed shares of a stock; Don't know; Prefer not to say]

11. If you own a call option with a strike price of $50 on a security that is priced at $40, and the option is expiring today, which of the following is closest to the value of that option?

[10; 0; -10; Don't know; Prefer not to say]

B. Six financial literacy questions asked in the 2021 NFCS survey

(Choices to each question are mutually exclusive)

Big 3 consists of the first three questions as follows.

1. Interest Rate Question

Suppose you had $100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

[More than $102; Exactly $102; Less than $102; Don't know; Prefer not to say]

2. Inflation Question

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

[More than today; Exactly the same; Less than today; Don't know; Prefer not to say]

3. Risk Diversification Question

Buying a single company's stock usually provides a safer return than a stock mutual fund. [True; False; Don't know; Prefer not to say]

4. Bond Pricing Question

If interest rates rise, what will typically happen to bond prices?

[They will rise; They will fall; They will stay the same; There is no relationship between bond prices and the interest rate; Don't know; Prefer not to say]

5. Compound Interest Rate Question

Suppose you owe $1,000 on a loan and the interest rate you are charged is 20% per year compounded annually. If you didn't pay anything off, at this interest rate, how many years

would it take for the amount you owe to double?

[Less than 2 years; At least 2 years but less than 5 years; At least 5 years but less than 10 years; At least 10 years; Don't know; Prefer not to say]

6. Mortgage Question

A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid over the life of the loan will be less.

[True; False; Don't know; Prefer not to say]