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Confidence and Competence in Investor Cognition: An Exploratory Analysis of the Calibration Gap and Decision Biases

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Abstract. This article explores how subjective confidence and objective knowledge relate to investment decision behavior. The data are the investor sub-sample of the 2024 U.S. National Financial Capability Study (N=2861). Subjective knowledge uses a seven-point self-assessment, objective knowledge a twelve-item test; they correlate at only 0.376, and 29.4% of investors are in a high-self-assessment, low-ability state. Controlling objective knowledge, each standard deviation of self-assessment is associated with high-frequency trading 7.87 percentage points higher, complex product holding 11.04 higher and social-media-driven decisions 9.96 higher. Objective knowledge varies by outcome: positive for high-frequency trading (5.84 points), not significant for complex products, negative for social-media-driven decisions and fraud susceptibility. Those who participated in financial education score 0.320 standard deviations higher on self-assessment but only 0.116 higher on objective knowledge, so their calibration gap is larger. The data are cross-sectional; conclusions are conditional correlations, not causal effects.

Keywords: behavioral finance, overconfidence, calibration, financial literacy, financial education

1. Introduction

Overconfidence is a cognitive bias repeatedly discussed in behavioral finance. Odean finds individual investors trade far more than rational expectations imply, and the stocks they sell then outperform those they buy [1]. Barber and Odean report male investors' annual turnover is 45% higher than women's, yet their net return is lower [2]. Such evidence links a psychological construct to observable behavior.

Measurement, however, remains the weak link between bias and behavior. Moore and Healy note overconfidence has at least three independent forms: overestimation, better-than-average and over-precision [3]; Kruger and Dunning find the largest self-evaluation bias among the least able [4]. The literature commonly proxies overconfidence by the difference between self-rating and test score [5]. That difference score is structurally defective: it arithmetically contains the negative of the objective score, so when ability explains the outcome strongly the difference captures the ability effect and is

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misread as confidence. Liu et al. likewise show extensive covariation among behavioral-finance constructs, demanding stricter identification [6].

This paper instead enters both measures together and examines the net association of self-assessment after controlling objective knowledge, separating the two within one equation. This net association is only a proxy for overconfidence: it may also carry investment experience, risk preference and general self-efficacy, and is not claimed to equal strictly measured overconfidence. Bonaparte and Fabozzi argue that an investor's calibration state is itself an independent dimension explaining portfolio behavior [7].

This exploratory analysis makes three contributions: it separates the two knowledge measures in one model and finds their direction varies by outcome; it estimates how financial-education experience relates to confidence and to ability separately, finding the former clearly stronger; and it thereby engages the debate on the effect of financial education [8].

2. Literature review

2.1. Excessive self-confidence and transaction behavior

The link between overconfidence and trading frequency is among the most discussed regularities in behavioral finance [1]. Inghelbrecht and Tedde, using Belgian broker data, find overconfidence significantly related to excessive trading, an association financial literacy does not eliminate [9]. Digital trading amplifies the mechanism: attention-driven buying on Robinhood is followed by significant negative returns [10]; and gamified interface design alone can increase risk-asset allocation [11].

2.2. The separation of subjective knowledge and objective knowledge

The weak correlation between self-assessed and measured knowledge is documented across fields [4]. Anderson et al. find their difference relates significantly to precautionary saving and retirement planning, in a direction distinct from mere lack of knowledge [5]. In credit-card management the two relate to mismanagement in opposite directions [12]; cryptocurrency holding gives a similar conclusion [13]; and literacy overconfidence relates significantly to investment fraud victimization [14]. Collapsing them into one index would hide these mechanism differences.

2.3. The correction effect of financial education

Whether financial education improves financial behavior is long debated. Fernandes et al.'s meta-analysis finds financial-literacy interventions explain only 0.1% of downstream behavior, decaying rapidly [15]. Willis therefore proposes the financial education fallacy: education may raise the confidence of the educated rather than their ability, leading to riskier choices [16]. Kaiser et al. are more optimistic, finding positive but small effects [8]. The debate asks whether education works; it rarely estimates how strongly educational experience relates to confidence versus ability. This article gives descriptive evidence on that gap.

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3. Methodology

3.1. Data and samples

The data come from the 2024 National Financial Capability Study of the FINRA Investor Education Foundation [17], fielded every three years, 2024 being the sixth wave [18]. This article uses its investor sub-sample: 2,861 adults holding investments outside retirement accounts, matched by respondent ID to the same wave of the national survey at a 100% match rate, which supplies the demographic and financial-education variables. Estimates use the survey's investor weight; after dropping missing core variables the main-model sample ranges from 1811 to 2704.

3.2. Variable measurement

Subjective investment knowledge is the respondent's self-assessment on a seven-point scale. Objective knowledge is the foundation's twelve-item test, covering stock and bond claims, bankruptcy priority, risk-return, past-performance extrapolation, index-fund fees, municipal-bond tax, margin losses, short selling and option expiry.

Following the literature, the standardized difference serves as a reference indicator:

$$OC_i = z(S_i) - z(K_i) \tag{1}$$

Here S_i is self-assessment, K_i the test score and $z(\cdot)$ the standardization operator. Because this indicator contains $-z(K_i)$, it is defective for identification and is used only for robustness tests. The main specification instead reads the coefficient on $z(S_i)$ holding $z(K_i)$ fixed, as conditional subjective confidence -- a proxy for overconfidence rather than a measure of it, which may also reflect trading experience, risk preference and general self-efficacy.

Four observable behaviors serve as outcomes, each with construct-validity boundaries. High-frequency trading is four or more non-retirement trades in 12 months; the data carry no returns, so this is not the wealth-reducing overtrading defined in the literature. Complex product holding is any of margin, options, social-media stocks or cryptocurrency; options may also hedge, so the indicator measures exposure complexity, not pure speculation. Social-media-driven decisions follow a social-media personality's recommendation; such information may itself be valid, so the indicator measures information sourcing. Fraud susceptibility is willingness to buy a promised risk-free 25% annual return for five years; that promise is financially impossible, so validity here is clearer. Financial-education experience is self-reported, undifferentiated by content, duration or quality.

3.3. Measurement strategy and analysis positioning

The main model is weighted Logit:

$$\Pr(Y_i = 1 \mid \cdot) = \Lambda\left(\alpha + \beta_1 z(S_i) + \beta_2 z(K_i) + \gamma' X_i\right) \tag{2}$$

X_i covers age, gender, education, income, marital status, employment, portfolio size and retirement-account ownership. Results are average marginal effects with HC1 robust standard errors; the maximum variance inflation factor is 1.71. For financial-education experience and calibration:

$$z(S_i) - z(K_i) = \delta_0 + \delta_1 E_i + \gamma' X_i + \varepsilon_i \tag{3}$$

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The paper also stacks $z(S_i)$ and $z(K_i)$ and tests the difference between the two coefficients with respondent-clustered standard errors.

This is an exploratory analysis without pre-registration. The initial specification used the difference score as the independent variable, with high-cost borrowing and missing emergency savings as outcomes; there the self-assessment component carried no independent association (p=0.697) and almost all explanatory power came from objective knowledge. Two adjustments followed: the separated specification of equation (2), given the difference score's arithmetic defect; and a shift of outcome domain to trading behavior, because financial-distress outcomes are mainly explained by income constraints. Both rest on construct validity rather than coefficient significance, but the process is not claimed to equal confirmatory testing, and all results below are reported as they are, including those that are not significant. Figure 1 summarises the framework.

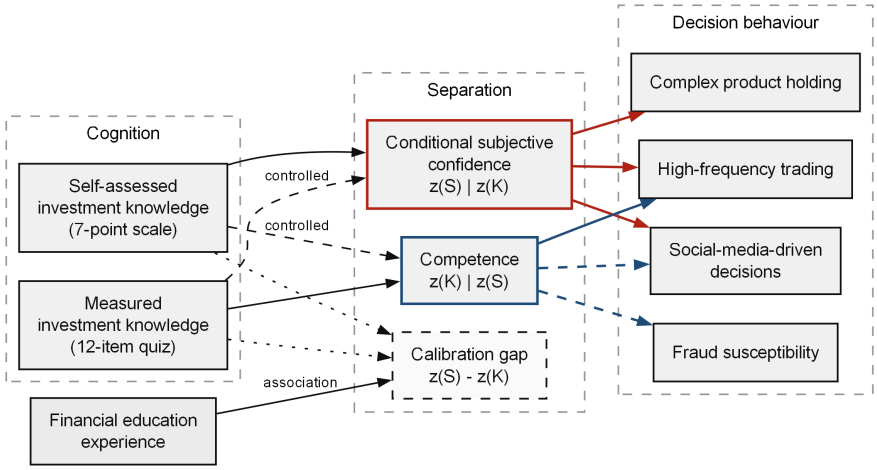

Figure 1. Analytical framework separating self-assessed confidence from measured knowledge

4. Results

4.1. Calibration gap

Self-assessment averages 4.56 (of 7, SD 1.36) and the objective test 5.86 (of 12, 48.9% correct, SD 2.66); they correlate at only 0.376. Item difficulties locate the gap: option expiry is answered correctly by 12.2%, margin-loss by 23.4% and short selling by 26.1%, and over half fail to reject the extrapolation bias that past performance predicts future returns. Combining self-assessment above the median with a test score below it, 29.4% of investors are in a high-self-assessment, low-ability state.

4.2. The relationship between self-confidence and knowledge varies from result to result

Table 1 reports the main model. Controlling objective knowledge and demographics, each standard deviation of self-assessment is associated with high-frequency trading 7.87 percentage points higher (95% CI 5.86 to 9.88), complex product holding 11.04 higher (9.17 to 12.90) and social-media-driven decisions 9.96 higher (8.36 to 11.56); for fraud susceptibility it is negative and not significant.

Objective knowledge is not simply the opposite of confidence; it varies with outcome. In the high-frequency trading model it is also significantly positive (5.84 percentage points, CI 3.69 to

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7.98) -- those with more knowledge trade more often. It is not significant for complex product holding. Only for social-media-driven decisions are the two directions genuinely opposite, confidence positive and objective knowledge negative (2.89 points); and for fraud susceptibility confidence is not significant while objective knowledge is significantly negative (4.23 points). Only one of four outcomes is strictly opposite. The safer generalization: self-assessment relates to higher participation and risk exposure, while objective knowledge is protective only for credulity outcomes.

Figure 2 plots these average marginal effects with their 95% confidence intervals.

The mechanism evidence agrees: higher self-assessment goes with more reliance on every channel at once -- social-media boards 7.72 percentage points higher, institutional research tools 9.70 higher, advisor-routed orders 10.18 higher -- while higher objective knowledge goes with less reliance on all three. The difference score, a high-self-assessment/low-ability dummy, a linear probability model and a specification adding household financial literacy all give same-signed, significant results.

4.3. The gap between financial education experience and calibration

Those who participated in financial education score 0.116 standard deviations higher on objective knowledge and 0.320 higher on self-assessment, a difference of 0.212 that is significant under a respondent-clustered stacked estimate (CI 0.062 to 0.361); their calibration gap is correspondingly 0.204 standard deviations larger. The high-self-assessment, low-ability share is 38.6% among the educated versus 32.1% among the uneducated, still significant after controlling demographics. The interaction shows the association between self-assessment and the outcomes does not weaken among the educated; it is stronger for complex product holding, social-media-driven decisions and fraud susceptibility, and not significant for high-frequency trading. All of this is cross-sectional; financial-education experience is self-reported and not randomly assigned, and cannot be read as a causal effect of education.

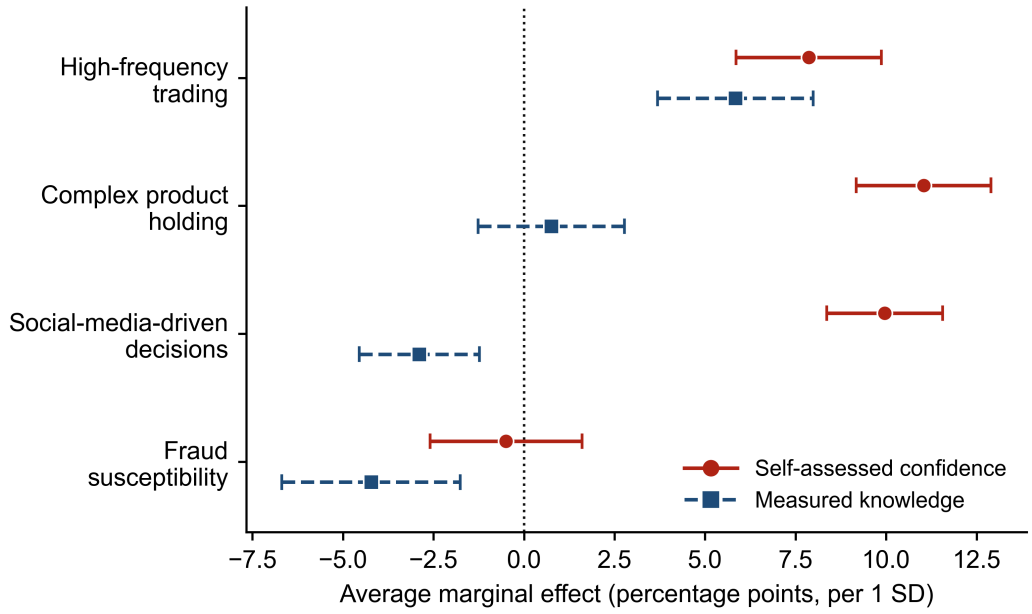

Figure 2. Average marginal effects of self-assessed confidence and measured knowledge across four decision behaviours (95% CI)

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Table 1. Self-assessed confidence versus measured knowledge as predictors of investment decision biases

Outcome	N	Rate	Confidence AME	Knowledge AME
High-frequency trading (4+ trades/yr)	2,491	39.5%	+7.87***(0.050)	+5.84***(0.053)
Complex product holding	2,704	41.4%	+11.04***(0.052)	+0.75(0.057)
Social-media-driven decisions	2,691	27.1%	+9.96***(0.065)	-2.89***(0.067)
Fraud susceptibility	1,811	70.8%	-0.50(0.054)	-4.23***(0.064)

Average marginal effects in percentage points from weighted logit models; HC1 robust standard errors of the underlying logit coefficients in parentheses. All models control for age, gender, education, income, marital status, employment, portfolio size and retirement-account ownership. * p<0.1, ** p<0.05, *** p<0.01.

5. Discussion

The results place a direct requirement on how cognitive bias is measured. Using the self-assessment-minus-test difference as a single index folds the ability effect into the confidence effect; once separated, the structure is not a simple opposition: self-assessment relates to broader participation, whereas objective knowledge is protective only for credulity outcomes and is even positive for high-frequency trading. The two act through different channels, so treating knowledge as a general debiasing instrument may be too optimistic.

The financial-education result needs careful reading. Participation associates with higher confidence about three times as strongly as with higher ability, and this group's high-self-assessment, low-ability share is larger. This runs in the direction of Willis's argument [16] and is compatible with the weak education effect in Fernandes et al. [15], but three explanations cannot be separated here: education raises confidence; the more confident are likelier to attend and recall education; or both reflect unobserved traits. As trading interfaces grow more gamified [11], this at least suggests that measuring knowledge gains alone is insufficient when evaluating education programmes.

Three limitations apply. First, the data are cross-sectional and reverse causality is possible: trading experience itself raises self-assessment, so the coefficients of equation (2) are conditional correlations, not causal effects. Second, the outcomes have construct-validity boundaries, set out in Section 3.2. Third, the study is exploratory and its measure and outcome domain were adjusted; although the grounds are construct validity, the findings need re-testing under a pre-registered design with longitudinal data. The sample covers only U.S. investors, so extrapolation should be cautious.

6. Conclusion

Using the investor sub-sample of the 2024 U.S. National Financial Capability Study, this article separates subjective confidence from objective knowledge within one model. Three descriptive findings stand out. First, self-assessment relates only weakly to measured knowledge, and nearly 30% of investors are in a high-self-assessment, low-ability state. Second, controlling ability, self-assessment relates to a higher probability of high-frequency trading, complex product holding and social-media-driven decisions, while objective knowledge varies by outcome: positive for high-frequency trading, negative for credulity outcomes, opposite in sign to confidence only for social-

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media-driven decisions. Third, financial-education participation relates more strongly to higher confidence than to higher ability, and this group's calibration gap is larger.

All of these are conditional correlations. One testable implication: evaluations of education programmes should measure not only the knowledge gain but also the confidence gain and the difference between them. Whether that holds awaits randomised intervention and longitudinal data.

Declaration of interest

The author declares no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author contribution

The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

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