Is Answering "Don't know" Better Than Answering Incorrectly in Financial Literacy Tests: Differentiating Incorrect and Don't Know Responses when Predicting Financial Behaviors

The is the penultimate draft of this paper. For citations, please use the published version

Abstract

This study investigates implications of answering a financial question *incorrectly* when one has the option to select "don't know". Those who answer "don't know" are uncertain with regard to a financial matter, while those answering incorrectly make an error. We use data from the 2021 National Financial Capability Survey to create regression models. We take the number of incorrect responses to financial knowledge questions as an independent variable, as compared with don't know responses, and take a range of financial behaviors as dependent variables. We find that providing an incorrect response rather than selecting "don't know" is associated with an increased likelihood of engaging in both positive and negative financial behaviors, including risky investment behavior. This may suggest that choosing an incorrect answer when given the option to respond "don't know" could reflect a tendency toward over-confidence, which may be associated with problematic financial behavior. We also find that financial education is associated with an increased likelihood of engaging in both positive and negative behaviors, but that these effects are moderated by higher accuracy levels in financial knowledge. Therefore, practitioners assessing consumers' financial knowledge level should check that consumers have an accurate assessment of their own knowledge and aim to improve this accuracy in their education efforts.

Keywords:

Financial Behavior, Financial Capability, Financial Education, Financial Literacy, Financial Well-Being

Introduction

Research has long established that financial knowledge is a significant factor influencing financial behavior (Lusardi & Mitchell, 2014). Financial knowledge has often been treated as a binary matter, where a person either knows the answer to a financial question or not. However, this ignores the possibility that when asked about a financial topic, a consumer may say that they "don't know", rather than providing an answer, either correct or incorrect (Pearson et al., 2024). Research suggests, though, that "don't know" responses may be related to financial behavior in distinct ways compared to both correct and incorrect responses (Marley-Payne et al., 2024). Therefore, better understanding the relationship between "don't know" responses and financial behavior is an important part of the project of leveraging financial knowledge to improve financial outcomes.

Prior research has found that answering "don't know" is associated with a decreased likelihood of engaging with various financial products, when contrasted with answering *correctly.* In addition, it has been found that many people who at first say they don't know will answer correctly if compelled to provide an answer (Bucher-Koenen et al., 2021, Marley-Payne et al., 2024). Saying one doesn't know when one is capable of providing a correct answer is plausibly associated with a lack of confidence, and so researchers have argued that many consumers would benefit from raising their confidence levels in order to reduce the extent to which they think they don't know something (Bucher-Koenen et al., 2021).

This paper focuses on a related but different issue: the significance of answering a financial question *incorrectly* in contrast to answering "don't know". If answering "don't know" when one could answer correctly is plausibly associated with under confidence, then answering incorrectly when one has the option to say one doesn't know is plausibly associated with *over*

confidence. Prior research has shown that overconfidence in financial knowledge level is associated with a range of harmful financial behaviors (Mokhtari & Chawla, 2023).

Our primary research question, therefore, is: How is answering financial questions *incorrectly*, as compared to responding "don't know", related to financial behavior? In particular, is there an association between response type and the kinds of risky behaviors typically associated with overconfidence? Answering this is important to understand potential pitfalls as well as benefits to intervening in cases where respondents say they "don't know".

In addition, prior research has suggested that financial education may be an avenue for appropriately calibrating financial confidence (Gentile et al., 2016), so we also ask: How is participating in financial education related to financial behavior, after controlling for responses to financial knowledge questions?

We examine these questions using data from the 2021 wave of the National Financial Capability Survey (both the state-by-state survey and the investor survey). We construct both probit and linear regression models to measure the difference in behavioral outcomes associated with answering incorrectly as opposed to answering don't know. Notably, we find that answering incorrectly as opposed to don't know is associated with increased negative financial behavior, such as taking out a payday loan, and increased risky investment behavior, such as purchasing cryptocurrency. This suggests that we should be cautious in encouraging people to believe they know the answer to financial questions since doing so could lead to them answering incorrectly, an occurrence associated with some negative outcomes.

In addition, we find, concerningly, that there is a significant association between financial education and negative financial behavior – behavior one would hope such education programs teach students to avoid. We do find, however, a significant negative interaction effect between a

high rate of accuracy in financial knowledge and such behaviors. In other words, those who take a financial education course and rarely answer incorrectly are less likely to engage in negative behavior.

Literature Review and Hypothesis Development

Issues around inappropriate levels of confidence have long been an area of research in financial literacy. A common way to measure this is to take a measure of objective knowledge and a measure of subjective knowledge and compare the two. Those with high subjective knowledge and low objective knowledge are classified as over-confident, while those with low subjective knowledge and high objective knowledge are classified as under-confident (Kim et al., 2020).

A significant body of research has found that over-confident individuals, in this sense, engage in a range of problematic financial behaviors: for example fall into mortgage delinquency (Kim et al., 2020), trade investments more frequently (Abreu & Mendes, 2012; Barber & Odean, 2000), invest in cryptocurrencies more frequently (Kim et al., 2022), use costly alternative financial services and credit cards (Mokhtari & Chawla, 2023; Robb et al., 2015) under diversify their investment portfolios (Goetzmann & Kumar, 2008), and are less likely to seek out financial advice (Porto & Xiao, 2016). A general trend is that over-confident individuals are likely to take on excessive risk – that is, risks they are not equipped to handle or that are not compensated for by a higher expected return.

Additional research has found some negative behaviors associated with under-confidence, most notably around limited engagement with financial tools. Angrisani (2019) finds that such individuals fare worse with regard to retirement preparations. Ahmad (2020) finds that

under-confident investors in developing countries experience worse financial outcomes. Huang et al. (2023) find that under-confidence negatively affects market participation, while Parker et al. (2012) find that low confidence is associated with worse retirement planning and fee minimization for investors.

A parallel line of research that has received much recent attention looks at a person's willingness to answer a factual question when given the option to select "don't know" instead. Some researchers have suggested that willingness to provide an answer rather than stating one doesn't know is a reflection of confidence level (Bucher-Koenen et al., 2021).

Whether don't know response patterns are in fact a reliable proxy for over/under confidence level requires empirical validation, however. It is possible that some respondents tend to guess in multiple choice questions as a matter of test taking strategy that is unrelated to confidence in decision making in everyday life. Similarly, some respondents may answer "don't know" due to an aversion to engaging with tests, while not being under-confident. On the other hand, don't know responses provide an opportunity to examine confidence in revealed behavior rather than relying on subjective self-evaluations, so they may shed some additional light on confidence levels, compared to traditional measures.

Traditionally, research has treated "don't know" and incorrect responses interchangeably (Bucher-Koenen et al., 2021). However, recent research has started to examine the unique features of "don't know" responses. Wilmarth and Kim (2023) find that responding "don't know" is associated with personality traits plausibly connected to confidence – for example, those with positive affect are less likely to select don't know while those with negative affect are more so (Tekinsoy et al., 2024). Further, Bucher-Koenen et al. (2021) find that those selecting "don't know" are less likely to engage in investment behavior while Wilmarth and Kim (2023)

find that they are less likely to have an emergency fund or plan for retirement – behavioral factors also associated with under-confidence.

Importantly, it has been shown that women are more prone to this form of under-confidence than men (Bucher-Koenen et al., 2021, Chen & Garand, 2018). In their influential paper, "Fearless Women", Bucher-Koenen et al., (2021) used a dataset in which respondents were asked the same set of financial literacy questions on two separate occasions, the first time with a "don't know" option, the second time without. They found that there was a significant amount of knowledge among those answering "don't know". That is, people who at first answered "don't know", answered correctly more frequently when required to select an answer than could be explained by lucky guessing. They further found that there was a greater degree of this type of response pattern among women than men (see also, Kim & Mountain, 2019; Pearson et al., 2024).

The researchers take from this an imperative to reduce women's tendency to think they don't know the answer to financial questions: "From this point of view, it seems crucial to support individuals not only in acquiring financial knowledge but also in instilling confidence in their knowledge." (Bucher-Koenen et al., 2021, p. 28) This is taken to be a task for financial educators and practitioners, so that the relationship between "don't know responses", financial education and relevant behaviors is a crucial topic of interest.

When evaluating this assumption, however, it's important to note that some of those selecting "don't know" really do not know the answer, and if they are persuaded to provide a response, may make an error. Given that answering incorrectly when one has the option to say one doesn't know is plausibly related to *over-confidence*, it is important to establish whether this kind of response is associated with the same behavioral patterns as other measures of over-

confidence. As mentioned above, over-confidence has been connected with risky investment behavior. Understanding don't know responses is thus a crucial research question, especially as the frequency with which people provide such a response is increasing over time (Kim et al., 2022).

Research suggests financial education might play an important role in understanding the relationship between responses to financial knowledge questions and financial behavior. First, because research shows financial education tends to increase financial knowledge and improve many types of financial behaviors (Kaiser et al., 2022). In addition, financial education has been shown to increase financial confidence levels (Anaebere et al., 2024; Imarhiagbe et al., 2017). Further, some researchers have suggested that financial education may help appropriately calibrate people's confidence level in accord with their objective financial knowledge level (Gentile et al., 2016).

Based on the above literature, we propose three hypotheses. We define "financial knowledge accuracy" as the balance between correct and incorrect responses to financial knowledge questions, taking into account "don't know" responses.

H1. Answering financial questions *incorrectly* is negatively associated with desirable financial behavior, when compared with responding "don't know".

H2. Participating in financial education is positively associated with desirable financial behavior.

H3. There is no moderating effect of financial education on the association between financial knowledge accuracy and financial behavior.

Methodology

Data

As discussed above, the aim of this study is to gain more information on the potential risks and benefits of being disposed to provide an answer to financial questions rather than selecting "don't know". The goal is to understand the different behaviors associated with providing an *incorrect* response rather than answering "don't know," alongside the previously researched contrast between "don't know" and correct responses. This is especially important, given the default assumption that "don't know" and incorrect responses can be grouped together. We will be looking at how correct, incorrect and "don't know" responses are related to a broader range of financial behaviors than has previously been studied – we will, in particular, focus on risky investment behaviors prior research leads us to think may be a cause for concern.

Our study uses data from the 2021 National Financial Capability Survey (NFCS). This dataset is representative of the US adult population, with a sample size of 27,118. Respondents answer a large range of questions on their financial attitudes and behaviors. In addition, they are asked six multiple choice questions to test their financial knowledge on a range of topics. Respondents are given the option to choose an answer or select "don't know". In addition, a subset of 2824 respondents who took the general survey and indicated that they used investment products were asked in detail about their investment behavior in the 2021 NFCS investor survey (Lin et al., 2022).

Variables

Looking through the survey questions, we found that those relevant to our study were naturally divided into positive and negative behaviors. We identified four key variables in each category to use in our model. These are similar to those used in Marley-Payne et al., (2022).

The positive variables are: (i) having created an emergency fund; (ii) having opened a savings account; (iii) having opened an investment account; (iv) having made a plan for retirement (for current retirees, having made a plan for retirement before they retired).

The negative variables are: (i) occasionally overdrawing a checking account; (ii) being charged interest on a credit card balance in the past year; (iii) taking out a payday loan in the past five years; (iv) using a pawn shop in the past five years.

As recent work looked particularly at the relationship between don't know responses and investment behavior, we pay particular attention to this. Here, we used the NFCS investor survey to look at specific investor behaviors in relation to these input variables. We identified four potentially risky investment behaviors the investor survey asked respondents about: (i) investing in cryptocurrency; (ii) making purchases on margin; (iii) purchasing options; (iv) purchasing so-called *meme-stocks* (that is, stocks in Gamestop, Blackberry or AMC).

Though these are all plausibly thought of as negative behavior, we categorize them separately to make clear they are drawn from a different dataset and are of particular salience with regard to the issue of "don't know" responses.

All dependent variables are binary indicators, taking value 1 if the respondent reported engaging in the respective behavior and 0 otherwise. We in addition created composite variables taking the sum (out of four) behaviors engaged in within each of the three variables. Given that there is limited research on the behavioral associations of incorrect vs. "don't know" responses, we do not wish to assume that effects will be uniform across the individual variables. More so, when considering the potential for interaction with financial education. Therefore, we report regression results for each dependent variable taken as an individual outcome, along with those for composite variables.

We build our independent variables from the responses to the six financial knowledge questions. We have a score for knowledge, uncertainty, and error:

1. Knowledge: Number of correct responses to financial knowledge questions
2. Uncertain: Number of “don’t know” responses to financial knowledge questions
3. Error: Number of incorrect responses to financial knowledge questions

Each of these variables can take an integer value between 0 and 6. Note that the sum of these values must always be six, so the three variables have two degrees of freedom. Therefore, in a regression model, only two of the three variables can be included, with the other one acting as a reference. The full sample of respondents is included in the regression models. Note that for respondents who answer all questions correctly, both the *Uncertain* and *Error* variables will have value 0.

In addition, we created an ‘accuracy’ variable, which is the difference between the number of correct responses and errors. In other words, one is added to the score for each correct response, one is subtracted from the score for each incorrect response, and nothing is added for each “don’t know" response. Thus, the accuracy variable can take any integer value between -6, and 6 and is a single catch all measurement of the balance between correct, incorrect and “don’t know” responses.

Finally, we created a financial education variable taking value one if the respondent took a course in financial education, either in high school, college or at work, and zero otherwise.

We include, as controls, key demographic variables including gender, race, age, and income, along with all variables used in the survey weighting, so we don’t have to weight the regression analysis – reducing the standard errors in our results.

We tested for multi-collinearity between our independent variables and the control variables used in both versions of our regression models, which is taking correct and incorrect responses as inputs and taking accuracy and an interaction term, using variance inflation factor (VIF). All had a moderate value between 1 and 5, therefore, the collinearity was not at a level to undermine our regression models.

Analyses

We created a regression model that takes error as the main independent variable, with don't know as the reference class. We included an additional variable controlling for the number of correct responses. Due to the restricted degrees of freedom, increasing the number of incorrect answers entails decreasing the number of don't know responses, since the model has a separate variable fixing the number of correct responses. The same holds for increasing the number of correct responses.

Setting the model up this way allows us to maximize our understanding of don't know responses: the coefficient for "error" tells us the predicted impact of an additional incorrect response combined with one fewer don't know response; while the coefficient for "correct" tells us the predicted impact of increasing correct responses while decreasing don't know responses. This model does not tell us directly the impact of increasing correct responses while decreasing incorrect responses. We chose to make this trade off as the impact of correct vs incorrect responses is widely studied in existing research. We take financial education as an additional independent variable.

The dependent variables are all binary, taking value 1 if the relevant action is performed and value 0 otherwise. We perform regressions on each dependent variable separately as we cannot be sure in advance if their associations with the independent variables are uniform. We

follow Marley-Payne et al. (2022) in using probit regression to produce predicted results between 0 and 1. This gives a model of the form: $p = \Phi(\beta_i x_i)$, where p represents the probability that the dependent variable has value 1; Φ is the standard normal distribution function; x_i is a vector of the independent variables; and β_i is the vector of coefficients. In addition, we used OLS linear regression with total positive actions taken (positive score), total negative actions taken (negative score), and total risky investment actions (risk score) taken by a subject as outcome variables.

In addition, we created a model to check for interaction between financial education and accuracy: here we took accuracy and financial education as input variables along with an interaction variable which is the product of these two. All other aspects of the models remained the same.

Results

Descriptive statistics for key variables are presented in table 2. Respondents, on average, answer just under half of the knowledge questions correctly (2.87/6) and, out of the remainder, answer slightly fewer incorrectly (1.34/6) as opposed to saying they don't know (1.79). Respondents engage in a higher number of positive behaviors (2.02/4) than negative behaviors (1.02/4) and even fewer risky investment behaviors (0.55/4).

Next, we look at the regression results for our model taking errors, correct responses, and financial education as independent variables. These are displayed in tables 3-5. Error responses are associated with an increase in positive behavior, but also with an increase in negative behavior, where don't know responses are the reference class. We see that correct responses are associated with an increase in positive behavior and a decrease in negative behavior across all outcomes.

For the probit regressions, we analyzed average marginal effect (AME) to get a sense of the magnitude of the associations for our key independent variables. These results are displayed in table 7. Though results vary across different variables, in cases where there is a significant association, the AME associated with changing the value of an independent variable is generally between 0.02 and 0.05 – in other words it changes the likelihood of the outcome being observed by 2-5%.

Of particular note, is that both errors and correct responses are associated with an increased likelihood of having a non-retirement investment account where don't know responses are the reference class – in line with previous research suggesting that answering "don't know" is associated with a *decreased* chance of such behavior. For risky investment behavior, errors are associated with increased likelihood of engaging in the behavior, with don't know as the reference class, while there is no significant association between correct responses and the behavior.

We see that taking financial education is associated with both an increase in positive behaviors and an increase in negative behaviors. There is no consistent significant association between financial education and risky investment behavior. In general, coefficient values for control variables are as expected from previous research and are stable in value across the models.

Table 6 shows the results of the regressions, taking accuracy, education and interaction as independent variables. Values for control variables are omitted in this case as they are similar to those found in the previous set of models. We see that having high accuracy is associated with an increase in positive behavior and a decrease in negative and risky investment behavior. Meanwhile financial education is associated with an increase in both positive and negative

behavior and an increased likelihood of margin trading. The interaction variable has significant negative values for both positive and negative behaviors as well as margin trading. Again, AMEs for probit regressions are displayed in table 7.

Discussion

These results raise interesting new considerations concerning the nuanced relationship between financial knowledge and financial behavior. While being able to answer financial questions correctly is associated with beneficial behaviors, making errors as opposed to responding "don't know" is associated with negative financial and investing behaviors.

The pattern of results is nuanced. Our first hypothesis can be rejected: there are significant associations between incorrect responses and some beneficial financial behaviors, when contrasted with "don't know" responses. Interestingly, incorrect responses are associated with an increase in positive financial behavior but also an increase in risky investment behavior. Specifically, answering incorrectly is associated with a significantly greater likelihood of having an emergency fund, owning investments, and planning for retirement as well as increased positive behavior overall. On the other hand, it is associated with an increased likelihood of engaging in all negative financial behaviors and all risky investment behaviors.

Hypothesis 2 is also rejected as though taking a financial education course is associated with an increase in positive behavior, it is also associated with an increase in negative behavior and has no association with risky investment behavior. According to our model, taking financial education is associated with an increased likelihood of engaging in all positive and negative financial behaviors. There is no significant relationship between financial education and any of the risky investment behaviors. Finally, hypothesis 3 is rejected, as there is a significant negative

interaction effect between financial education and accuracy for all positive financial behaviors and negative financial behaviors, along with for margin trading.

Previous researchers, in focusing on the contrast between "don't know" and correct responses, have advocated for interventions that reduce people's propensity to answer don't know. While our current data does not allow us to draw causal conclusions, it does suggest we should proceed with caution. Answering "don't know" is associated with some better outcomes than one of the alternatives (i.e., an incorrect response), so we should be wary of trying to push people out of this group until we know more about the underlying mechanisms involved.

This is particularly important with regards to the results regarding investment behavior. Though investing in a diversified portfolio including stocks and other volatile financial instruments is a crucial part of building wealth over the long term, uninformed investing in overly risky products can cause significant financial harm. Therefore, the fact that answering "don't know" is associated with a decreased likelihood of engaging in various investment behaviors is a double edge sword: it involves avoiding potential pitfalls as well as missing out on potential benefits.

The results make sense upon reflection. If a person mistakenly believes themselves to be knowledgeable about financial matters and so answers incorrectly at a high rate, rather than acknowledging that they don't know, it is plausible they will be more likely to engage with all kinds of financial products. Such a person may lack the discrimination to know which products are beneficial and which are harmful and so is more likely to engage in both positive and negative financial behavior. This is especially problematic because of the proliferation of misleading financial products available, designed to draw customers in with appealing promises and significant costs hidden in the details (Mathur et al., 2019).

The fact that financial education is associated with an increase in negative behavior and has no consistent association with risky investments is concerning. One of the key aims of such education programs is to teach people to avoid detrimental financial practices. This suggests that though financial education may encourage consumers to engage with more financial products, it does not lead to them discriminating against potentially harmful products and so avoiding them.

However, when financial education is combined with a high accuracy rate, the association with negative behaviors is mitigated due to the significant negative interaction coefficient. It should be noted, though, that there is a negative interaction effect for positive behaviors too so that the combination of financial education and high accuracy leads to less benefits here than would be predicted if the two were independent.

A possible explanation for the negative behavior result is that taking a course in financial education tends to leave a person feeling confident in their capability to use financial products and more likely engage with them, regardless of how effective the education they received was. Research shows that financial education varies significantly in quality (Urban et al., 2020). It may be that effective financial education, which provides participants with accurate financial knowledge, gives confidence to engage with financial products but discernment to avoid negative behaviors, while ineffective financial knowledge provides the confidence without such discernment, leading to an increase in negative behavior.

Regarding the positive behavior result, the negative interaction effect suggests that, at a given level of accuracy, higher financial education may not increase—but instead reduce—the likelihood of engaging in positive financial behaviors. It may be that where financial education increases financial knowledge, it doesn't always lead to consumers putting that knowledge into action, so that there is a knowledge-behavior gap.

However, it could also be that results for either positive or negative behavior are driven by collinearity between financial education and accuracy, or that there are additional underlying factors driving financial behavior that this study's models were not able to account for. These interpretations are necessarily speculative at this stage, and additional research is required to better understand the results we have observed here.

Limitations

As mentioned above, the data used in this paper is cross-sectional and does not allow us to draw causal inferences. In addition, we do not have any information on the motivations underlying how respondents answer knowledge questions. For example, if it is determined in their broader financial confidence level or if it is a matter of test taking strategy. Therefore, our discussion on the relationship between incorrect responses and confidence level, along with why the relationship between financial education and financial behavior displays the patterns we observe, and the possibility it is mediated by overconfidence, is necessarily speculative.

To further understand these issues, additional studies are required. One avenue would be a study that gives respondents the same questions with and without the option to answer "don't know", in combination with the questions regarding financial behavior this paper has drawn attention to. Another potential project would be a longitudinal study looking at the effects of an intervention encouraging respondents to believe they know the answer to financial questions. A final valuable project would be to look at a financial education intervention and measure both financial knowledge and confidence in one's knowledge before and after the course, to see whether over-confidence increases.

Implications for Practitioners

Financial practitioners often assess their clients' knowledge about financial topics to determine their needs and challenges, and work with them to outline their financial goals. In order to provide helpful guidance, assessment measures need to accurately reflect test-takers' knowledge. Often, these assessments include multiple choice questions with a "don't know" option, with these responses typically being categorized as "incorrect" without further analysis, similar as to within the research community. These results suggest that practitioners should take care to distinguish between don't know and incorrect responses in order to fully understand their clients' needs and likely dispositions.

In addition, the interaction between accuracy and financial education suggests that practitioners must make sure when providing education that they leave consumers with appropriate confidence-levels in their own knowledge, both so that they don't over-confidently engage in adverse behavior or fail to act on knowledge they do possess in order to engage in positive behavior.

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Table 1: Variable Specification

Our regression models use the following variables, all taken from the 2021 NFCS survey data:

Name	Description	Value	Survey Source
Explanatory Variables			
Correct	Number of correct responses to financial knowledge questions	Integer between 0 and 6	M6, M7, M8, M9, M10, M31
Error	Number of incorrect responses to financial knowledge questions	Integer between 0 and 6	M6, M7, M8, M9, M10, M31
Accuracy	Difference between correct and incorrect responses	Integer between -6 and 6	=Correct - Error
Financial Education	Assesses whether respondent took financial education class	Dummy variable	M20
Outcome Variables			
Emergency	Assesses whether subject has ever set aside an emergency fund	Dummy variable	J5
Savings	Assesses whether subject has a savings account	Dummy variable	B2
Investment	Assesses whether subject has non-retirement investments	Dummy variable	B14
Retirement	Assesses whether subject has calculated retirement needs	Dummy variable	J8/J9
Positive Score	Assesses total positive actions taken	Integer between 0 and 4	Sum of Emergency, Savings, Investment and Retirement values
Overdraw	Assesses whether subject occasionally overdraws checking account	Dummy Variable	B4
Credit Card Interest	Assesses whether subject has been charged credit card interest in past 12 months	Dummy Variable	F2_2
Payday	Assesses whether subject has taken out payday loan in past 5 years	Dummy Variable	G25_2
Pawn	Assesses whether subject has used pawn shop in past 5 years	Dummy Variable	G25_4
Negative Score	Assesses total negative actions taken	Integer between 0 and 4	Sum of Overdraw, Credit Card Interest, Payday and Pawn
Crypto	Assesses whether subject has ever bought crypto	Dummy Variable	B25 (investor survey)
Margin	Assesses whether subject has ever traded on margin	Dummy Variable	B6 (investor survey)
Option	Assesses whether subject has ever bought options	Dummy Variable	B34 (investor survey)
Meme Stock	Assesses whether subject has ever bought stock in AMC, Blackberry or GameStop	Dummy Variable	B35 (investor survey)
Risk Score	Assesses total risky investment actions taken	Integer between 0 and 4	Sum of Crypto, Margin, Option and Meme stock
Control Variables			
Female	Subject is female	Dummy (reference male)	A3

Minority	Subject belongs to a minority group	Dummy (reference non-minority)	A4A_new_w
Married	Subject is married	Dummy (reference not married)	A6
No HS	Subject did not complete high school	Dummy (reference graduate degree)	A5_2015
High School	Subject completed high school	Dummy (reference graduate degree)	A5_2015
Some College	Subject attended some college	Dummy (reference graduate degree)	A5_2015
Associate's	Subject has associate degree	Dummy (reference graduate degree)	A5_2015
Bachelor's	Subject has bachelor's degree	Dummy (reference graduate degree)	A5_2015
Children	Subject has children	Dummy (reference no children)	A11
Military	Subject's family is or was in military	Dummy	AM21
< $25k	Income is below $25k	Dummy (reference income 150k+)	A8
$25-50k	Income is $25-50k	Dummy (reference income 150k+)	A8
$50-75k	Income is $50-75k	Dummy (reference income 150k+)	A8
$75-150k	Income is $75-150k	Dummy (reference income 150k+)	A8
New England	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
Mid Atlantic	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
East North Central	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
West North Central	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
South Atlantic	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
East South Central	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
West South Central	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV
Mountain	Subject lives in census region	Dummy (reference Pacific)	CENSUSDIV

Table 2: Descriptive Statistics

Table 1: Descriptive statistics for independent and dependent variables

	Mean	Count or Min/Max*	Standard Deviation
Correct Responses	2.87	0/6	1.72
Error Responses	1.34	0/6	1.26
Don't Know Responses	1.79	0/6	1.83
Financial Education	0.21	5667	0.41
Accuracy	1.54	-6/6	2.39
Emergency	0.53	14285	0.50
Savings	0.72	19639	0.45
Investment	0.35	93878	0.48
Retirement	0.42	11400	0.49
Positive Score	2.02	0/4	1.33
Overdraw	0.30	8084	0.46
Credit Card	0.33	9055	0.47
Payday	0.17	4701	0.38
Pawn	0.23	6129	0.42
Negative Score	1.03	0/4	1.12
Crypto	0.18	520	0.39
Margin	0.09	248	0.28
Option	0.13	425	0.33
Meme Stock	0.15	354	0.36
Risk Score	0.55	0/4	0.99

Table 1

* For binary variables, count is provided; for continuous variables min/max

Table 3: Positive Behavior Regression Results

	Emergency	Savings	Investment	Retirement	Positive Score†
Intercept	1.23 ***	1.48 ***	0.02	0.09	2.80 ***
	(0.06)	(0.07)	(0.06)	(0.06)	(0.05)
Correct	0.08 ***	0.09 ***	0.18 ***	0.16 ***	0.17 ***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Error	0.06 ***	0.01	0.12 ***	0.12 ***	0.11 ***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Financial Education	0.11 ***	0.07 **	0.15 ***	0.25 ***	0.19 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Female	-0.11 ***	0.01	-0.21 ***	-0.05 *	-0.12 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Black	0.02	0.05	0.08 *	0.18 ***	0.13 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Hispanic/Latino(a)	0.05	-0.01	-0.07	0.01	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
AAPI	0.31 ***	0.07	0.14 **	-0.03	0.14 ***
	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Other Race	-0.17 ***	-0.02	0.04	0.09	-0.04
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)
18-24	-0.38 ***	-0.09 *	0.17 ***	-0.36 ***	-0.17 ***
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)
25-34	-0.61 ***	-0.26 ***	0.01	-0.40 ***	-0.36 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
35-44	-0.67 ***	-0.43 ***	-0.13 ***	-0.40 ***	-0.46 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
45-54	-0.70 ***	-0.34 ***	-0.35 ***	-0.34 ***	-0.49 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
55-64	-0.36 ***	-0.21 ***	-0.17 ***	-0.12 ***	-0.23 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Married	0.22 ***	0.12 ***	0.03	0.14 ***	0.14 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
No HS	-0.71 ***	-0.65 ***	-0.52 ***	-0.58 ***	-0.69 ***
	(0.07)	(0.06)	(0.08)	(0.07)	(0.05)
High School	-0.42 ***	-0.39 ***	-0.42 ***	-0.40 ***	-0.49 ***
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Some College	-0.44 ***	-0.22 ***	-0.29 ***	-0.29 ***	-0.38 ***
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
Associate's	-0.33 ***	-0.16 ***	-0.27 ***	-0.23 ***	-0.29 ***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Bachelor's	-0.10 **	-0.02	-0.07 *	-0.14 ***	-0.07 **
	(0.03)	(0.04)	(0.03)	(0.03)	(0.02)
Children	-0.15 ***	-0.08 ***	-0.05 *	0.06 **	-0.06 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Military	0.09 **	0.05	0.14 ***	0.11 ***	0.12 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Income < $25k	-1.15 ***	-1.03 ***	-1.10 ***	-0.87 ***	-1.31 ***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)
$25-50k	-0.84 ***	-0.64 ***	-0.83 ***	-0.63 ***	-0.94 ***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)
$50-75k	-0.54 ***	-0.37 ***	-0.59 ***	-0.39 ***	-0.57 ***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)

$75-150	-0.29 ***	-0.17 ***	-0.35 ***	-0.20 ***	-0.28 ***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)
New England	-0.03	0.01	-0.05	-0.01	-0.03
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
Mid Atlantic	0.01	-0.10 *	0.02	-0.12 **	-0.06
	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)
East North Central	0.01	-0.05	-0.05	-0.02	-0.05
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
West North Central	-0.06	-0.11 **	-0.01	-0.04	-0.06 *
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
South Atlantic	-0.02	-0.14 ***	-0.04	0.02	-0.05
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
East South Central	-0.09 *	-0.28 ***	-0.08	0.00	-0.12 ***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
West South Central	-0.07	-0.29 ***	-0.11 **	-0.06	-0.14 ***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)
Mountain	-0.06	-0.01	-0.01	0.03	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
N	25929	26415	24453	25709	22928
AIC	29382.34	25185.69	27660.17	30218.12	66945.48
BIC	29659.89	25463.87	27935.72	30495.37	67226.89
Pseudo R2	0.29	0.22	0.26	0.25	
R2					0.36

*** p < 0.001; ** p < 0.01; * p < 0.05.

† OLS regression

Table 4: Negative Behavior Regression Results

	Overdraw	Credit Card	Payday	Pawn	Negative Score†
Intercept	-1.60 ***	-1.05 ***	-2.22 ***	-2.29 ***	0.13 **
	(0.07)	(0.06)	(0.08)	(0.08)	(0.04)
Correct	-0.06 ***	-0.01	-0.06 ***	-0.06 ***	-0.04 ***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Error	0.14 ***	0.07 ***	0.22 ***	0.22 ***	0.18 ***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Financial Education	0.05 *	0.06 **	0.21 ***	0.14 ***	0.10 ***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Female	0.00	0.14 ***	-0.10 ***	-0.15 ***	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Black	0.08 *	0.13 ***	0.23 ***	0.16 ***	0.20 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Hispanic/Latino(a)	-0.04	0.11 ***	0.09 **	0.05	0.07 **
	(0.03)	(0.03)	(0.04)	(0.03)	(0.02)
AAPI	-0.15 **	-0.41 ***	-0.17 **	-0.28 ***	-0.23 ***
	(0.05)	(0.04)	(0.06)	(0.06)	(0.03)
Other Race	0.12 *	0.01	0.04	0.18 ***	0.09 *
	(0.05)	(0.05)	(0.06)	(0.05)	(0.04)
18-24	0.64 ***	-0.06	0.89 ***	1.04 ***	0.40 ***
	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)
25-34	0.79 ***	0.22 ***	0.95 ***	1.08 ***	0.58 ***
	(0.04)	(0.03)	(0.05)	(0.04)	(0.02)
35-44	0.73 ***	0.28 ***	0.90 ***	1.01 ***	0.55 ***
	(0.04)	(0.03)	(0.05)	(0.04)	(0.02)
45-54	0.46 ***	0.34 ***	0.64 ***	0.75 ***	0.35 ***
	(0.04)	(0.03)	(0.05)	(0.04)	(0.02)
55-64	0.26 ***	0.23 ***	0.40 ***	0.47 ***	0.18 ***
	(0.04)	(0.03)	(0.05)	(0.04)	(0.02)
Married	-0.02	-0.02	-0.11 ***	-0.15 ***	-0.05 ***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)
No HS	-0.01	-0.14 *	0.05	0.41 ***	0.17 ***
	(0.07)	(0.06)	(0.07)	(0.06)	(0.05)
High School	-0.12 **	0.11 ***	0.02	0.17 ***	0.04
	(0.04)	(0.03)	(0.04)	(0.04)	(0.02)
Some College	-0.04	0.26 ***	0.04	0.08 *	0.07 **
	(0.04)	(0.03)	(0.04)	(0.04)	(0.02)
Associate's	-0.09 *	0.22 ***	-0.03	0.00	0.00
	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)
Bachelor's	-0.12 ***	0.12 ***	-0.13 **	-0.16 ***	-0.07 **
	(0.04)	(0.03)	(0.04)	(0.04)	(0.02)
Children	0.36 ***	0.17 ***	0.36 ***	0.33 ***	0.33 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Military	0.31 ***	0.18 ***	0.45 ***	0.39 ***	0.31 ***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Income < $25k	0.34 ***	-0.13 ***	0.18 ***	0.52 ***	0.19 ***
	(0.05)	(0.04)	(0.05)	(0.05)	(0.03)
$25-50k	0.24 ***	0.20 ***	0.19 ***	0.37 ***	0.22 ***
	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)
$50-75k	0.05	0.25 ***	0.02	0.15 **	0.10 ***
	(0.04)	(0.04)	(0.05)	(0.05)	(0.03)
$75-150	0.03	0.17 ***	0.02	0.05	0.07 **
	(0.04)	(0.03)	(0.05)	(0.05)	(0.02)

New England	-0.02	0.06 *	-0.24 ***	-0.09 *	-0.03
	(0.04)	(0.03)	(0.05)	(0.04)	(0.02)
Mid Atlantic	0.03	0.02	-0.12 *	-0.09	-0.03
	(0.05)	(0.04)	(0.05)	(0.05)	(0.03)
East North Central	-0.09 *	-0.09 *	0.03	-0.02	-0.04
	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)
West North Central	0.00	-0.09 **	0.03	0.12 **	0.00
	(0.04)	(0.03)	(0.04)	(0.04)	(0.02)
South Atlantic	-0.01	0.00	-0.01	0.13 ***	0.02
	(0.04)	(0.03)	(0.04)	(0.04)	(0.02)
East South Central	0.05	-0.07	0.28 ***	0.23 ***	0.09 **
	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)
West South Central	0.11 *	-0.01	0.21 ***	0.34 ***	0.16 ***
	(0.04)	(0.04)	(0.05)	(0.04)	(0.03)
Mountain	0.05	-0.02	0.09 *	0.18 ***	0.06 **
	(0.04)	(0.03)	(0.04)	(0.04)	(0.02)
N	24389	26057	26635	26679	23494
AIC	22179.83	32381.60	18122.74	21055.85	63551.24
BIC	22455.29	32659.31	18401.20	21334.36	63833.50
Pseudo R2	0.18	0.07	0.27	0.31	
R2					0.22

*** p < 0.001; ** p < 0.01; * p < 0.05.

† OLS regression

Table 5. Risky Investment Regression

	Owns Crypto	Traded on Margin	Bought Options	Owns Meme Stock	Risk Score†
Intercept	-1.92 ***	-2.61 ***	-1.69 ***	-2.30 ***	0.07
	(0.23)	(0.32)	(0.23)	(0.27)	(0.10)
Correct	0.04	0.09	0.03	-0.02	0.01
	(0.03)	(0.04)	(0.03)	(0.03)	(0.01)
Error	0.11 **	0.32 ***	0.18 ***	0.21 ***	0.18 ***
	(0.04)	(0.05)	(0.04)	(0.04)	(0.02)
Financial Education	-0.11	0.15	0.09	-0.03	0.01
	(0.07)	(0.09)	(0.07)	(0.08)	(0.03)
Female	-0.51 ***	-0.24 **	-0.29 ***	-0.43 ***	-0.22 ***
	(0.07)	(0.09)	(0.07)	(0.09)	(0.03)
Black	0.12	0.13	0.37 **	0.45 **	0.22 **
	(0.14)	(0.17)	(0.13)	(0.14)	(0.07)
Hispanic/Latino(a)	-0.02	0.09	0.08	-0.08	-0.02
	(0.13)	(0.16)	(0.13)	(0.15)	(0.07)
AAPI	-0.21	0.02	0.09	0.09	-0.06
	(0.14)	(0.16)	(0.13)	(0.15)	(0.06)
Other Race	0.09	-0.26	-0.13	-0.30	-0.12
	(0.19)	(0.30)	(0.22)	(0.26)	(0.10)
18-24	1.71 ***	1.22 ***	0.99 ***	1.71 ***	1.17 ***
	(0.18)	(0.21)	(0.18)	(0.20)	(0.10)
25-34	1.75 ***	0.78 ***	0.92 ***	1.50 ***	1.03 ***
	(0.13)	(0.15)	(0.12)	(0.14)	(0.06)
35-44	1.43 ***	0.59 ***	0.61 ***	1.17 ***	0.68 ***
	(0.11)	(0.14)	(0.11)	(0.13)	(0.05)
45-54	1.17 ***	0.24	0.31 **	0.75 ***	0.32 ***
	(0.11)	(0.15)	(0.11)	(0.14)	(0.05)
55-64	0.66 ***	0.24	0.16	0.51 ***	0.15 ***
	(0.10)	(0.13)	(0.09)	(0.13)	(0.04)
Married	-0.01	0.07	0.12	0.06	0.03
	(0.08)	(0.11)	(0.08)	(0.10)	(0.04)
No HS	-3.66	-3.53	-3.81	1.32	-0.05
	(79.40)	(75.73)	(79.50)	(0.83)	(0.46)
High School	0.18	-0.08	-0.07	-0.07	-0.00
	(0.13)	(0.17)	(0.13)	(0.16)	(0.06)
Some College	0.24 *	-0.22	-0.06	0.18	0.02
	(0.11)	(0.14)	(0.11)	(0.13)	(0.05)
Associate's	0.15	-0.18	0.08	0.34 *	0.06
	(0.12)	(0.16)	(0.12)	(0.14)	(0.06)
Bachelor's	-0.07	-0.17	-0.11	0.08	-0.06
	(0.09)	(0.10)	(0.08)	(0.11)	(0.04)
Children	0.14	0.42 ***	0.27 ***	0.29 **	0.25 ***
	(0.08)	(0.10)	(0.08)	(0.09)	(0.04)
Military	0.06	0.32 **	0.03	0.22 *	0.12 **
	(0.09)	(0.10)	(0.09)	(0.10)	(0.04)
Income < $25k	0.04	-0.27	-0.39 *	0.01	-0.11
	(0.16)	(0.23)	(0.18)	(0.19)	(0.08)
$25-50k	0.20	-0.33	-0.38 **	-0.05	-0.08
	(0.12)	(0.17)	(0.13)	(0.15)	(0.06)
$50-75k	-0.14	-0.12	-0.20	-0.09	-0.11 *
	(0.11)	(0.14)	(0.11)	(0.14)	(0.05)
$75-150	-0.16	-0.06	-0.15	0.05	-0.07

	(0.09)	(0.11)	(0.09)	(0.11)	(0.04)
New England	-0.11	-0.06	-0.05	-0.11	-0.06
	(0.13)	(0.16)	(0.13)	(0.15)	(0.06)
Mid Atlantic	-0.00	0.03	0.11	0.20	0.04
	(0.15)	(0.18)	(0.15)	(0.16)	(0.07)
East North Central	-0.15	0.28	0.09	-0.06	0.00
	(0.13)	(0.15)	(0.13)	(0.15)	(0.06)
West North Central	-0.07	-0.29	-0.06	-0.17	-0.09
	(0.12)	(0.18)	(0.13)	(0.15)	(0.06)
South Atlantic	0.10	0.04	0.01	-0.02	-0.00
	(0.11)	(0.14)	(0.11)	(0.13)	(0.05)
East South Central	0.22	0.02	0.24	-0.06	0.05
	(0.16)	(0.21)	(0.16)	(0.20)	(0.08)
West South Central	0.26	0.28	0.25	0.20	0.18 *
	(0.15)	(0.18)	(0.15)	(0.17)	(0.07)
Mountain	-0.03	0.04	0.14	-0.09	-0.01
	(0.12)	(0.15)	(0.12)	(0.14)	(0.05)
N	2824	2824	2824	2824	2824
AIC	2074.31	1223.96	2021.29	1469.30	6703.37
BIC	2276.47	1426.12	2223.45	1671.46	6911.48
Pseudo R2	0.32	0.28	0.20	0.36	
R2					0.31

*** p < 0.001; ** p < 0.01; * p < 0.05.

† OLS regression

Note: We use the same financial literacy knowledge questions in our investment behavior models as in our models for other financial behaviors. We do not use the specific investment knowledge questions.

Table 6: Interaction Regression Results

	Positive Behavior				
	Emergency Fund	Savings Account	Investment Account	Retirement Plan	Positive Score†
Accuracy	0.02755***	0.0496***	0.0636***	0.04393***	0.05754***
Fin Ed	0.1829***	0.1281***	0.2922***	0.3416***	0.3237***
Interaction	-0.02457**	-0.02111*	-0.03734***	-0.01686*	-0.03654***
	Negative Behavior				
	Overdraws Checking	Credit Card Interest Fees	Payday Loan	Used Pawn shop	Negative Score†
Accuracy	-0.08302***	-0.02738***	-0.1195***	-0.1179***	-0.08092***
Fin Ed	0.1242***	0.1105***	0.3063***	0.242***	0.2557***
Interaction	-0.03336***	-0.01935*	-0.0523***	-0.05283***	-0.05771***
	Risky Investment Behavior				
	Owns Crypto	Traded on Margin	Bought Options	Owns Meme Stock	Risk Score†
Accuracy	-0.03452*	-0.07624***	-0.06874***	-0.08932***	-0.06078***
Fin Ed	-0.1767	0.3565**	0.03626	0.1401	0.1148
Interaction	0.02687	-0.06967*	0.02484	-0.05767	-0.026

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

† OLS regression; all other rows are probit regression

Note: We use the same financial literacy knowledge questions in our investment behavior models as in our models for other financial behaviors. We do not use the specific investment knowledge questions.

Table 7 – Average Marginal Effects

	Model 1			Model 2		
	Correct	Error	Financial Education	Accuracy	Fin Ed	Interaction
Emergency Fund	0.02648***	0.01973***	0.03372***	0.008892***	0.05884***	-0.00793**
Savings Account	0.02319***	0.003199	0.01835**	0.01328***	0.03361***	-0.005655*
Investment Account	0.05801***	0.03781***	0.04987***	0.02081***	0.09795***	-0.01222***
Positive Score	0.05215***	0.03937***	0.08487***	0.01497***	0.1181***	-0.005747*
Overdraws Checking	-0.01407***	0.03496***	0.01368*	-0.0211***	0.03238***	-0.008479***
Credit Card Interest Fees	-0.00243	0.02353***	0.02154**	-0.009689***	0.03953***	-0.006848*
Payday Loan	-0.01089***	0.04154***	0.042***	-0.02259***	0.06269***	-0.009889***
Used Pawn shop	-0.01289***	0.04826***	0.03247***	-0.02612***	0.05619***	-0.0117***
Owns Crypto	0.007227	0.02101**	-0.02117	-0.006832*	-0.03401	0.005318
Traded on Margin	0.009766	0.03522***	0.01782	-0.008633***	0.04473**	-0.007888*
Bought Options	0.006139	0.03415***	0.01848	-0.01321***	0.007019	0.004773
Owns Meme Stock	-0.00244	0.02903***	-0.003416	-0.01223***	0.01978	-0.00789