

An Empirical Test of a Financial Decision-Maker Risk-Profile Framework

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ABSTRACT

The purpose of this article is twofold. The first is to determine if the unobserved factors of behavioral loss tolerance and capacity to take a risk exist empirically. The second is to illustrate how these constructs individually and jointly can be used to explain financial decision-maker investment behavior. Using panel data collected in the United States between October 2020 and March 2021 (n = 265), findings from this study show that a financial decision-maker's behavioral loss tolerance and risk capacity can be estimated and that these estimates can be used to build a risk profile that can then be used to describe subsequent investment behavior. When viewed from a descriptive framework perspective, those who exhibit more behavioral loss tolerance and greater risk capacity are more likely to hold a larger proportion of their portfolio in equities compared to other financial decision-makers.

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Introduction

Recent periods of market uncertainty, price volatility, and turmoil have prompted researchers to reconsider traditional asset allocation and portfolio management assumptions, models, and procedures.¹ Research in the field is being spurred on by a desire to better understand how household-level financial risk aversion (the inverse of which is risk tolerance) is related to investment allocation decisions, which is a household financial management task that recurs on a frequent basis.² The investment decision-making process should normatively be informed by a range of factors, including a financial decision-maker's (a) personal circumstances, (b) investment goal, (c) time horizon, (d) source of investment capital, (e) risk attitude, and (f) ability to absorb losses in the value of their investments.³ These factors act like levers that result in trade-offs when a decision-maker is forced to choose among alternative courses of action.⁴ This implies that rather than relying solely on a single numerical score developed from a risk-aversion assessment questionnaire or test, financial advisors should spend time compiling relevant data to create a multifactor financial decision-maker risk profile.⁵

A financial risk profile serves three purposes. The first is to ensure that investment and other financial recommendations match a financial decision-maker's unique situation. The second is to help a financial

decision-maker or their financial advisor keep track of the multiple factors that likely influence current and future financial decisions. The third purpose, for a financial advisor, is to demonstrate regulatory compliance. The objective of this study is to describe tests of a model developed to determine if a financial decision-maker's behavioral loss tolerance and risk capacity (i.e., an indicator of a financial decision-maker's ability to take a risk) exist empirically and, if yes, whether these constructs individually and jointly can be used to explain subsequent investment behavior. As will be described later in this article, it does appear that behavioral loss tolerance and risk capacity can be estimated and that these estimates can be used to build a risk profile that can then be used to describe investment choices.

Background

Cordell was among the first to formally describe what is now known as a risk profile.⁶ Cordell proposed the notion that a financial decision-maker's risk-taking behavior can be described by their propensity to take a risk, their attitude towards risk, their capacity to take a risk, and their financial knowledge. Nearly two decades later, Davies refined the concept by arguing that the factors comprising a financial decision-maker's risk profile can be classified into one of two categories: (a) their willingness to take a risk and (b) their ability to take a risk. Someone's willingness to take a risk is sometimes referred to as risk aversion, risk tolerance, risk attitude, and risk appetite.⁷ Building on the work of Cordell and Davies, Hubble and associates added clarity to risk-profiling discussions by suggesting that someone's willingness to take a risk is just one element of a larger factor called behavioral loss tolerance.⁸ As conceptualized by Hubble et al., behavioral loss tolerance can be described by a financial decision-maker's risk preference, financial knowledge, investing experience, risk perception, and risk composure in addition to risk tolerance or risk aversion. The following discussion provides a definitional overview of these concepts.

Risk preference refers to a financial decision-maker's objective and subjective cognitive evaluation of feelings directed at an object or course of action.⁹ Risk preference can be seen as an inclination to like or dislike a choice or task. *Financial knowledge* is a representation of a financial decision-maker's familiarity with and comprehension of financial information, facts, and skills that can be applied when making decisions. Sometimes financial knowledge is referred to as financial literacy.¹⁰ It is generally thought that knowledge and loss tolerance are positively associated.¹¹ *Investing experience* describes a financial decision-maker's practical familiarity with investments and financial markets. *Risk perception* refers to a judgment a financial decision-maker makes when assessing the severity of risk in the context of environmental conditions.¹² Perceptions of risk are derived through cognitive appraisals.¹³ *Risk composure* refers to an evaluation of what a financial decision-maker did in the past as an indicator of what they are likely to do in the future.¹⁴

The other risk-profiling factor identified by Davies is risk-taking ability, which is sometimes referred to as risk capacity, ability to bear a loss, and capacity for loss. In the context of the present study, risk-taking ability is referred to as *risk capacity*, which is specifically defined as a financial decision-maker's ability to withstand probable and unanticipated investment losses. When conceptualized this way, risk capacity is an unobserved factor characterized by variables such as time horizon, wealth status, household income, and sources of income.¹⁵

As noted below, it is hypothesized in this study that the combination of behavioral loss tolerance and risk capacity determines, to a great extent, how financial and investment decisions are framed and the manner in which financial decision-makers (and their financial advisors) develop a risk profile. The following discussion describes the conceptual framework that was developed to illustrate how behavioral loss tolerance and risk capacity can be combined to define a financial decision-maker's risk profile.

Conceptual Framework and Hypotheses

Documenting a financial decision-maker's risk need, time horizon, and liquidity constraint(s) is the first step when building a risk profile. A household's financial goal is the dominant consideration describing the risk need.¹⁶ Some goals may require a household to allocate investment assets aggressively (i.e., increasing returns while increasing price volatility). Other goals may be accomplished by taking less risk. Assuming a need to take risk exists, the investment management process shifts to evaluating the decision-maker's time horizon for goal achievement and their liquidity need(s). When evaluated holistically, these three factors determine the risk and return profile of a baseline investment or portfolio recommendation. Once the baseline has been established, the financial decision-maker's capacity to take a risk and their behavioral loss tolerance need to be considered. These two factors work to shift the risk and return profile of the baseline investment or portfolio recommendation upwards or downwards.

A proposition underlying the research presented in this article is that to maximize goal achievement, a financial decision-maker's risk need, risk capacity, and behavioral loss tolerance should align. As noted by Hubble et al., goal achievement is jeopardized whenever the risk need exceeds a financial decision-maker's capacity to take the required risk and/or when a financial decision-maker's behavioral loss tolerance falls below what is needed to ensure goal achievement.¹⁷ In situations where risk need, risk capacity, and behavioral loss tolerance are out of alignment, the recommendation ought to be that the financial goal be revised to align more closely with each element of the financial decision-maker's risk profile.

To evaluate alignment across the risk need, risk capacity, and behavioral loss tolerance elements, it is necessary to estimate risk capacity and behavioral loss tolerance using observed financial decision-maker personal and household characteristics. As shown in Figure 1, risk capacity can be described using variables such as wealth status, household income, and other measures

of household financial stability. Behavioral loss tolerance can be inferred through the documentation of a financial decision-maker's (a) risk tolerance or risk aversion, (b) risk preference, (c) financial knowledge, (d) investment experience, (e) risk perception, and (f) risk composure.

The conceptual framework illustrated in Figure 1 was evaluated and tested to determine whether: (a) wealth status, household income, and other measures of household financial stability can be used to describe a financial decision-maker's *risk capacity*; (b) risk tolerance/aversion, risk preference, financial knowledge, experience, risk perception, and risk composure can be used to describe a financial decision-maker's *behavioral loss tolerance*; and (c) risk capacity and behavioral loss tolerance can be used to predict subsequent-period financial risk-taking.

In this study, it was assumed that risk capacity and behavioral loss tolerance are relatively stable over short periods of time. While it is acknowledged that wealth status, income, and other measures of household financial stability can vary across time, it was determined that during the periods analyzed in this study, these factors did not change in significant ways systematically across the sample.¹⁸ It was further assumed that the elements describing behavioral loss tolerance were likewise relatively stable across the periods of analysis. This assumption matches what has generally been reported in the literature; namely, how a financial decision-maker evaluates the riskiness of choices varies only slightly over short periods.¹⁹ These assumptions lead to a key proposition embedded in this study: while a separate risk profile can (and should) be estimated in alignment with each goal, original source of wealth, and account type, the elements comprising a financial decision-maker's risk capacity and behavioral loss tolerance tend to be relatively stable. As such, rather than develop a risk profile for each participant in this study based on their risk need, time horizon, and need for liquidity, it was assumed that those in the sample were similar in saving for a long-term funding need, such as accu-

mulating retirement assets or saving and investing for another long-term income need. As such, these variables were not directly tested in this study.²⁰ These simplifying assumptions allowed for a direct test of the risk capacity and behavioral loss tolerance measures as shown in Figure 1. Specifically, the following hypotheses were tested:

Hypothesis 1: Risk capacity can be inferred by observing a financial decision-maker’s wealth status, income, and other measures of household financial stability.

Hypothesis 2: Behavioral loss tolerance can be inferred through estimates of a financial decision-maker’s risk tolerance/aversion, risk preference, financial knowledge, experience, risk perception, and risk composure.

Hypothesis 3: Risk capacity and behavioral loss tolerance can be used to predict subsequent-period investment choices.

Methods

Data for this study were obtained from a panel study conducted between October 2020 and March 2021. To correspond to the framework assumptions and hypotheses, and to standardize the risk need, time horizon, and need for liquidity across the sample, the sample was delimited to participants 45 years of age or older who also indicated being actively engaged in making household financial and saving/investment decisions (n = 265). Table 1 summarizes the descriptive profile of those in the sample.²¹ The following discussion summarizes how the variables of interest were measured and the way hypotheses tests were conducted.

Risk Capacity

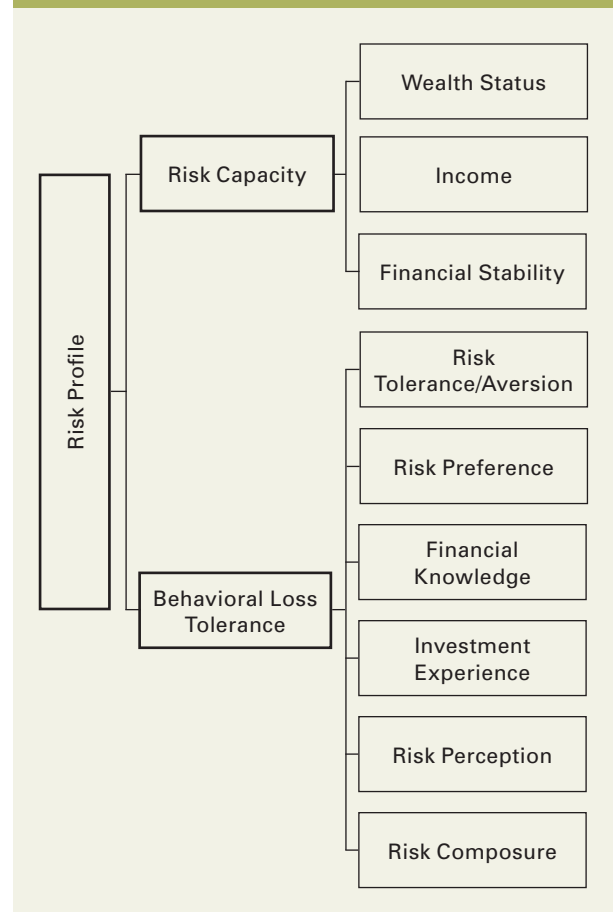
Four variables measured at the first survey were used to describe risk capacity. Wealth status (WS) was measured with the following item: “Think about what you own (assets) and what you owe to others (debts and liabilities). If you sold everything you own and paid off all your debts, how much would you have left over?” Participants were asked to select from the following five options: (1) It would be a large negative

number; (2) It would be a negative number; (3) Neither negative or positive (\$0); (4) It would be a positive number; and (5) It would be a large positive number. The modal response was “It would be a large positive number.” It was thought that the capacity to take risks would be higher for those with more net wealth.²²

Household income was measured using a 12-point ordinal scale with 1 = income less than \$10,000 and 12 = more than \$150,000. The modal category was \$100,000 to \$149,999. Similar to wealth status, it was assumed that higher income (Income) would be associated with an enhanced capacity to take a financial risk.²³ Two measures of household financial

FIGURE 1

Conceptual Framework Showing Risk Capacity and Behavioral Loss Tolerance as Factors Comprising a Financial Decision-Maker’s Risk-Profile



stability were proxied through homeownership and contribution to one's household income. Those who indicated owning their home (Home) were coded 1, otherwise 0. Homeowners (82 percent of the sample) were thought to have an enhanced capacity to take a risk compared to others.²⁴ Contribution to household income (IncCont) was measured by calculating the percent of total household income contributed by the survey participant. Estimates ranged from zero to 100 percent. A negative association between contribution estimates and risk capacity was anticipated, with those who reported contributing proportionately more income to their household financial position being more likely to exhibit lower risk capacity.

Behavioral Loss Tolerance

Six variables measured at the first survey were used as indicators of risk tolerance/aversion, risk preference, financial knowledge, experience, risk perception, and risk composure. Risk tolerance/aversion [constant relative risk aversion (CRRA)] was assessed using the following question²⁵:

Suppose you are considering making an investment. You have a chance to make an investment that will return either \$50,000 or \$100,000. Your financial advisor estimates that the probability of receiving \$50,000 is 50% and the probability of receiving \$100,000 is also 50%. You also learn from your financial advisor that shares in this investment are limited and difficult to obtain. Therefore, the less you are willing to invest, the lower the chance that you will be able to participate in the investment. Based on this information, what is the largest amount of money you would be willing to pay to participate in this investment, assuming you had the money?

The following answer choices were provided: (1) \$70,700; (2) \$66,667; (3) \$63,246; (4) \$60,571; (5) \$58,566; (6) \$57,083; (7) \$55,978; (8) \$55,143; (9) 54,499; and (10) \$53,991. These dollar amounts represent the mathematical certainty equivalent amounts associated with the question and correspond to each study participant's level of CRRA.²⁶ For the

analyses, the variable was reverse coded so that higher scores represented increased risk tolerance (i.e., low risk aversion). The mean and standard deviation for the scale was 3.89 and 1.38, respectively.

Risk preference (Pref) was assessed with the following item: "Given the best- and worst-case returns of the four investment choices below, which would you prefer?": (1) \$200 gain best case, \$0 gain/loss worst case; (2) \$800 gain best case, \$200 loss worst case; (3) \$2,600 gain best case, \$800 loss worst case; or (4) \$4,800 gain best case, \$2,400 loss worst case. The modal response was "\$800 gain best case, \$200 loss worst case."

Investing experience (Exp) was assessed by asking, "In terms of experience, how comfortable are you investing in stocks or stock mutual funds?": (1) Not at all comfortable; (2) Somewhat comfortable; or (3) Very comfortable. The modal category was "Somewhat comfortable."

Risk perception (Perc) was measured with the following item: "When you think of the word 'risk,' which of the following words comes to mind first?": (1) loss; (2) uncertainty; (3) opportunity; or (4) thrill. The modal response category was "uncertainty."

Risk composure (Comp) was proxied by asking, "Suppose a relative left you an inheritance of \$100,000, stipulating in the will that you invest all the money in one of the following choices. Which one would you select?": (1) a savings account or money market mutual fund; (2) a mutual fund that owns stocks and bonds; (3) a portfolio of 15 common stocks; or (4) commodities like gold, silver, and oil.²⁷ The modal category was "a mutual fund that owns stocks and bonds." Self-assessed financial knowledge (FK) was determined by asking, "How knowledgeable are you about personal finance topics?" Participants were asked to indicate their knowledge from the following five categories: (1) not knowledgeable at all; (2) slightly knowledgeable; (3) moderately knowledgeable; (4) very knowledgeable; and (5) extremely knowledgeable. The modal category was "moderately knowledgeable." Table 1 summarizes the descriptive profile of the sample and the variables used in the study.

Outcome Variable

Financial risk-taking was measured at the second survey by asking participants to respond to the following question (coded Post Equity Holdings): “Suppose that you were to take a snap-shot of your current financial position. Approximately what percent of your total savings and investments are invested in equities (e.g., stock mutual funds or stocks)?” Responses ranged from close to zero (suggesting that the participant was invested primarily in fixed-income or other types of assets) to 100 percent (meaning that the participant held all of their portfolio in equities). The mean and standard deviation of responses was 37.58 percent and 27.28 percent, respectively.

Methods of Analysis

A structural equation model (SEM) was developed to represent the conceptual framework. The SEM analytical approach allowed behavioral loss tolerance and risk capacity, which cannot be directly observed, to be modeled empirically.²⁸ Figure 2 shows the operationalized model. A robustness check of the SEM findings was undertaken using a regression model where the outcome variable was the Post Equity Holdings variable.²⁹

Results

Table 1 shows the descriptive statistics for the variables used in this study. When viewed broadly, the sample can best be described as comprised of older, higher-income, well-educated, White/Caucasian homeownership financial decision-makers, which is a profile of a representative person who is in the pre-retirement or retirement stage of their life.

Results from the SEM analysis are shown in Figure 3 and Table 2. The fit indices for the model were acceptable,³⁰ which provided support for the first and second hypotheses. Risk capacity was described by a financial decision-maker’s wealth, income, income contribution, and homeownership status. Behavioral loss tolerance was described by a financial decision-maker’s risk tolerance/aversion, risk preference, financial knowledge, experience, risk perception, and risk composure. The association between risk capacity and behavioral loss tolerance (represented by the dual-headed arrow in the model) was positive and statistically significant ($r = .40$). Additionally, support was found for the third hypothesis, which stated that risk capacity and behavioral loss tolerance can be used to predict subsequent-period investment choice (i.e., post equity holdings).

FIGURE 2
Operationalization of the Risk-Profiling Framework

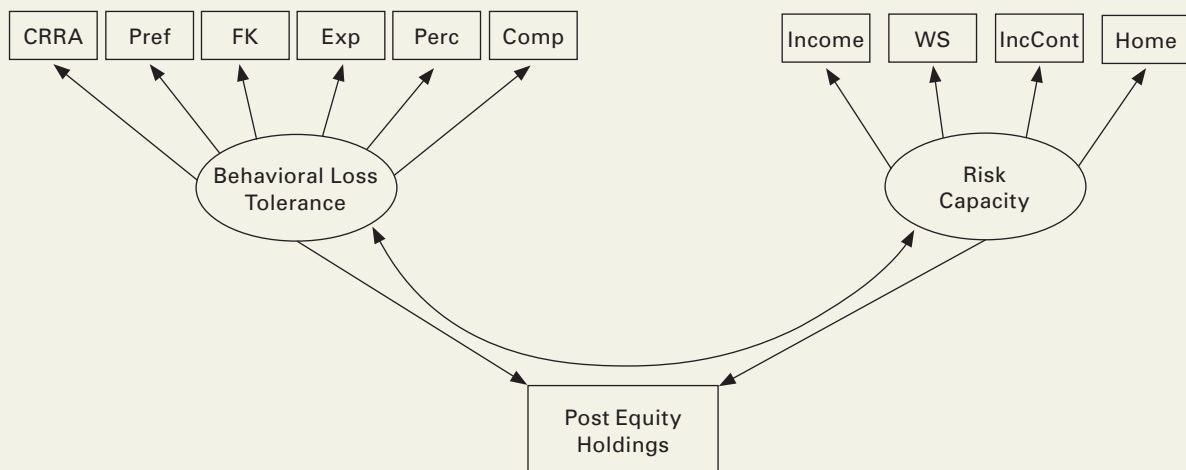


TABLE 1
Descriptive Profile of the Sample and the Model Variables

| Variable | Mean | SD | Frequency |
|-------------------------------|------|------|-----------|
| Income | | | |
| Less than \$10,000 | | | 2% |
| \$10,000 to \$19,999 | | | 4% |
| \$20,000 to \$29,999 | | | 6% |
| \$30,000 to \$39,999 | | | 8% |
| \$40,000 to \$49,999 | | | 8% |
| \$50,000 to \$59,999 | | | 8% |
| \$60,000 to \$69,999 | | | 7% |
| \$70,000 to \$79,999 | | | 6% |
| \$80,000 to \$89,999 | | | 6% |
| \$90,000 to \$99,999 | | | 6% |
| \$100,000 to \$149,999 | | | 22% |
| More than \$150,000 | | | 17% |
| Wealth Status | | | |
| Large Negative | | | 2% |
| Negative | | | 5% |
| Neither Negative nor Positive | | | 12% |
| Positive | | | 33% |
| Large Positive | | | 48% |
| Contribution to Income | .87 | .25 | |
| Homeownership | | | |
| Own Home | | | 82% |
| Other | | | 18% |
| Risk Aversion | 3.89 | 1.38 | |
| Risk Preference | | | |
| Very Low | | | 24% |
| Low | | | 35% |
| High | | | 34% |
| Very High | | | 7% |
| Financial Knowledge | | | |
| None | | | 6% |
| Slightly | | | 15% |
| Moderately | | | 39% |
| Very | | | 26% |
| Extremely | | | 14% |
| Investing Experience | | | |
| Not Comfortable | | | 30% |
| Somewhat Comfortable | | | 46% |
| Very Comfortable | | | 24% |
| Risk Perception | | | |
| Loss | | | 11% |
| Uncertainty | | | 64% |
| Opportunity | | | 23% |
| Thrill | | | 2% |
| Risk Composure | | | |
| Savings | | | 36% |
| Stocks/Bonds | | | 40% |
| Stocks | | | 15% |
| Commodities | | | 9% |

A key takeaway from the analysis is that risk capacity, as an unobserved characteristic, can be described by a combination of observed variables. Household income, wealth status, and being a homeowner were found to be descriptive of a financial decision-maker's risk capacity. The factor coefficient for the income contribution variable was significant but negative in describing risk capacity. This means that risk capacity fell as the proportion of a household's income produced by the survey participant increased. One way to view this relationship is that diversification of household income appears to increase risk capacity. Another takeaway is that risk capacity can be used to predict subsequent-period investment allocation choices. Those with greater risk capacity were observed to hold more equities.

Similar takeaways were noted in relation to behavioral loss tolerance. Risk aversion, risk preference, financial knowledge, investment experience, risk perception, and risk composure were found to work in combination to describe a financial decision-maker's

TABLE 1 (cont'd.)
Descriptive Profile of the Sample and the Model Variables

| Variable | Mean | SD | Frequency |
|---------------------------|-------|-------|-----------|
| Gender | | | |
| Male | | | 57% |
| Female | | | 43% |
| Marital Status | | | |
| Married | | | 63% |
| Other | | | 37% |
| Race/Ethnicity | | | |
| White/Caucasian | | | 71% |
| Other | | | 29% |
| Education | | | |
| High School | | | 14% |
| Some College | | | 18% |
| Associate's Degree | | | 8% |
| Bachelor's Degree | | | 32% |
| Graduate/Professional | | | 28% |
| Risk Capacity | 0.18 | 0.90 | |
| Behavioral Loss Tolerance | 0.001 | 1.01 | |
| Equity Holdings | 37.58 | 27.24 | |

behavioral willingness to engage in behaviors in which outcomes are uncertain and potentially negative. As risk aversion fell and risk preference, financial knowledge, experience, risk perception, and risk composure increased, behavioral loss tolerance increased. Furthermore, higher levels of behavioral loss tolerance were found to be positively associated with holding a higher proportion of wealth in subsequent-period equities.

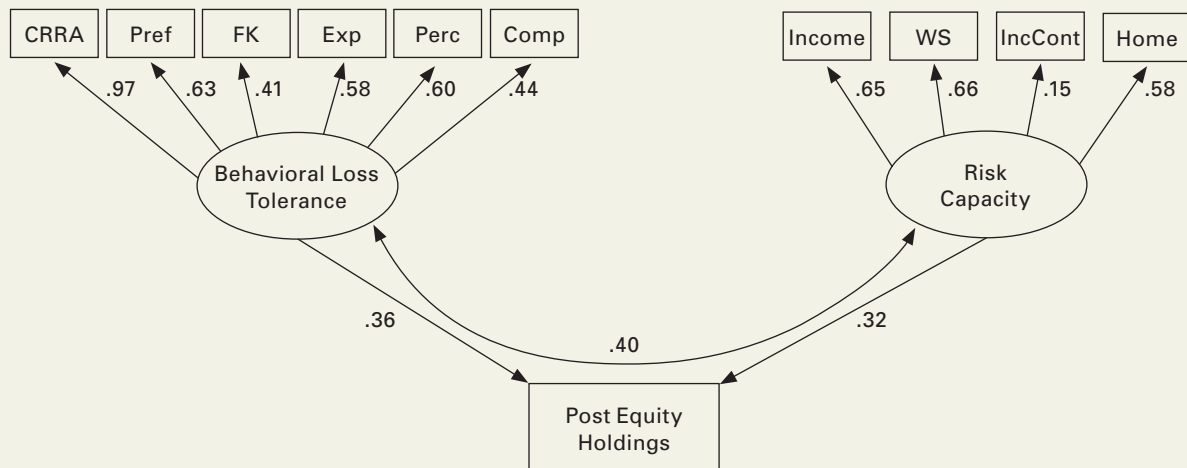
A principal components factor analysis, using Promax rotation, was used to confirm the results from the SEM. The risk capacity and behavioral loss tolerance analyses were meaningful (i.e., factor loadings were .40 or higher) with one factor emerging for each variable. A risk capacity and behavioral loss tolerance variable was saved for each study participant. These variables were then included in a robustness check of subsequent investment behavior using an ordinary least squares (OLS) regression.³¹ The regression included gender, marital status, race/ethnicity, and education as control variables. The model shown in Table 3 was statistically significant, $F_{6,240} = 14.65, p < .001$, with the independent variables explaining approximately 27 percent of the variance in equity holdings. The regression results provide additional support for the study’s research hy-

potheses. Additionally, these results indicate that a financial decision-maker’s risk capacity and behavioral loss tolerance, as unobserved factors, appear to be better predictors of investment behavior than commonly used demographic characteristics.

Discussion

The investment decision-making process (as well as broader financial-decision making procedures) should be—and generally is—informed by a variety of personal and household characteristics. While this insight is generally acknowledged within regulatory frameworks, in practice, only a few of these characteristics are routinely assessed and used explicitly in investment and financial decision-making models. Specifically, financial risk tolerance/aversion is the one factor that securities markets regulators and licensing boards require financial advisors to measure and incorporate into recommendations made to clients. Nearly all self-service and automated investing systems also utilize risk tolerance/aversion assessments as a foundation of investment and financial advice. Other inputs into the investment and financial decision-making process tend to be evaluated less formally and incor-

FIGURE 3
Standardized Coefficients Associated with Each Path in the Risk-Profiling Model



porated into decision-making processes using judgment, experience, and other qualitative techniques.³²

Results from this study suggest that the factors described in this article can be used to explain investment behavior at the individual and household level. Based on an assumption of a similar pattern of risk need, time horizon, and need for liquidity across the sample, risk-taking capacity was found to be described by income, wealth status, and financial stability (i.e.,

homeownership status and household income diversification). Behavioral loss tolerance was inferred through descriptions of risk aversion, risk preference, financial knowledge, investing experience, risk perception, and risk composure. As unobserved factors, risk capacity and behavioral loss tolerance were found to predict subsequent period investment choices. Specifically, those in the sample who exhibited a greater risk capacity and a greater behavioral loss tolerance were more likely to hold a larger proportion of their investment portfolio in equities compared to others in the sample.

TABLE 2
SEM Maximum Likelihood Estimates

| Path | | b | S.E. | β |
|----------------------|---------|----------|-------|-------|
| CRRA | <---BLT | .970*** | .101 | .965 |
| Risk Preference | <---BLT | .425*** | .038 | .628 |
| Financial Knowledge | <---BLT | .325*** | .048 | .406 |
| Investing Experience | <---BLT | .318*** | .032 | .575 |
| Risk Perception | <---BLT | .282*** | .027 | .598 |
| Risk Composure | <---BLT | .308*** | .042 | .442 |
| Household Income | <---RC | .650*** | .073 | .654 |
| Wealth Status | <---RC | .285*** | .042 | .656 |
| Income Contribution | <---RC | -.017* | .008 | -.147 |
| Homeowner | <---RC | .101*** | .016 | .585 |
| Post Equity Holdings | <---BLT | 7.437*** | 1.337 | .363 |
| Post Equity Holdings | <---RC | 3.991*** | .989 | .325 |

Notes: *** $p < .001$ ** $p < .01$ * $p < .05$
BLT = behavioral loss tolerance; RC = risk capacity

TABLE 3
Regression Model Showing Relationship between Risk Capacity, Behavioral Loss Tolerance, and Subsequent-Period Equity Holdings

| | b | S.E. | β | t | p |
|----------------------------------|--------|-------|-------|-------|------|
| Constant | 27.002 | 6.335 | | 4.262 | .000 |
| Behavioral Loss Tolerance Factor | 9.348 | 1.623 | .346 | 5.761 | .000 |
| Risk Capacity Factor | 6.964 | 2.105 | .229 | 3.308 | .001 |
| Gender (1 = Male) | 1.941 | 3.145 | .035 | .617 | .538 |
| Marital Status (1 = Married) | .081 | 3.525 | .001 | .023 | .982 |
| Race/Ethnicity (1 = White) | -.935 | 3.404 | -.016 | -.275 | .784 |
| Education | 2.076 | 1.198 | .109 | 1.733 | .084 |

Conclusion

Using panel data collected in the United States between October 2020 and March 2021, this study shows that a financial decision-maker’s risk capacity and behavioral loss tolerance can be estimated and that these estimates can be used to build a risk profile that can then be used to describe investment behavior. It was determined that those who exhibit more greater risk capacity and behavioral loss tolerance are more likely to hold a larger proportion of their portfolio in equities compared to other financial decision-makers. While the findings from this study advance the risk-taking, risk-profiling, and investment management literature in meaningful ways, it is important to place the results in the context of study limitations. It is worth noting that while the sample represented what one might consider to be a typical preretirement or retired financial decision-maker, the sample was not nationally representative. This means that results derived from the tested framework may have been different had a larger representative sample been used. This possibility is worthy of future study. Additionally, some of the items used as indicators of the factors comprising the risk capacity and behavioral loss tolerance factors may have been weak proxies for these concepts. Future studies are needed to derive specific measures for each variable used in this study. Also, additional research is needed to further refine and standardize what is meant by the term risk profile and how investors, financial decision-makers, and their financial advisors

can apply risk-profiling techniques in practice.

Nonetheless, findings from this study provide support for the use of risk profiles. The reliance on risk tolerance/aversion as the primary objectively measured input into investment and financial decision-making models has resulted in a proliferation of competing models, frameworks, and definitional constructs around the notion of what other personal and household characteristics should be assessed and how these factors should be combined. While there is a consensus that investment and other financial decisions should be guided by a financial decision-maker's willingness and capacity to take a risk,³³ the manner in which willingness and capacity are measured and combined varies by investor and financial advisor. For example, some financial advisors rely on stated-preference items, propensity scales, or revealed-preference tests to measure risk tolerance/aversion. There is no uniformity or regulatory prescription in this regard. Similarly, some financial advisors use a financial decision-maker's time horizon, wealth status, or current income as proxies for risk capacity. It is the opaqueness of standards, rules, and procedures related to conceptualizing risk profiles that prompted the current study. It is hoped that the results from this study, and the corresponding discussion, will stimulate additional discussions among interested stakeholders to clarify and possibly codify what is meant by the term "risk profile." ■

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(4) The European Securities and Market Authority (n.d.) summarized how a financial advisor should incorporate these personal and household characteristics when working with clients: "When providing investment advice or portfolio management the investment firm shall obtain the necessary information regarding the client's or potential client's knowledge and experience in the investment field relevant to the specific type of product or service, that person's financial situation including his (sic) ability to bear losses, and his (sic) investment objectives including his (sic) risk tolerance so as to enable the investment firm to recommend to the client or potential client the investment services and financial instruments that are suitable for him (sic) and, in particular, are in accordance with his (sic) risk tolerance and ability to bear losses." (Source: European Securities and Market Authority, (n.d.), *FCA Handbook*; accessed at: <https://www.handbook.fca.org.uk/handbook/COBS/9A/?view=chapter>). FINRA provides similar guidance for advisors working in the United States. (See: <https://www.finra.org/rules-guidance/key-topics/suitability/faq>).

(5) Other personal and household factors that are thought to be associated with investment decision making include a financial decision-maker's knowledge, confidence, experience, outlook, preferences, perceptions, and expectations.

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(13) Geoff Davey and Michael J. Roszkowski, "Risk Perception and Risk Tolerance Change Attributable to the 2008 Economic Crisis: A Subtle but Critical Difference," *Journal of Financial Service Professionals* 64, no. 1 (2010): 42-53.

(14) Nick Carr, "Reassessing the Assessment: Exploring the Factors That Contribute to Comprehensive Financial Risk Evaluation," Unpublished doctoral dissertation, Kansas State University, 2014.

(15) Depending on the situation, other personal and household characteristics can be used to describe a financial decision-maker's capacity to take risk (e.g., holding appropriate insurance, presence of an emergency fund, diversified sources of income, etc.).

(16) The framework is premised on the notion that a financial decision-maker's risk profile will change when a goal or financial objective changes. While elements of a risk profile may remain stable across scenarios and time, someone's risk profile will vary based on the specific risk need.

(17) Hubble, Grable, and Dannhauser (2020), endnote 8.

(18) No statistically significant differences were noted between periods for wealth status, income, or the other measures of household financial stability used in this study.

(19) Chris Brooks and Louis Williams, "The Impact of Personality Traits on Attitude to Financial Risk," *Research in International Business and Finance* 58 (2021): 101501.

(20) For a discussion of the relationship between planning horizon and investment choices, see: Yulis V. Veld-Merkoulova, "Investment Horizon and Portfolio Choice of Private Investors," *International Review of Financial Analysis* 20, no. 2 (2011): 68-75.

(21) The online Qualtrics survey platform, using a Dynata panel, was used to gather participant response data. Participants meeting age and experience screening requirements completed the first Qualtrics survey in October 2020. The same individuals completed the second Qualtrics survey in March 2021. Participants received a modest financial incentive after completing each survey.

(22) Ming Fang, Haiyang Li, and Qin Wang, "Risk Tolerance and Household Wealth—Evidence from Chinese Households," *Economic Modelling* 94 (2021): 885-895.

(23) Terrence A. Hallahan, Robert W. Faff, and Michael D. McKenzie, "An Empirical Investigation of Personal Financial Risk Tolerance," *Financial Services Review* 13, no. 1 (2004): 57-78.

(24) Nancy A. Jianakoplos and Alexandra Bernasek, "Financial Risk Taking by Age and Birth Cohort," *Southern Economic Journal* 72, no. 4 (2006): 981-1001.

(25) John E. Grable et al., "A Simplified Measure of Investor Risk Aversion," *Journal of Interdisciplinary Economics* 32 (2020); accessed at: <https://doi.org/10.1177/0260107920924518>.

(26) This question measures risk tolerance/aversion on a scale ranging from risk avoiding to risk seeking. A very risk-averse investor (i.e., someone who invests \$53,991) could potentially earn \$53,991 or lose \$3,999. A very risk-seeking investor could earn \$27,300 or lose \$20,700.

(27) While not a perfect indicator of past experience, it was assumed that research participants answered this question based on previous behavior. (See John E. Grable and Ruth H. Lytton, "Financial Risk Tolerance Revisited: The Development of a Risk Assessment Instrument," *Financial Services Review* 8, no. 3 (1999): 163-181).

(28) A structural equation model (SEM) is a type of multivariate analytical technique that estimates a series of multiple regressions and factor analyses at one time using latent variables. An SEM allows for the interrelated associations among variables to be measured and evaluated simultaneously. The approach is useful when attempting to evaluate possible causal associations between and among variables. The advantage associated with SEM is that a structural equation model allows for multiple independent and dependent variables in the same model. The technique can accommodate measurement error by "explicitizing" the error variance parameters, which results in more reliable parameter estimates. In this study, the conceptual framework was operationalized to identify statistically significant relationships among the variables in the model. A maximum likelihood (ML) approach was used to estimate path coefficients. Additionally, each path in the model was evaluated using the following fit indices: a chi-square test, normed fit index (NFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). See the following for more details about structural equation modeling: Noel A. Card and Todd D. Little, "Studying Aggression with Structural Equation Modeling," in D. J. Flannery, A. T. Vazsonyi, and I. D. Waldman (eds.), *The Cambridge Handbook of Violent Behavior and Aggression* (Cambridge, MA: Cambridge University Press, 2007), 727-739; Joseph F. Hair et al., *Multivariate Data Analysis*, 7th ed. (New York: Pearson Education Limited, 2014); and Rebecca Weston and Paul A. Gore Jr., "A Brief Guide to Structural Equation Modeling," *The Counseling Psychologist* 34, no. 5 (2006): 719-751.

(29) A principal components factor analysis, using Promax rotation, was used to create factor variables representing risk capacity and behavioral loss tolerance. The following variables, representing unique participant characteristics, were controlled in the regression: gender, marital status, race, and educational status. Gender was assessed by asking each study participant to self-identify as

male, female, nonbinary, or other. The sample included only males (57% of the sample) and females (43% of the sample). Marital status was coded as married = 1, otherwise 0 (i.e., single, separated, divorced, widowed, and other). Sixty-three percent of the sample was married. Self-identified race/ethnicity was assessed by asking each participant to self-report whether they affiliated as Caucasian/White, African American/Black, Hispanic/Latino/Latinx, Native American, Asian or Pacific Islander, or other. Responses were recoded dichotomously so that Caucasian/White = 1, otherwise 0. Seventy-one percent of the sample identified as Caucasian/White. Formal attained education was measured using the following six categories: (a) some high school or less; (b) high school graduate; (c) some college/trade/vocational training; (d) associate's degree; (e) bachelor's degree; and (f) graduate or professional degree. The education variable was considered to be an ordinal construct but a continuous variable in the analyses. (See David J. Pasta, "Learning When to Be Discrete: Continuous vs. Categorical Predictors," *SAS Global Forum Paper 248-2009* (2009).); accessed at: <https://support.sas.com/resources/papers/proceedings09/248-2009.pdf>)

(30) The CFI and NFI were .83 and .79, respectively, whereas the RMSEA was .11. Not unexpectedly, the chi-square statistic was not significant. Model specification procedures were run to determine if a better-fit model could be identified. It was determined that

risk aversion was the dominant factor describing behavioral loss tolerance. Rather than remove one or more variables comprising the latent variable, which would have resulted in an improved RMSEA, CFI, and NFI, a decision was made to retain each observed variable because of the practical significance of each variable in the model. It was also determined that the model-fit indexes could be improved by removing the contribution of income to one's household variable. A similar decision was made to retain the variable. This decision was made based on the significance of the variable in the model and the confirmation of the variable's factor score in the factor analysis confirmation test.

(31) A Tobit model was estimated to confirm the OLS regression results. No differences between the models were noted. For ease of interpretation, the OLS results are reported and discussed.

(32) Consider how portfolios are optimized in a mean-variance framework. The only personal characteristic that is used to differentiate portfolios across investors is risk tolerance/aversion, which is the key factor used to derive an investor's utility function. Other personal and household characteristics are applied in a mean-variance model through judgment and experience (e.g., reducing risky asset exposure as an investor's time horizon shortens).

(33) Adam Barone, "Risk Profile," *Investopedia*, September 23, 2020; accessed at: <https://www.investopedia.com/terms/r/risk-profile.asp>.

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