Financial Knowledge and Confidence: A Methods Analysis

Brenda J. Cude, University of Georgia[1]
Robin Henager, Whitworth University[2]
Lu Fan, University of Georgia[3]

Objective

Financial literacy in the U.S. has captured the attention of many entities, including policymakers, the media, educators, and parents. These concerns are largely based on failing financial "literacy" scores, which are, in reality, often measured via a limited number of knowledge questions.

How much faith should we put in these scores? Are respondents just guessing? Traditional financial knowledge measures have important limitations that previous researchers have recognized. The measures typically assess (1) objective financial knowledge based on the number of correct answers to knowledge questions and/or (2) financial confidence (also known as subjective financial knowledge) based on self-assessment survey questions. Both measures are usually based on a limited number of questions, such as Lusardi and Mitchell's (2008) Big 3 or Big 5 questions to assess knowledge and one or only a few survey questions to assess subjective financial knowledge (see, for example, the single-item measure in the 2021 National Financial Capability Study). However, another important limitation is the possibility that even those respondents who chose the correct response to an objective measure of financial knowledge merely guessed.

This study sought to develop a novel measure to account for confidence when assessing financial knowledge across various money management topics, including budgeting, insurance, retirement planning, savings and investing, home buying, credit, and use of financial institutions. The study used data from a financial knowledge test administered to 427 college students to test the measure. For each of the 40 knowledge questions on the test, participants rated their confidence in their answers on a 5-point Likert scale. The advanced measure developed in this study can provide a better understanding of individuals' financial knowledge that takes into consideration their confidence, and be a useful tool for financial educators and researchers.

Significance

As researchers, we can only make assumptions about why respondents choose a "don't know" response (Nicolini, 2022). Lusardi and Mitchell (2008) suggested that choosing "don't know" in response to their basic three financial knowledge questions indicated low financial literacy. However, others, including Mondak and Creel Davis (2002), have suggested that the choice of a "don't know" option may have more to do with psychological traits (such as self-confidence, competitiveness, and risk-taking) than knowledge. Including a "don't know" option also creates methodological issues; Kim and Mountain (2019) proposed replacing "don't know" responses with correct and incorrect answers based on the proportion of each in the sample. The issue is important, as Urban and Valdes (2022) reported a steady decline in financial knowledge scores over the 12 years of the FINRA Investor Education Foundation's National Financial Capability Study but comparable increases in the likelihood that respondents would choose the "don't know" response.

A novel financial knowledge measure that accounts for confidence may be one solution to the "don't know" and guessing dilemma. We call the advanced measure we created a confidence-adjusted financial knowledge score. We also calculated a traditional financial knowledge score and two confidence measures. To better understand the value of the new measure, we examined the relationship between each score and several variables measuring respondents' financial responsibilities and financial situations, controlling for gender and academic major.

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[1] Brenda J. Cude (bcude@uga.edu), Professor Emeritus, Department of Financial Planning, Housing and Consumer Economics
[2] Robin Henager (rhenager-greene@whitworth.edu), Associate Professor, School of Business
[3] Lu Fan (lufan@uga.edu), Assistant Professor, Department of Financial Planning, Housing and Consumer Economics

Several researchers have previously examined confidence in one's financial literacy. They often have relied on a single measure, such as the National Financial Capability Study's item: *On a scale from 1 to 7, where 1 means very low and 7 means very high, how would you assess your overall financial knowledge?"* Some researchers have compared the response to a confidence measure to objective financial knowledge scores and created measures termed unjustified confidence (see, for example, Parker & Stone, 2014), inappropriate confidence (see, for example, Parker et al., 2012), or simply overconfidence (see, for example, Cwynar et al., 2020; Harvey et al., 2018). Less often, financial literacy researchers have examined underconfidence, where respondents believe they have less financial knowledge than they have (see, for example, Razmdoost et al., 2015). Yet comparing a general response about perceived "overall" financial knowledge to answers to questions about specific financial knowledge topics is a very imprecise approach.

Several previous studies have measured consumer confidence relative to specific knowledge responses using different approaches. The Cognitive Economics Study (CogEcon), a longitudinal study of older Americans and their spouses, asks respondents to analyze eight financial statements (i.e., "Financially, investing in the stock market is no better than buying lottery tickets"). Respondents make a judgment about how likely their response to each is to be true. Respondents circle 50% (indicating a complete guess) or 100% (indicating absolute certainty), or a number in between for each item (Dunning et al., 1990). Similarly, Sundblad et al. (2009) asked respondents to assess their confidence about their knowledge of climate for each of 44 true-false statements using a six-point rating scale (ranging from 1, very uncertain, to 6, very certain).

Researchers also have asked respondents to rate their confidence in their ability to make predictions. Dunning et al. (1990) used this methodology (i.e., "*estimate your confidence between 50% and 100%*") to examine consumer confidence in 20 predictions dealing with consumer preferences, hypothetical dilemmas, and personal habits or characteristics. Vallone et al. (1990) examined undergraduate students' confidence in their predictions about their futures.

While the focus of this paper is methodological, we assess how well the measure appears to work in regression models, which requires the selection of independent variables. Our rationale for the variables we selected is explained below. However, it is important to note that our choice of independent variables was limited as the focus in data collection was on assessing financial knowledge and one's confidence in that knowledge.

Self-Determination Theory (Ryan & Deci, 2017) suggests that individuals' motivation to engage with personal finance can differ. They described three types of motivation -- autonomous (volitional), controlled (pressured), and amotivation (a lack of motivation). Research has indicated that more autonomous forms of motivation are most often associated with better performance and wellness outcomes in several applied domains, including education (Ryan et al., 2021). Di Domineco et al.'s (2022) research concluded that autonomous motivation was positively associated with several financial behaviors, including saving, and characteristics, including financial self-awareness. Thus, we chose two variables to control for motivation to learn about personal finance. One was based on responses to a question asking respondents to evaluate their current financial situation. Over 40% indicated they had more debt than they like, and another 30% indicated they had no savings. Dissatisfaction with one's financial situation may very well motivate a student to enroll in a personal finance course; the variable also may control for self-selection bias.

Another set of variables chosen to control for motivation to take a personal finance course was responsibility for a credit product. Previous research (Henager & Cude, 2016) has found that young adults with little experience with financial products tend to have less objective financial knowledge and potentially higher (unjustified) confidence in their financial management abilities. The respondents in this study had varying levels of experience with financial products. The survey questions in this study about responsibility for three credit products (student loans, car loans, and credit cards) deemed relevant to college students are used as proxies for experience.

Finally, we controlled for the students' gender and major. Researchers have consistently reported gender as a primary influence on college students' financial literacy (Chen & Volpe, 2002; Ford & Kent, 2010; Markovich & DeVaney, 1997), with males usually scoring higher than females, but not always as in Robb (2007), Norvilitis et al. (2006), and Sarigűl (2014). Several researchers, including Hanna et al. (2010), Chen and Volpe (2002), and Markovich and DeVaney (1997), reported that business majors had higher financial literacy scores than other majors. However, Bongini et al. (2012) found that the influence of both major and gender was specific to the financial knowledge area.

Method

Instrument

The data for the instrument for this project came from a one academic credit hour elective financial literacy course taught at a major southeastern university each Fall and Spring Semester. The target population for this course was seniors who had not previously taken a personal finance course for academic credit in college.

The 40-item multiple-choice exam that was the basis for this research was based on data from 1,089 students across 14 semesters. Following Bongini et al. (2012), Knoll and Houts (2012), and Despard and Chowa (2014), Item Response Theory (IRT) guided the selection of the 40 items (Cude & Myers, 2018). The 40 test items were chosen based on the discrimination score (chosen if the discrimination score was at least 2) and difficulty level (a variety of difficulty levels was represented).

The choice of 40 items was somewhat arbitrary; it is greater than the recommended minimum of 16 -- four items for each of the four primary financial literacy topic areas identified by Huston (2010) and reasonable for most students to comfortably complete within 30 minutes. The major personal finance content areas recommended by Remund (2010) and Huston (2010) were represented in the exam.

Data

This paper reports analyses based on data from 491 undergraduate college students who took the IRT-validated 40-item test between Fall 2016 and Spring 2020. Each of the 40 multiple-choice knowledge questions had four answer choices; don't know was not an option. As described earlier, for each knowledge question, students evaluated their confidence in their responses on a 1 to 5 scale, where 5 was most confident. Due to missing data, the final sample was 427 students.

Variables

A traditional financial knowledge score was calculated based on responses to the 40 knowledge questions. This score was simply the number of questions (0-40) the student answered correctly.

A financial confidence score (Confidence1) was calculated based on the students' assessment of their confidence in their knowledge of each of the 40 questions. For each financial knowledge question, students were asked, "On a scale from 1-5, with 1 = least confident and 5 = most confident, how confident are you that your answer is correct?" This format was chosen primarily to match the five answer choices on the Scantron forms available at the university to score the exam.

A second financial confidence score (Confidence2) was calculated based on students' subjective assessments of their confidence in their general financial knowledge, ability to manage finances, knowledge of credit, and ability to manage credit. Answer choices were "not at all" (1), "uncertain" (2), and "very" (3). The measure Confidence2 was created by adding the values for the four questions; values for Confidence 2 ranged from 4 to 12, with a higher score indicating more confidence.

Finally, we created a confidence-adjusted knowledge score following Cude and Myers' (2018) methodology. Correctly-answered financial knowledge questions were assigned a value of +1 and multiplied by the corresponding self-selected confidence value (1-5); incorrectly answered financial knowledge questions were assigned a value of -1 and multiplied by the corresponding self-selected confidence value (1-5). For example, a student who answered a question correctly and was highly confident in the answer selection would have a confidence-adjusted knowledge score of 5 for that question. A student who answered a question incorrectly and was highly confident in their answer selection would have a confidence-adjusted knowledge score of -5. The maximum confidence-adjusted knowledge score a student could achieve was 200, while the minimum score was -200.

Responses to each of the three financial responsibility questions (credit card, student loan, and car loan) were coded as binary variables, with 1 indicating responsibility. Two binary financial situation variables were created using responses to the question asking students to select one of the following to describe their financial situation: "I have no debt but I have savings," "I have no debt and I have no savings," and "I have more debt than I like." "I have more debt than I like" was the reference response.

Two demographic characteristics were included in the analyses – gender and major. Students from 15 different majors across campus were represented in the sample. However, for the analyses, major was recoded as a binary variable with Business or Family and Consumer Sciences (FACS)

taking the value of 1, and all other majors as the reference group. Previous research has consistently shown that Business majors score higher on financial knowledge tests (see, for example, Hanna et al., 2010). However, Business and FACS majors were coded as one group as financial management courses are readily available to students in FACS at the university where the data were collected. Gender was a binary variable with male assigned the value of 1. While data about two other demographic characteristics (age and marital status) were collected, the sample was primarily a traditional college-age group. Eighty-nine percent of the sample was between 18 and 22 years old, and 95% were single. Thus, we did not control for either variable in the regression analyses.

Analyses

We first produced sample descriptive statistics and conducted t-tests to compare differences based on gender and major in the financial knowledge score, the two financial confidence scores, and the confidence-adjusted knowledge score. Then, four regression models (three OLS models and one ordered logistic model) were performed to analyze the relationships between the traditional financial knowledge score, two financial confidence scores, and the confidence-adjusted financial knowledge score and the respondents' financial responsibility and financial situation, controlling for gender and major. The four models were:

Model 1: Financial knowledge $= f(Financial\ responsibility, financial\ situation, gender, major)$

Model 2: Financial confidence1 $=$
$f(Financial\ knowledge, financial\ responsibility, financial\ situation, gender, major)$

Model 3: Confidence $-$ adjusted financial knowledge $=$
$f(Financial\ responsibility, financial\ situation, gender, major)$

Model 4: Financial confidence2 $= f(Financial\ responsibility, financial\ situation, gender, major)$

Results

The financial knowledge score, the two financial confidence scores, and the confidence-adjusted financial knowledge score are described in Table 1, along with the demographic characteristics of the 427 students in this sample. The mean traditional financial knowledge score across the 40 items was 23.5. The range in scores was from 8 to 35 (out of the possible 0 to 40). The mean financial confidence score across the 40 items was 111.6. The range was from 40 to 193 (out of the possible 40 to 200). The mean confidence-adjusted knowledge score across the 40 items was 28.65; the range was from -66 to 137 (out of -200 to 200). The sample was 53% female and 47% male. The academic major of about a third of the respondents was Business or FACS. Of the Business/FACS majors, 60% were male and 40% were female.

Table 1 also reports the four scores (financial knowledge, two measures of financial confidence, and the confidence-adjusted knowledge score) by gender and major. T-tests indicated the differences in the financial knowledge and financial confidence score means were statistically significant at the 0.01 or 0.001 level by gender and major. Males scored higher than females on each measure. All mean scores for Business/FACS majors were higher than the mean scores for all other majors.

As shown in Table 1, the largest proportions (57.8% and 62.5%, respectively) chose "uncertain" as the response choice when asked how confident they were about their knowledge of financial management and their ability to manage their finances. Just more than one-half (52.9%) said they were not at all confident about their knowledge of credit and almost 90% of the sample were not at all confident (42.3%) or uncertain (46.3%) about their ability to manage credit.

Most students in the sample did not have responsibility for either a credit card or loans. The largest proportion (45.4%) had at least some responsibility for one or more credit cards, while 37.2% said they were responsible for their student loans and 5.1% for a car loan.

When asked to describe their current financial situation, about one-half of the sample said they had no debt, but about one-half also said they had no savings. Forty-one percent of the sample reported they had more debt than they would like (but the answer choice did not include information about savings).

Results from the regression analyses are in Table 2. Model 1 used the traditional financial knowledge score as the dependent variable; the R^2 was 0.094. Three variables were significant and positively related to the financial knowledge scores -- having responsibility for a credit card, gender, and academic major. Financial Confidence1 was the dependent variable in Model 2; the R^2 was 0.354. The same variables that were significant in Model 1 were significant in Model 2; financial knowledge

was also positively and significantly related to this measure of financial confidence. Financial Confidence2 was the dependent variable in Model 3; the R^2 was 0.134. Each variable except responsibility for a car loan was significant in this model and positively related to Financial Confidence2.

The confidence-adjusted knowledge score (4-12) was the dependent variable in Model 4, which was analyzed using an ordered logistic regression; the pseudo R^2 was 0.116. The same three variables that were significant in Model 1 – responsibility for a credit card, gender, and major – also were significant in Model 4. The odds ratios calculated in Model 4 indicated that respondents with a higher financial knowledge score were 14% more likely to self-report confidence in their financial and credit knowledge and management than those with lower scores. Those with responsibility for a student loan were 80% more likely and those with responsibility for a credit card were nearly three times more likely to score higher on this measure of financial confidence than those without either responsibility. Respondents who self-reported their financial situation as having no debt but having savings were twice as likely as their counterparts to have a higher Financial Confidence2 score. Both males and Business/FACS majors were more than three times as likely as their counterparts to self-report confidence in their financial and credit knowledge and management.

Conclusions

This paper aimed to develop a novel advanced measure of financial knowledge that accounts for confidence across a broad set of financial management content area. To further examine this new measure, we used regression to analyze the influence of the respondents' financial responsibilities and financial situation on each of the four measures, controlling for gender and major.

We confirmed previous research that reported that male college students and those in majors related to economics and finance (typically defined as business majors) scored higher on financial knowledge tests. However, we also learned that students with these characteristics had significantly more confidence in their knowledge than their counterparts, regardless of how confidence was measured.

A confidence-adjusted knowledge score presents a somewhat different picture of students' financial knowledge than raw knowledge scores alone. It may require use to best understand its value. For example, a 23.54 traditional financial knowledge score on a 40-item test is 59% correct, which most would quickly interpret as failing. But what does a 28.65 confidence-adjusted financial knowledge score mean? It is greater than 0, indicating both "some" confidence and "some" knowledge. Perhaps the greatest value of a confidence-adjusted score may be as a comparative tool, for example, to compare pre- and post-test scores or to examine knowledge and confidence across topic areas. Such a score also challenges educators to consider whether increasing student knowledge and confidence in their knowledge are equally important.

One interpretation of the mean confidence-adjusted financial knowledge score of 28.65 is that the college students in the sample knew when they were guessing about the answers to the financial knowledge questions. For example, a score below zero would indicate both lack of knowledge and lack of confidence. A low positive score indicates lack of confidence but some knowledge. They had no incentive to inaccurately assess their confidence in their knowledge. The test was scored as an assignment, and everyone who completed it received the same number of points regardless of the number of correct answers or how they assessed their confidence.

The study has several limitations. One important one is selection bias. While the students who chose to take the personal finance elective from which the data were collected came into the course with varying degrees of knowledge, they had one important characteristic in common – an interest in enrolling in a personal finance elective. However, only one of the two variables we chose to control for motivation to take the course (credit responsibility) was significant across the four models.

Another limitation is that the sample participants were college students. Additional work is needed to examine the value of a confidence-adjusted financial knowledge score in a broader population.

Due to the limited number of control variables, the results of the regression analyses should be generalized with caution. However, they do suggest further exploration is needed to consider whether a single-item measure assessing confidence in overall financial knowledge is at all comparable to a measure that assesses confidence in both knowledge and management ability in general as well as in a specific area of financial management (credit) deemed to be most relevant to the study population.

Despite the study's limitations, the results suggest that a confidence-adjusted financial knowledge measure has potential. Financial educators and practitioners can use this measurement to better assess students' and clients' financial knowledge as well as their confidence in their knowledge. A more precise measure allows educators and practitioners to develop targeted strategies based on the content-specific knowledge and confidence scores. A more advanced measure also improves the ability of policymakers to more accurately assess needs for financial literacy interventions and allocate resources.

Table 1
Descriptive Statistics (N = 427)

Variable	Frequency	Mean		Std Dev
Financial Knowledge Score (0-40)		23.54	***	(4.640)
Financial Confidence Score 1 (40 - 200)		111.63	***	(28.922)
Confidence Adjusted Knowledge Score (-200 to +200)		28.65		(31.580)
Financial (Credit and Financial) Confidence Score 2 (4 - 12)		6.89		(2.013)
Male (%)	46.84			
Financial Knowledge Score		24.37	**	(4.842)
Financial Confidence Score 1		122.04	***	(29.077)
Confidence Adjusted Knowledge Score		36.52	***	(35.647)
Financial Confidence Score 2		7.62	***	(1.984)
Female (%)	53.16			
Financial Knowledge Score		22.81	**	(4.336)
Financial Confidence Score 1		102.45	***	(25.529)
Confidence Adjusted Knowledge Score		21.72	***	(25.648)
Financial Confidence Score 2		6.26	***	(1.815)
Business or FACS Major (%)	32.08			
Financial Knowledge Score		24.61	**	(4.818)
Financial Confidence Score 1		126.99	***	(31.869)
Confidence Adjusted Knowledge Score		40.27	***	(34.822)
Financial Confidence Score 2		7.89	***	(2.148)
Other Major (%)	67.92			
Financial Knowledge Score		23.04	**	(4.475)
Financial Confidence Score 1		104.37	***	(24.298)
Confidence Adjusted Knowledge Score		23.16	***	(28.376)
Financial Confidence Score 2		6.42	***	(1.764)
Age 18 - 22	89.20			
Single	95.07			
How confident are you about:				
Your knowledge of financial management?		1.74		(0.595)
Not at all	34.19			
Uncertain	57.85			
Very	7.96			
Your ability to manage your finances?		1.91		(0.606)
Not at all	23.42			
Uncertain	62.53			
Very	14.05			
Your knowledge of credit?		1.56		(0.656)
Not at all	52.93			

Uncertain	37.94		
Very	9.13		
Your ability to manage credit?		1.69	(0.664)
Not at all	42.39		
Uncertain	46.37		
Very	11.24		
Responsible for credit card	45.43		
Responsible for student loan	37.24		
Responsible for car loan	5.15		
Current financial situation:			
No Debt, Have Savings	29.27		
No Debt, No Savings	29.51		
More Debt Than I Like	41.22		

** T-test indicated a statistically significant difference between male and female and between Business/FACS and other majors at 0.01

*** T-test indicated a statistically significant difference between male and female and between Business/FACS and other majors at 0.001

*** T-test indicated a statistically significant difference between financial knowledge score and financial confidence score 1 at 0.001

Table 2

Model 1 OLS Regression - Financial Knowledge Score

Variable	Coefficient		Std. Err.
Responsible for a Student Loan	0.913		(0.640)
Responsible for a Car Loan	-0.877		(1.012)
Responsible for a Credit Card	1.693	***	(0.453)
Current Financial Situation: (Ref: More debt than I like)			
No Debt, Have Savings	-0.248		(0.699)
No Debt, No Savings	-0.084		(0.690)
Male	1.393	**	(0.442)
Business/ FACS Major (Ref: All other majors)	1.376	**	(0.476)

Model 2 OLS Regression - Financial Confidence Score

Variable	Coefficient		Std. Err.
Financial Knowledge Score	2.244	***	(0.257)
Responsible for a Student Loan	0.870		(3.383)
Responsible for a Car Loan	11.720	*	(5.338)
Responsible for a Credit Card	3.324		(2.428)
Current Financial Situation: (Ref: More debt than I like)			
No Debt, Have Savings	1.131		(3.684)
No Debt, No Savings	2.563		(3.634)
Male	13.783	***	(2.358)
Business/ FACS Major (Ref: All other majors)	16.534	***	(2.534)

Model 3 OLS Regression - Confidence-Adjusted Knowledge Score

Variable	Coefficient		Std. Err.
Responsible for a Student Loan	4.319		(4.263)
Responsible for a Car Loan	0.117		(6.735)
Responsible for a Credit Card	9.870	***	(3.016)
Current Financial Situation: (Ref: More debt than I like)			
No Debt, Have Savings	-1.694		(4.651)
No Debt, No Savings	1.824		(4.590)
Male	12.834	***	(2.943)
Business/ FACS Major (Ref: All other majors)	15.218	***	(3.169)

Model 4 Ordered Logistic Regression - Composite score for Confidence in Financial Management and Credit Management

Variable	Coefficient		Std. Err.	Odds Ratio
Financial Knowledge Score	0.131	***	(0.208)	1.140
Responsible for a Student Loan	0.589	*	(0.447)	1.803
Responsible for a Car Loan	0.732		(0.806)	2.079
Responsible for a Credit Card	1.055	***	(0.538)	2.871
Current Financial Situation: (Ref: More debt than I like)				
No Debt, Have Savings	0.740	**	(0.571)	2.097
No Debt, No Savings	-0.131		(0.238)	0.877
Male	1.258	***	(0.648)	3.520
Business/ FACS Major (Ref: All other majors)	1.198	***	(0.661)	3.314

* p < .05; ** p < .01; *** p < .001

References

Bongini, P., Trivellato, P., & Zenga, M. (2012). Measuring financial literacy among students: An application of Rasch analysis. *Electronic Journal of Applied Statistical Analysis, 5*(3), 425-430.

Chen, H., & Volpe, R. (2002). Gender differences in personal financial literacy among college students. *Financial Services Review, 11*(4), 289-307.

Cude, B. J., & Myers, M. P. (2018). Are they guessing? Confidence-weighted financial knowledge scores. *Consumer Interests Annual, 64.*

Cwynar, A., Cwynar, W., Patina, W., & Sibanda, W. (2020). Young adults' financial literacy and overconfidence bias in debt markets. *International Journal of Business Performance, Management, 21*(1-2), 95-113.

Despard, M. R., & Chowa, G. A. N. (2014). Testing a measurement model of financial capability among youth in Ghana. *Journal of Consumer Affairs, 48*, 301-322.

Di Domenico, S. I., Ryan, R. M., Bradshaw, E. L., & Duineveld, J. J. (2022). Motivations for personal financial management: A Self-Determination Theory perspective. *Frontiers in Psychology.* https://doi.org/10.3389/fpsyg.2022.977818

Dunning, D., Griffin, D. W., Milojkovic, J. D., & Ross, L. (1990). The overconfidence effect in social prediction. *Journal of Personality and Social Personality, 58*(4), 568-581.

Ford, M. W., & Kent, D. W. (2010). Gender differences in student financial market attitudes and awareness: An exploratory study. *Journal of Education for Business, 85*(1)*,* 7-12.

Hanna, M. E., Hill, R. R., & Perdue, G. (2010). School of study and financial literacy. *Journal of Economics and Economic Education Research, 11*(3), 29-37.

Harvey, M., Burke, J., Serido, J., & Shim, S. (2018). What drives financial overconfidence among young adults? *Consumer Interests Annual, 64.*

Henager, R., & Cude, B. J. (2016). Financial literacy and long-and short-term financial behavior in different age groups. *Journal of Financial Counseling and Planning*, *27*(1), 3-19.

Huston, S. J. (2010). Measuring financial literacy. *Journal of Consumer Affairs, 44*, 296-316.

Kim, N., & Mountain, T. P. (2019). Financial knowledge and "don't know" response. *Journal of Consumer Affairs, 53*(3), 1948-1969.

Knoll, M. A., & Houts, C. R. (2012). The financial knowledge scale: An application of Item Response Theory to the assessment of financial literacy. *Journal of Consumer Affairs, 46*(3), 381-410.

Lusardi, A., & Mitchell, O. S. (2008). Planning and financial literacy: How do women fare? *American Economic Review, 98*(2), 413-417.

Markovich, C. A., & DeVaney, S. A. (1997). College seniors' personal finance knowledge and practices. *Journal of Family and Consumer Sciences, 89*, 61-65.

Mondak, J., & Creel Davis, B. (2002). Asked and answered: Knowledge levels when we will not take "don't know" for an answer. *Political Behavior, 23*(3), 199-224.

Nicolini, G. (2022). Assessment methods in financial literacy. In G. Nicolini & B. Cude (Eds.), *The Routledge handbook on financial literacy* (pp. 110-123). Routledge.

Norvilitis, J. M., Merwin, M. M., Osberg, T. M., Roehling, P. V., Young, P., & Kamas, M. M. (2006). Personality factors, money attitudes, financial knowledge, and credit-card debt in college students. *Journal of Applied Social Psychology, 36*(6), 1395-1413.

Parker, A. M., Bruine de Bruin, W., Yoong, J., & Willis, R. (2012). Inappropriate confidence and retirement planning: Four students with a national sample. *Journal of Behavioral Decision Making, 25*(4), 382-389.

Parker, A. M., & Stone, E. R. (2014). Identifying the effects of unjustified confidence versus overconfidence: Lessons learned from two analytic methods. *Journal of Behavioral Decision Making, 27*(2), 134-145.

Razmdoost, K., Dimitriu, R., & Macdonald, E. K. (2015). The effect of overconfidence and underconfidence on consumer value. *Psychology and Marketing, 32*(4), 392-407.

Remund, D. L. (2010). Financial literacy explicated: The case for a clearer definition in an increasingly complex economy. *Journal of Consumer Affairs, 44*, 276-295.

Robb, C. A. (2007). *College students and credit card use: The effect of personal financial knowledge on debt behavior.* Ph.D. Dissertation. University of Missouri, Columbia, MO.

Ryan, R. M., & Deci, E. L. (2017). *Self-Determination Theory: Basic psychological needs in motivation, development, and wellness.* The Guildford Press.

Ryan, R. M., Deci, E. L., Vansteenkiste, M., & Soenens, B. (2021). Building a science of motivated persons: Self-Determination Theory's empirical approach to human experience and the regulation of behavior. *Motivation Science, 7*, 97–110.

Sarigül, H. (2014). A survey of financial literacy among university students. *Journal of Accounting and Finance, 64,* 207-224.

Sundblad, E-L., Biel, A., & Gärling, T. (2009). Knowledge and confidence in knowledge about climate change among experts, journalists, politicians, and laypersons. *Environment and Behavior, 41*(2), 281-302.

Urban, C., & Valdes, O. (2022, August). Why is measured financial literacy declining and what does it mean? Maybe we just don't know. *FINRA Investor Education Foundation Insights: Financial Capability.*

Vallone, R. P., Griffin, D. W., Lin, S., & Ross, L. (1990). Overconfident prediction of future actions and outcomes by self and others. *Journal of Personality and Social Psychology, 58,* 582-592.