# An Evaluation of the Consistency of Financial Risk-Aversion Estimates

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## Abstract

This paper reports results from tests designed to determine whether financial risk aversion—the opposite of which is financial risk tolerance—varies based on the at-risk dollar amount presented in a risk-aversion evaluation. Risk aversion was observed to decrease slightly when respondents were presented with a low at-risk dollar amount, although the difference in observed scores across three at-risk dollar scenarios was less than one point on a 10-point scale. It was also noted that survey respondents were relatively risk averse and that females and older respondents exhibited greater risk aversion. When presented with a high at-risk dollar choice, those who self-identified as Black and those with high incomes exhibited less financial risk aversion.

## Keywords

Risk aversion, constant relative risk aversion (CRRA), risk tolerance

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# INTRODUCTION

Financial risk aversion can be thought of as the "extent to which people are willing to take on risk" (Charness et al., 2013, p. 43) or the unwillingness of a financial decision-maker to engage in a behavior in which the outcome is both unknown and potentially negative (Dickason & Ferreira, 2018; Grable, 2016; Mata et al., 2018; Steinberg, 2013). Risk aversion is typically evaluated on a scale ranging from highly risk tolerant to highly risk averse.

Financial decision-makers, and those who provide advice to household financial decision-makers, rely on measures of risk aversion (or risk tolerance) when making financial planning and portfolio management decisions. The use of assessment tools is often mandated. In the context of assessment issues, a financial decision-maker's willingness to take risks is thought to be relatively stable across time (Gerrans et al., 2015). A core assumption underlying nearly all financial planning and portfolio management models is that those who exhibit greater degrees of risk aversion (i.e., those who prefer safety) should be more likely to avoid or minimize financial risk. Economic theory suggests that those with the highest levels of risk aversion should generally be uncomfortable investing in stocks and other risky assets (Eckel, 2019; Lei, 2018; Mishra, 2018; Ruiz-Menjivar et al., 2018; Von Neumann & Morgenstern, 1953).

A wide assortment of risk-aversion measures are used by financial decision-makers and financial advisors to gauge the degree to which someone is willing to take a risk. Researchers tend to make use of tools designed to assess risk aversion (Eckel, 2019; Hanna & Lindamood, 2004; Kahneman et al., 1991), whereas household financial decision-makers and financial advisors typically utilize risk-tolerance assessments. Both approaches, as discussed in more detail later in the paper, should provide similar insights into financial planning and investment behavior.

Risk aversion, as conceptualized in this study, represents the degree of uncertainty a financial decision-maker is *unwilling* to tolerate when making a financial decision (Dickason & Ferreira, 2018; Gerrans et al., 2015). Risk-aversion assessments are designed to reveal a decision-maker's risk preference.[18] A revealed-preference risk-aversion test typically asks a financial decision-maker to choose from two options. The first option involves no risk, whereas the second option frames outcomes to include both potential gains and losses. Revealed-preference evaluations almost always include an incentive structure (Holt & Laury, 2002) and a clear articulation of decision outcome probabilities (Barsky et al., 1997).

A valid measure of a financial decision-maker's risk aversion is needed in order to identify an optimal portfolio, based on a unique utility function, for the financial decision-maker (Beshears et al., 2008; Warren, 2019). In the context of financial planning and investment management, among those who follow normative economic recommendations, constant relative risk aversion (CRRA) is typically used as an indicator of risk aversion. CRRA is defined as the rate at which a financial decision-maker will give up a higher expected return in exchange for less volatility (Nguyen & Noussair, 2014). CRRA can be calculated as:

$$U(W) = \begin{cases} \ln(W) & \text{if } Y = 1 \\ \dfrac{W^{(1-\gamma)}}{1-\gamma} & \text{if } \gamma>0, \gamma\neq 1 \end{cases}$$

where utility received ($U$) is based on a financial decision-maker's degree of risk aversion ($\gamma$) and level of wealth ($W$).

In order for an estimated utility function to be valid, the risk-aversion input must be robust. This means that a financial decision-maker's risk-aversion score should correspond to and be consistent with the degree of risk aversion observed across scenarios in which financial uncertainty exists. Holt and Laury (2002) noted that this assumption may sometimes be violated in practice. Holt and Laury (2002) argued that estimates of risk aversion may be impacted by the dollars at risk and payouts offered in choice scenarios. The purpose of this study was to evaluate the possibility that the dollars at risk in a choice scenario alter estimated risk-aversion scores. Specifically, this paper reports findings from tests developed to determine whether risk aversion varies across scenarios when the difference in scenarios is the amount of money at risk.

# BACKGROUND

While nearly all financial decision-makers, and those who provide advice to household financial decision-makers, use the phrase financial risk tolerance to refer to a financial

18. A revealed preference is a taste that rationalizes an economic agent's observed actions (Beshears, Choi, Laibson, & Madrian, 2008). Tests of revealed preference are widely used to assess household financial decision-makers' preference for risk. .

decision-maker's willingness to take financial risk, academicians generally refer to this notion as risk preference. From a measurement point of view, risk preference is typically conceptualized as risk aversion. Pratt (1964) and Arrow (1971) are generally given credit for linking the notion of risk aversion to financial planning and investment management activities. Arrow (1971) defined risk aversion as a financial decision-maker's unwillingness to take financial risk in a fair bet. Arrow's (1971) definition was grounded in the concept of risk rather than uncertainty, where risk defines a situation in which probability outcomes are known before a decision is made, whereas uncertainty encompasses scenarios where *a priori* probability outcomes are unknown. Uncertain situations require a decision-maker to estimate probability outcomes subjectively. Arrow (1971) and Pratt (1964) defined absolute risk aversion, as well as relative risk aversion (RRA). Absolute risk-aversion measures the rate at which marginal utility decreases when wealth is increased by one unit, whereas RRA is the elasticity of marginal utility of wealth (Eeckhoudt et al., 2011). Among academicians and those in the financial planning and investment management community who apply modern portfolio theory (MPT) concepts when developing portfolio recommendations, risk aversion is generally measured as CRRA (Hanna et al., 2001; Wakker, 2008). Those who model asset choices and portfolio decisions using other techniques generally use traditional psychometric (i.e., propensity) and stated-preference measures of risk tolerance (Brayman et al., 2017) to estimate a decision-maker's unwillingness to take financial risk.

While academically-advocated risk-aversion estimation techniques are mathematically eloquent, few financial decision-makers or financial advisors use revealed-preference tests or traditional risk-aversion evaluation techniques to arrive at approximations of CRRA. As noted above, financial decision-makers and financial advisors most often use propensity measures and stated-preference techniques to gauge a decision-maker's willingness to take a risk. There are three reasons why revealed-preference tests are not more widely used in practice. The first reason is that nearly all revealed-preference tests are built around the concept of risk rather than uncertainty. This is evidenced by the testing practice that requires a financial decision-maker to choose between two options where the outcomes are known with certainty before the decision is made. This makes such questions and tests disconnected from the reality faced by financial decision-makers in which probability assessments are almost always subjective (Grable et al., 2020; Hanna & Lindamood, 2004). The second reason is that while revealed-preference measures are mathematically persuasive, these assessments place a high cognitive load on financial decision-makers. As noted by Guiso and Sodini (2013), the questions used to elicit CRRA may be too complex for the average financial decision-maker to answer with care and honesty. The third reason is that the outcome of a revealed-preference assessment is a scale score that is hard to interpret. Scores typically range from 1 (i.e., very risk tolerant) to 10 (very risk averse) (Gandelman & Hernández-Murillo, 2014; Mehra & Prescott, 1985). While revealed-preference scores are measured on a scale, the difference in scores (e.g., 2 compared to 5) is not intuitively obvious. Without a grounding in economic modeling theory, deciphering revealed-preference and resulting CRRA scores devolves to stating that one financial decision-maker is more or less risk averse than another financial decision-maker,[19] with the degree of difference left undefined.

Even in light of these measurement and application challenges, the literature does suggest that scores from revealed-preference tests offer a rigorous pathway to portfolio selection, particularly when MPT models are used to define portfolio constraints (Hanna & Lindamood, 2004). Grable et al. (2020) argued that there may be a simpler and more applied way to evaluate financial risk aversion. They noted that instead of asking a series of choice dilemmas and then estimating risk aversion indirectly, it is possible to create investment scenarios that ask a financial decision-maker to directly indicate the amount they would be willing to invest. The approach advocated by Grable et al. (2020) links investment dollar choices offered to a decision-maker to mathematical certainty equivalent amounts and degrees of risk aversion (γ).

Grable and associates (2020) showed that scores derived from simplified revealed-preference assessments correlate with other measures of risk aversion and risk-taking behavior. They also showed that scores correspond to certain financial decision-maker demographic characteristics, many of which match what has been reported in the literature over the past

19. As reported by Eeckhoudt et al. (2011), "Researchers in finance and in macroeconomics are so accustomed to [power utility functions] … that many of them do not even mention it anymore when they present their results" (p. 21). CRRA scores do gain relevance once a score is used as an input into a utility function and applied in the efficient portfolio selection process; however, given that few household financial decision-makers, or those who provide advice to household financial decision-makers, take this step, most revealed-preference and CRRA scores tend to be interpreted in a qualitative sense.

several decades in relation to decision-maker risk preferences. In the context of the current study, six of these demographic characteristics were assessed. The choice to evaluate these factors when measuring risk aversion was based on wanting to use the same test variables examined by Grable et al. (2020) and to match what the literature has consistently shown to be personal and household characteristics associated with financial risk aversion, risk tolerance, and risk-taking preferences. The following discussion highlights these variables and summarizes how each has been observed in previous research.

The most widely used demographic descriptor of financial risk aversion is a financial decision-maker's self-identified gender. The literature shows that those who identify as female tend to be more risk averse compared to those who identify as male (Anbar & Eker, 2010; Chavali & Mohanraj, 2016; Dickason & Ferreira, 2018; Hartnett et al., 2019; Koekemoer, 2018; Larkin et al., 2013). Similarly, the majority of previous studies indicate that age is a factor associated with financial risk aversion. Age is thought to be positively associated with financial risk aversion (Brooks et al., 2018; Cardak & Martin, 2019; Gibson et al., 2013; Hartnett et al., 2019; Koekemoer, 2018; Pinjisakikool, 2017; Wong, 2011). A financial decision-maker's racial/ethnic background is also thought to be associated with financial risk aversion, although the relationship tends to be unstable. Coleman (2003), for example, noted that Hispanic and Latinx household heads are more risk averse than others. Dickason and Ferreira (2018) argued that Whites and Asians exhibit more risk aversion compared to Blacks; however, Fisher (2019) found that Blacks are more likely to be risk averse. Similar inconsistent findings have been reported in relation to marital status and financial risk aversion. Grable and Joo (2004), Hallahan and associates (2004), Wong (2011), and Koekemoer (2018) reported that singles exhibit lower risk aversion than marrieds, although others (e.g., Anbar & Eker, 2010) have reported observing no differences in risk aversion based on marital status. The literature is more consistent in documenting a relationship between household income and risk aversion. The relationship between these two variables is thought to be negative (Faff et al., 2009; Fang et al., 2021; Grable & Joo, 2004; Pinjisakikool, 2017; Wong, 2011). Education, like household income, is generally reported as being negatively associated with financial risk aversion (Grable, 2000; Grable & Joo, 2004; Hallahan et al., 2004; Larkin et al., 2013; Pinjisakikool, 2017; Wong, 2011).

The remainder of this paper presents the methodology used to determine whether risk aversion varies across scenarios when different at-risk dollar amounts are incorporated into risk-aversion assessment questions. The presentation of the methodology is followed by a summary of results and a discussion of findings.

# METHODOLOGY

## Survey and Sample

An online questionnaire developed with Qualtrics, and administered by Dynata, was used to gather data for this study. Data were collected during spring 2020. The survey procedure was approved by the research team's university institutional review board prior to the distribution of the questionnaire. Answers to measures of risk aversion, risk taking, feelings about prevailing financial market conditions, and household characteristics were obtained from 525 individuals. The sample included adults aged 18 or older who were screened by the likelihood of being tasked with making a financial planning or investment decision within the timeframe of the survey. Respondents received a modest incentive upon completion of the questionnaire.

## Measures

The three investment scenarios shown in Table 1 were used to estimate each survey respondent's level of financial risk aversion. The scenarios were adapted from Grable et al. (2020) who noted that questions such as these can be used to estimate a financial decision-maker's degree of financial risk aversion. The questions were originally developed to address concerns associated with nearly all existing revealed-preference risk-aversion assessments; namely, the lack of applicability to real-life situations and the high degree of cognitive load placed on test-takers when completing a traditional revealed-preference test. As noted by Eckel (2019), nearly all existing measures of risk aversion suffer from these two problems. Eckel (2019) pointed out that "Economists tend to design measures that are appealing from a theoretical perspective, but that do not necessarily take into account the ability of individuals without Ph.D.s to fully comprehend the decisions they have to make. It may be the case that measures designed with human limitations as well as theoretical considerations in mind can do a better job of accurately eliciting preferences" (p. 9). Grable et al. (2020), echoing Eckel's conclusion, argued that questions like the ones shown in Table 1 may provide more valid insights into a financial

decision-maker's degree of risk aversion because the questions align with the type of investment decisions often faced by financial decision-makers.

Traditional measures of risk aversion require a test taker to answer a series of questions in which choices are presented dichotomously. The choice options represent outcomes with known probabilities. A skip-pattern is used to present new questions based on a test-taker's previous response. Once enough questions have been answered, it is possible to estimate CRRA for the test taker. The questions shown in Table 1 bypass the multiple item process by providing the CRRA dollar amounts directly. A test-taker's choice represents the person's CRRA. In this study, survey respondents were asked to select a dollar amount corresponding to the choices for each question.[20] The dollar choices were calculated to represent the certainty equivalent amounts associated with each scenario. The dollar amounts relate back to lambda (γ), which is a required input into the estimation of a financial decision-maker's utility function. In these questions, higher dollar amounts correspond to lower risk aversion. In other words, the lowest risk premiums are associated with the high-dollar choices. Someone with a CRRA score of 1 can be classified as very risk tolerant. This type of financial decision-maker is willing to potentially lose more than they can gain. Someone with a CRRA score of 10 can be classified as very risk averse. Those fitting this profile are unwilling to lose more than a minimal dollar amount should the investment turn out badly.

## Table 1. Measure of Financial Risk Aversion Corresponding to Certainty Equivalent Amounts

| Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|
| 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? | Suppose you are considering making an investment. You have a chance to make an investment that will return either $75,000 or $150,000. Your financial advisor estimates that the probability of receiving $75,000 is 50% and the probability of receiving $150,000 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? | Suppose you are considering making an investment. You have a chance to make an investment that will return either $25,000 or $50,000. Your financial advisor estimates that the probability of receiving $25,000 is 50%; the probability of receiving $50,000 is also 50%. Your advisor also tells you 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 opportunity, assuming you had the money? |

20. Harrison et al. (2005) reported that estimates of risk aversion can sometimes be biased when the order of choice scenarios presented to a survey respondent are scaled upward as questions are answered. In other words, scaling up payments is thought to lead to an increased estimate of risk aversion (Holt & Laury, 2005). In response to this possibility, the three questions were randomly ordered in the survey.

| γ | Amount Willing to Invest | | |
|---|---|---|---|
| 1 | $70,711 | $106,066 | $35,355 |
| 2 | $66,667 | $100,000 | $33,333 |
| 3 | $63,246 | $94,868 | $31,623 |
| 4 | $60,571 | $90,856 | $30,285 |
| 5 | $58,566 | $87,849 | $29,283 |
| 6 | $57,083 | $85,624 | $28,541 |
| 7 | $55,978 | $83,967 | $27,989 |
| 8 | $55,143 | $82,715 | $27,572 |
| 9 | $54,499 | $81,748 | $27,249 |
| 10 | $53,991 | $80,987 | $26,996 |

The following respondent demographic characteristics were measured in the survey and used as control variables in the analyses. Self-identified gender was coded 1 = male and 2 = female.[21] Age was measured in years. Household income was evaluated using 11 categories ranging from 1 = none to 11 = above $100,000. Racial/ethnic background was assessed dichotomously based on self-identified choices of White = 1, otherwise 0; Black = 1, otherwise 0; Hispanic/Latinx = 1, otherwise 0; and Other = 1, otherwise 0. The other race/ethnicity category included those who self-identified as Asian, Native American, or other. The White category was used as the reference group when comparing risk-aversion scores based on racial/ethnic background. Marital status was coded dichotomously with married = 1, otherwise 0. Education was measured as an ordinal variable with the following categories: (1) some high school or less, (2) high school graduate, (3) some college/trade/vocational training, (4) Associate's degree, (5) Bachelor's degree, and (6) Graduate or professional degree.

## Data Analysis Methods

Descriptive statistics, correlation coefficients, and paired-sample *t*-tests were used to determine the degree of association across responses to the three financial risk-aversion questions. A multivariate general linear model (GLM) was then used to evaluate the financial risk-aversion profile of respondents. It was anticipated that the profile of survey respondents would be similar regardless of the dollar amounts included in the question scenarios.

# RESULTS

Table 2 shows the descriptive statistics for the variables of interest in this study. The sample can best be described as being comprised primarily of middle-aged, well-educated White households. Respondents exhibited a relatively high degree of financial risk aversion across the three scenarios.

### Table 2. Sample Descriptive Statistics (N = 525)

| Variable | Percentage | M (SD) |
|---|---|---|
| Financial Risk Aversion (Scenario 1) | | 6.36 |
| | | (3.55) |
| Financial Risk Aversion (Scenario 2) | | 6.34 |
| | | (3.45) |
| Financial Risk Aversion (Scenario 3) | | 5.81 |
| | | (3.61) |
| Gender | | |
| Male (coded 1) | 50.8% | |
| Female (coded 2) | 49.2% | |
| Age (years) | | 46.87 |
| | | (17.24) |
| Racial/Ethnic Background | | |
| White | 71.8% | |
| Black | 14.8% | |
| Hispanic/Latinx | 7.9% | |
| Other | 5.5% | |
| Household Income | | |
| $0 | 3.6% | |
| Less than $20,001 | 15.8% | |
| $20,001 to $30,000 | 10.2% | |
| $30,001 to $40,000 | 5.4% | |
| $40,001 to $50,000 | 5.6% | |
| $50,001 to $60,000 | 7.9% | |
| $60,001 to $70,000 | 6.7% | |
| $70,001 to $80,000 | 6.5% | |
| $80,001 to $90,000 | 5.6% | |
| $90,001 to $100,000 | 5.4% | |
| Above $100,000 | 27.3% | |

21. Although the questionnaire provided an option to select non-binary or other as a gender choice, all survey respondents self-identified as either male or female.

| Variable | Percentage | M (SD) |
|---|---|---|
| Marital Status (1 = Married) | 50.8% | |
| Education | | |
| Some High School or Less | 3.1% | |
| High School Graduate | 20.1% | |
| Some College/Trade/ Vocation Training | 22.2% | |
| Associate's Degree | 9.2% | |
| Bachelor's Degree | 25.5% | |
| Graduate or Professional Degree | 19.9% | |

Table 3 shows the strength of association among the three financial risk-aversion scenarios. Although not perfectly interchangeable, the correlation coefficient effect sizes were large in magnitude, which suggests that respondents, on average, answered consistently when choosing the amount to invest in each scenario.

## Table 3. Correlation Coefficient Estimates Across the Measures of Risk Aversion

| | Scenario 1 | Scenario 2 | Scenario 3 |
|---|---|---|---|
| Scenario 1 | 1.00 | | |
| Scenario 2 | .72** | 1.00 | |
| Scenario 3 | .66** | .65** | 1.00 |

*p < .05. **p < .01.

Table 4 displays the results from the paired-samples t-test analysis. The lowest mean level of risk aversion was in relation to Scenario 3, which was the question that had the smallest at-risk outcome amounts. Results from the analysis showed that mean scores for Scenario 3 were significantly lower compared to mean scores for Scenario 1 and Scenario 2. It is important to note, however, that while the difference in scores was statistically significant, the nominal difference in mean scores was less than 1.0 or less than one point on the scale that ranged from 1 = very high-risk tolerance to 10 = very high-risk aversion.

## Table 4. Paired-Samples t-Test Results

| Pair | Comparison | Mean Difference | SD | SEM | 95% CI of Difference | | t | p |
|---|---|---|---|---|---|---|---|---|
| | | | | LL | LL | UL | | |
| Pair 1 | Scenario 1 - Scenario 2 | .04 | 2.63 | .12 | -.19 | .26 | 0.30 | .77 |
| Pair 2 | Scenario 1 - Scenario 3 | .56 | 2.94 | .13 | .31 | .81 | 4.34 | .00 |
| Pair 3 | Scenario 2 - Scenario 3 | .52 | 2.94 | .13 | .27 | .78 | 4.07 | .00 |

Note. CI = confidence interval; LL = lower limit; UL = upper limit

.Table 5 shows the Spearman's rho correlation coefficients estimated for the control variables evaluated in this study. These correlation coefficient estimates were used to identify possible multicollinearity in the GLM analysis. Household income showed the greatest level of association with the other variables, although the effect sizes of the associations with household income were not large enough to warrant the removal of the variable from the GLM test. In relation to household income, those who self-identified as Black reported earning less income, whereas those with more attained education and those who were married reported earning more household income.

### Table 5. Spearman's rho Correlation Coefficients of Control Variable

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. Gender | 1.00 | | | | | | | |
| 2. Age | -.09* | 1.00 | | | | | | |
| 3. HH Income | -.18** | .22** | 1.00 | | | | | |
| 4. Black | -.03 | -.17** | -.33** | 1.00 | | | | |
| 5. Hispanic/Latinx | .04 | -.13** | -.06 | -.12** | 1.00 | | | |
| 6. Other Race | -.07 | .02 | .05 | -.09 | -.06 | 1.00 | | |
| 7. Married | -.15** | .24** | .54** | -.26** | -.08 | .05 | 1.00 | |
| 8. Education | -.19** | .14** | .52** | -.20** | -.05 | .08 | .32** | 1.00 |

*p < .05. **p < .01.

Table 6 presents the results from the multivariate GLM test. Two variables were found to be consistently related to exhibiting greater financial risk aversion across the three scenarios: (a) identifying as female and (b) being older. No other variables were statistically significant in describing risk aversion in the first scenario or the third scenario. However, two other variables were found to be statistically significantly associated with risk aversion in the second scenario, which was the question that offered the highest at-risk dollar outcomes. Households headed by someone who self-identified as Black and household heads with high incomes were observed to have a lower aversion to risk.

### Table 6. Results of the Multivariate General Linear Model Test

| Independent Variable | Scenario 1 | | | Scenario 2 | | | Scenario 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | B | SE | t | B | SE | t | B | SE | t |
| Intercept | 3.75** | .85 | 4.38 | 4.58** | .83 | 5.51 | 2.80** | .88 | 3.18 |
| Gender | 1.44** | .31 | 4.64 | 1.15** | .30 | 3.80 | 1.22** | .32 | 3.80 |
| Age | 0.04** | .01 | 3.88 | 0.03** | .01 | 3.62 | 0.04** | .01 | 3.92 |
| HH Income | -0.07 | .06 | -1.17 | -0.11* | .06 | -2.01 | -0.02 | .06 | -0.23 |
| Black | -0.82 | .47 | -1.75 | -1.20** | .45 | -2.64 | -0.48 | .48 | -0.99 |
| Hispanic/Latinx | -0.18 | .57 | -0.33 | 0.31 | .55 | 0.55 | -0.11 | .59 | -0.18 |
| Other Race | -0.67 | .67 | -0.99 | -0.52 | .65 | -0.79 | -0.05 | .69 | -0.08 |
| Married | 0.42 | .36 | 1.17 | 0.40 | .35 | 1.14 | 0.24 | .38 | 0.64 |
| Education | -0.21 | .12 | -1.76 | -0.19 | .11 | -1.67 | -0.13 | .12 | -1.07 |

*p < .05. **p < .01.

## DISCUSSION

Although a variety of methods can be used to evaluate a decision-maker's willingness to take financial risks, academicians commonly recommend the use of a revealed-preference risk-aversion test when the intention of the assessment is to estimate a utility function for a financial decision-maker. Given the importance of risk aversion in the development of optimal portfolios, and in other financial planning contexts, it is important for financial decision-makers to exhibit consistency across investment choice-dilemma scenarios. Financial decision-makers should present a high degree of consistency in their degree of risk aversion across cases in which uncertainty is present. Holt and Laury (2002) and Harrison et al. (2005) published warnings that estimates of risk aversion may be subject to bias based on the dollar amounts underlying decision choices. The purpose of this

study was to test whether risk aversion varies across scenarios when the difference in scenarios is the amount of money at risk.

Results from this study indicate that financial decision-makers tend to be relatively risk averse. The level of risk aversion observed in this study was much higher than what is typically reported in other tests of revealed risk aversion (e.g., Gandelman & Hernández-Murillo, 2014; Mehra & Prescott, 1985). There is some evidence indicating that historical norms are too low and not in alignment with actual financial decision-maker preferences, which may explain the equity risk premium puzzle, which is essentially the curious fact that individuals and households, on average, tend to avoid making investments in the stock market even when objectively they should be invested. As noted by Janecek (2004), the equity risk premium puzzle effectively disappears if one assumes a much higher level of risk aversion. Higher levels of aversion to risk, as noted in this study, provide a possible explanation as to why individuals and households shy away from financial risk-taking behavior; namely, traditional measures of risk aversion may overestimate someone's tolerance for risk.

Overall, those in this study were consistent in describing their risk aversion across the three scenarios, although two noteworthy dissimilarities were noted. First, the lowest levels of risk aversion were found to be associated with the third scenario, which was framed with the lowest at-risk dollar outcome. It is important to note, however, that in practical terms, differences in scores across the scenarios were not large enough to move a survey respondent from one end of the risk-aversion scale to the other end of the scale. Second, the profile of those who were willing to take more risk in the scenario with the highest at-risk dollar outcomes (Scenario 2) differed from the profile of those willing to take risk in the low and middle at-risk outcome scenarios. While females and older respondents were consistently more risk averse across scenarios, in Scenario 2, those who self-identified as Black and those with higher household income were found to be less risk averse.

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## CONCLUSION

Findings from this study provide evidence that the questions used in this study to assess financial risk aversion provide close inter-question approximations of lambda (γ). While smaller at-risk dollar outcomes did result in slightly lower levels of risk aversion (i.e., greater risk tolerance), the difference, compared to the other scenarios, was not particularly large (i.e., the mean difference was less than one point on the 10-point risk-aversion scales). Further tests using these or similar questions are needed. It is possible that while the dollar amounts used in a scenario do influence the way a financial decision-maker frames an outcome, the practical difference in choice outcomes may not be meaningful. That is, the estimated utility function based on a high-dollar outcome scenario may not actually be much different from a utility function estimated with a low-dollar outcome scenario. Overall, a key takeaway from this study is that the types of scenario-based questions described in this study appear to offer an alternative and valid way to evaluate constant relative risk aversion.

The findings from this study need to be evaluated in the context of certain limitations. For example, the sample was not designed to be nationally representative. Respondents were chosen based on the likelihood that they had or would be in a position to make a financial or investment decision at or near the time of completing the survey. Replication of this study with a broader national sample would help validate the findings. In addition, the timing of the survey needs to be considered. The survey was distributed during the outset of the COVID-19 pandemic before a national emergency was declared. It is possible that estimates of risk aversion may be influenced by external events like the COVID-19 pandemic. Further research regarding the timing of risk-aversion assessments can help researchers, financial decision-makers, and financial advisors determine the extent to which market events are associated with scores from revealed-preference tests of risk aversion.

## DECLARATION OF INTEREST STATEMENT

No conflicts of interest to report.

# REFERENCES

Anbar, A., & Eker, M. (2010). An empirical investigation for determining of the relation between personal financial risk tolerance and demographic characteristic. *Ege Akademik Bakis Dergisi, 10*(2), 503-522.

Arrow, K. J. (1971). *Essays in the theory of risk bearing.* Chicago: Markham Publishing Co.

Barsky, R. B., Juster, F. T., Kimball, M. S., & Shapiro, M. D. (1997). Preference parameters and behavioral heterogeneity: An experimental approach in the health and retirement study. *The Quarterly Journal of Economics, 112*(2), 537-579.

Beshears, J., Choi, J. J., Laibson, D., & Madrian, B. C. (2008). How are preferences revealed? *Journal of Public Economics, 92*(8-9), 1787-1794.

Brayman, S., Grable, J. E., Griffin, P., & Finke, M. (2017). Assessing a client's risk profile: A review of solution providers. *Journal of Financial Service Professions, 71*(1), 71-81.

Brooks, C., Sangiorgi, I., Hillenbrand, C., & Money, K. (2018). Why are older investors less willing to take financial risk? *International Review of Financial Analysis, 56*, 52-72.

Cardak, B. A., & Martin, V. L. (2019). Once in a lifetime? The effects of the global financial crisis on household willingness to take financial risk. *Economic Record, 95*(311), 442-461. doi:10.1111/1475-4932.12506

Charness, G., Gneezy, U., & Imas, A. (2013). Experimental methods: Eliciting risk preferences. *Journal of Economic Behavior and Organization, 87*, 43-51.

Chavali, K., & Mohanraj, M. (2016). Impact of demographic variables and risk tolerance on investment decisions: An empirical analysis. *International Journal of Economics and Financial Issues, 6*(1), 169-175.

Coleman, S. (2003). Risk tolerance and the investment behavior of Black and Hispanic heads of household. *Journal of Financial Counseling and Planning, 14*(2), 43-52.

Dickason, Z., & Ferreira, S. J. (2018). Gender and behavior: The effect of gender and ethnicity on financial risk tolerance in South Africa. *Gender and Behaviour, 16*(1), 10851-10862.

Eckel, C. C. (2019). Measuring individual risk preferences. *Proceedings of International Academic Conference 6408640*. International Institute of Social and Economic Sciences. Retrieved from: https://wol.iza.org/articles/measuring-individual-risk-preferences/long

Eeckhoudt, L., Gollier, C., & Schlesinger, H. (2011). Risk aversion. *Economic and financial decisions under risk* (pp. 3-25). Princeton, NJ: Princeton University Press.

Eisenhauer, J. G., & Ventura, L. (2003). Survey measures of risk aversion and prudence. *Applied Economics, 35*(13), 1477-1484.

Faff, R., Hallahan, T., & McKenzie, M. (2009). Nonlinear linkages between financial risk tolerance and demographic characteristics. *Applied Economics Letters, 16*(13), 1329-1332.

Fang, M., Li, H., & Wang, Q. (2021). Risk tolerance and household wealth: Evidence from Chinese households. *Economic Modelling, 94*, 885-895. https://doi.org/10.1016/j.econmod.2020.02.029

Fisher, P. (2019). Black-White differences in financial risk tolerance. *Journal of Financial Service Professionals, 73*(4), 70-82.

Gandelman, N., & Hernández-Murillo, R. (2014). Risk aversion at the country level. *Universidad ORT Uruguay. 98.* 1-11.

Gerrans, P., Faff, R., & Hartnett, N. (2015). Individual financial risk tolerance and the global financial crisis. *Accounting & Finance, 55*(1), 165-185.

Gibson, R. J., Michayluk, D., & Van de Venter, G. (2013). Financial risk tolerance: An analysis of unexplored factors. *Financial Services Review, 22,* 23-50.

Grable, J. E. (2000). Financial risk tolerance and additional factors that affect risk taking in everyday money matters. *Journal of Business and Psychology, 14*(4), 625-630.

Grable, J. E. (2016). Financial risk tolerance. In J. J. Xiao (Ed.), Handbook of consumer finance research (pp. 19-31). Switzerland, AG: Springer.

Grable, J. E., & Joo, S-H. (2004). Environmental and biopsychosocial factors associated with financial risk tolerance. *Journal of Financial Counseling and Planning, 15*(1), 73-82.

Grable, J. E., Kwak, E-J., Fulk, M., and Routh, A. (2020). A simplified measure of investor risk aversion. *Journal of Interdisciplinary Economics, 32*. https://doi.org/10.1177/0260107920924518

Guiso, L., & Sodini, P. (2013). Household finance: An emerging field in G. M. Constantinides, M. Harris, & R. M. Stulz (Eds.), *Handbook of the Economics of finance* (pp. 799-1612). Amsterdam, The Netherlands: North Holland.

Hallahan, T. A., Faff, R. W., & McKenzie, M D. (2004). An empirical investigation of personal financial risk tolerance. *Financial Services Review, 13*(1), 57-78.

Hanna, S. D., Gutter, M. S., & Fan, J. X. (2001). A measure of risk tolerance based on economic theory. *Journal of Financial Counseling and Planning, 12*(2), 53-60

Hanna, S. D. & Lindamood, S. (2004). An improved measure of risk aversion. *Journal of Financial Counseling and Planning, 15*(2), 27-45.

Harrison, G. W., Johnson, E., McInnes, M. M., & Elisabet, R. E. (2005). Risk aversion and incentive effects: Comment. *American Economic Review, 95*(3), 900-904.

Hartnett, N., Gerrans, P., & Faff, R. (2019). Trusting clients' financial risk tolerance survey scores. *Financial Analysts Journal, 75*(2), 91-104.

Holt, C. A., & Laury, S. K. (2002). Risk aversion and incentive effects. *American Economic Review, 92*(5), 1644-1655.

Holt, C. A., & Laury, S. K. (2005). Risk aversion and incentive effects: New data without order effects. *American Economic Review, 95*(3), 902-904.

Janecek, K. (2004). What is a realistic aversion to risk for real-world individual investors? *International Journal of Finance, 23,* 444-489.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic Perspectives, 5*(1), 193-206.

Koekemoer, Z. (2018). The influence of demographic factors on risk tolerance for South Africa financial decision makers. *Proceedings of the International Academic Conferences*, 6408640, International Institute of Social and Economic Sciences.

Larkin, C., Lucey, B. M., & Mulholland, M. (2013). Risk tolerance and demographic characteristics: Preliminary Irish evidence. *Financial Services Review, 22*(1), 77-91.

Lei, S. (2018). Financial advice and individual investors' investment decisions. *Applied Economics Letters, 26*(13), 1129-1132.

Mata, R., Frey, R., Richter, D., Schupp, J., & Hertwig, R. (2018). Risk preference: A view from psychology. *Journal of Economic Perspectives, 32*(2), 155-172.

Mehra, R., & Prescott, E. C. (1985). The equity premium: A puzzle. *Journal of Monetary Economics, 15*(2), 145-161.

Mishra, R. (2018). Financial literacy, risk tolerance and stock market participation. *Asian Economic and Financial Review, 8*(12), 1457-1471.

Nguyen, Y., & Noussair, C. N. (2014). Risk aversion and emotions. *Pacific Economic Review, 19*(3), 296-312.

Pinjisakikool, T. (2017). The influence of personality traits on households' financial risk tolerance and financial behavior. *Journal of Interdisciplinary Economics, 30*(1), 32-54.

Pratt, J. W. (1964). Risk aversion in the small and in the large. *Econometrica, 41*, 122-36.

Ruiz-Menjivar, J., Heo, W., & Grable, J. E. (2018). The effects of situational and dispositional factors on the change in financial risk tolerance. *Risk and contingency management: Breakthroughs in research and practice* (pp. 190-210). Hershey, PA: IGI Global.

Von Neumann, J., & Morgenstern, O. (1953). *Theory of Games and Economic Behavior.* Princeton, NJ: Princeton University Press.

Wakker, P. P. (2008). Explaining the characteristics of the power (CRRA) utility family. *Health Economics, 17*(12), 1329-1344.

Warren, G. J. (2019). Choosing and using utility functions in forming portfolios. *Financial Analysts Journal, 75*(3), 39-69.

Wong, A. (2011). Financial risk tolerance and selected demographic factors: A comparative study in 3 countries. *Global Journal of Finance & Banking Issues, 5*(5), 1-12.