Journal of Financial Services Marketing (2021) 26:1–9
https://doi.org/10.1057/s41264-020-00078-6

ORIGINAL ARTICLE

# Characteristics of random responders in a financial risk-tolerance questionnaire

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Received: 4 February 2019 / Revised: 9 October 2020 / Accepted: 26 October 2020 / Published online: 17 November 2020


## Abstract

The possibility of random response occurring, which can result in Type II errors, is possible whenever a financial risk-tolerance questionnaire is administered. This study was designed to apply inter-item standard deviation (ISD) scores, as introduced by Marjanovic, Holden, Struthers, Cribbie, and Greenglass (2015), to identify responders to a financial risk-tolerance questionnaire as hyper-consistent, conscientious, or random. Hyper-consistent responders were found to be more likely to be older married men who make their own financial and investment decisions. Those classified as hyper-consistent exhibited the lowest risk-tolerance scores. Conscientious responders were more likely to report having a high level of attained education and to rely on someone else when making financial and investment decisions. Financial risk-tolerance scores for conscientious responders fell between scores for hyper-consistent and random responders. Random responders were found to be younger, single, less well educated, and more likely to hold cash in their portfolio. Random responders also exhibited the highest financial risk-tolerance scores among participants in this study.

## Introduction

Attitudinal and trait measurement is of significant importance across nearly all fields of professional practice. This is particularly true in the domain of financial services. Financial service professionals work in an environment in which standards of conduct are highly prescribed. One consistent standard across regulatory agencies and certification boards is the requirement that financial service professionals assess the risk tolerance of clients in a reliable and valid manner (Hari, Pirsch, & Rawitzer, 2018). Consider the fiduciary rule as endorsed by the US Certified Financial Planner Board of Standards, Inc. (CFP Board). As outlined in duties owed to clients, CFP Board (2018) mandates that a "CFP® professional must act with the care, skill, prudence, and diligence that a prudent professional would exercise in light of the client's goals, *risk tolerance* [italics added], objectives, and financial and personal circumstances" (p. 2). In the context of financial advice, risk tolerance refers to a financial decision-maker's willingness to engage in a financial behavior in which the outcome of the behavior is both uncertain and potentially negative (Hatch, Carlson, & Droms, 2018; Nobre & Grable, 2015). In practice, financial service professionals use different techniques to meet risk-tolerance assessment requirements, with some using psychometrically and/or econometrically developed and tested risk-tolerance questionnaires, scales, surveys, and tests and others using measures developed in house with little theoretical grounding.

The role of financial risk tolerance in describing and shaping saving and investment behaviors at the household level has been extensively explored by researchers and policy makers. For example, in response to the 2002 Sandler

**Electronic supplementary material** The online version of this article (https://doi.org/10.1057/s41264-020-00078-6) contains supplementary material, which is available to authorised users.

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Report[1] that showed a growing and significant savings deficit in the UK, Nairn (2005) noted that assumptions about risk tolerance may contribute to low savings rates. She pointed out that it is often assumed as true that financial decision-makers are homogenous in their response to the way products are configured and presented. Nairn pointed out that building products and policies on this assumption can lead to problematic outcomes. Rather than being stable across financial decision-makers, risk tolerance can differ, resulting in distinctive saving and investing behavior across otherwise similar financial decision-makers. Nairn argued that rather than treating financial decision-makers broadly as one entity, a better approach, if the goal of financial advice is to positively change consumer saving and investing behavior, involves having "financial services organisations … harness 'risk tolerance' as a segmentation variable to alter behavior on a more targeted, micro level" (p. 375). Imbedded in Nairn's recommendation is the notion that measures of risk tolerance provide useful information across individuals.

## The present study

In order to appropriately classify financial decision-makers by risk tolerance, it is important to understand how financial decision-makers respond to risk-tolerance questionnaires. Marjanovic, Struthers, Cribbie, and Greenglass (2014) noted that the assumption of uniform information processing among individuals may be violated consistently whenever a questionnaire, scale, survey, or test is administered across a large sample of decision-makers, primarily because of the existence of what they termed random responders. Random responders answer questions in an arbitrary manner without regard to their true feelings or attitudes. Marjanovic et al. created a scale (i.e., the Conscientious Responder Scale) to separate conscientious responders who answer in good faith from random responders. When describing the need for such a scale, Marjanovic et al. noted that, even with measures that exhibit robust reliability and validity, random responders can make data interpretation problematic. Random responses can lead to a decrease in the power of a questionnaire, scale, survey, or test and increase the likelihood of making Type II errors when data from a risk-tolerance measure are analyzed. In the context of providing financial advice, this can be quite serious. Random responders are known to group scores around a midpoint. When this occurs, a financial service professional who works with a random responder may make an erroneous conclusion and classify such a financial decision-maker into an inappropriate risk-tolerance category. For example, a random responding financial decision-maker, whose risk tolerance actually is low, may be inadvertently placed into a moderate or high risk-tolerance category. Recommendations based on mis-classification may lead some random responding financial decision-makers to take more risk than is appropriate, whereas other recommendations, for some random responding financial decision-makers, may not be risky enough. In either case, financial decision-maker goal achievement can be compromised.

In a follow-up study, Marjanovic et al. (2015) pointed out that random responders are difficult to detect. This is the core reason the Conscientious Responder Scale was developed. While other tools have been built to help identify random responders (e.g., Huang et al. 2012), most of these tools have exhibited inconsistency and validity problems (see Meade & Craig, 2012). Marjanovic et al. (2015) noted that unless the Conscientious Responder or similar scale is included in a survey, those using a questionnaire, scale, survey, or test to classify individuals should assume that random responders are present and that random responses are a systemic problem. For financial service professionals, who are typically not trained in scale development or psychometric evaluation issues, the possibility of the presence of random responders in a required assessment is a serious issue.

### Inter-item standard deviation

As a response, Marjanovic et al. (2015) introduced the notion of using an inter-item standard deviation (ISD) score to identify random responders. They introduced ISD as an alternative to using a random response scale. The ISD is similar to standard deviation, but rather than being an interpersonal measure, the ISD is "an intrapersonal measure of response variance calculated at the individual level … On any given measure, the ISD reflects how closely a participant's item responses cluster around his/her composite mean score" (p. 80). An ISD score can be calculated with the following formula:

$$ISD_{\mathrm{j}} = \sqrt{\sum_{j=1}^{k} \left((X_{\mathrm{j}} - \bar{X}_{\mathrm{i}})^2\right)/(k-1)}$$

where $X_j$ = a participant's item score, $X_i$ = a participant's mean score across all measurement items, and $k$ = total number of measurement items. When an ISD score is estimated, an important caveat is that all items should be positively correlated.

The interpretation of an ISD score is relatively straightforward. According to Marjanovic et al. (2015), "… conscientious responders should produce small ISD scores

[1] The Sandler Report, Medium and Long-term Retail Savings in the UK: A Review (2002) ('Sandler Report'). See also: https://api.parliament.uk/historic-hansard/commons/2002/jul/09/retail-savings-sandler-review.

whereas random responders produce large ISD scores" (p. 80). Marjanovic et al. provided a relatively simple two-step test to categorize a questionnaire respondent into one of the following three groups: (a) hyper-consistent, (b) conscientious, and (c) random. First, Marjanovic et al. recommended that a confidence interval around the mean ISD score be determined, such as ± two standard deviations. Second, once the interval has been determined, a questionnaire respondent should be categorized as follows:

(a) Hyper-consistent: minus two or more standard deviations;

(b) Conscientious: within plus or minus two standard deviations; and.

(c) Random: plus two or more standard deviations.

### Purpose of study

The primary purpose of this study was to empirically apply the ISD model, as described by Marjanovic et al. (2015), to test the degree to which random responders are present in a widely used financial risk-tolerance questionnaire. A second purpose involved identifying differences in investment behavior across the response classifications. A third purpose was to describe the characteristics of those who were classified as hyper-consistent, conscientious, and random responders in the context of the risk-tolerance questionnaire. The following hypotheses were tested:

**$H_1$** Financial risk-tolerance scores for hyper-consistent responders will be significantly different from those classified as conscientious.

**$H_2$** Financial risk-tolerance scores for random responders will be significantly different from those classified as conscientious.

**$H_3$** Hyper-consistent responders will exhibit investment behavior that is significantly different from those classified as conscientious.

**$H_4$** Random responders will exhibit investment behavior that is significantly different from those classified as conscientious.

**$H_5$** The demographic characteristics of random, hyper-consistent, and conscientious responders will differ.

Findings from this study provide evidence that ISD scores can be used outside of academic environments and applied by those who use assessment questionnaires, scales, surveys, and tests (in this case, financial service professionals) in practice to identify those who need additional assessments prior to a diagnosis or recommendation.

## Methods

### Participants

Data were collected cross-sectionally through an Internet survey hosted by the Rutgers University Agricultural Experiment Station (see Grable, Roszkowski, Joo, O'Neill, & Lytton, 2006). Participants in this study consisted of 131,706 individuals who completed a risk-tolerance questionnaire that was included in the survey. Participants were recruited primarily from word-of-mouth and Internet search engines. The survey was broadly advertised as a way to obtain a no-cost financial risk-tolerance assessment for those participating in the study. (The survey period ran from 2007 through 2017.) The survey was widely used and promoted by financial literacy educators (e.g., Rabbani, O'Neill, Lawrence, & Grable, 2018), the general public (e.g., Robbins, 2014), and financial service professionals. Given the timing of the survey, and the fact that the survey was open to anyone with Internet access, it is possible that a response bias was present in the data. As a way to decrease response bias and increase the generalizability of findings to financial decision-makers, the sample was delimited to include only those who were age 25 or older at the time of the survey.

### Measures

Financial risk tolerance was assessed using a 13-item questionnaire originally developed by Grable and Lytton (1999). Grable and Lytton used classical test theory methods when creating the original questionnaire. The questionnaire was designed to provide educators, the general public, and financial service professionals with a summated scale score that provides an accurate gauge of a financial decision-maker's willingness to engage in household-level financial risk taking. Historically, Cronbach's alpha for the questionnaire has ranged from 0.70 to 0.80, with greater reliability reported for higher income and older questionnaire respondents (Kuzniak et al., 2015). In this study, Cronbach's alpha was 0.76. The validity of scores from the questionnaire has also been examined in the literature. Scores have shown a general pattern of higher risk tolerance being associated with holding more equity securities and making more aggressive financial decisions (Grable, Lyons, & Heo, 2019; Kuzniak et al., 2015). The mean risk-tolerance score among participants was 28.01 ($SD = 5.26$). Table 1 shows the inter-item correlation matrix for the items comprising the questionnaire. Data in Table 1 were used to confirm that the correlations among items were positive prior to running the ISD tests, which is a requirement imbedded in the Marjanovic et al. (2015) ISD modeling approach.

**Table 1** Inter-item correlation matrix for the Grable and Lytton (1999) risk-tolerance questionnaire

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Q1 | 1.000 | | | | | | | | | | | | |
| Q2 | .235 | 1.000 | | | | | | | | | | | |
| Q3 | .168 | .172 | 1.000 | | | | | | | | | | |
| Q4 | .209 | .224 | .083 | 1.000 | | | | | | | | | |
| Q5 | .202 | .206 | .090 | .418 | 1.000 | | | | | | | | |
| Q6 | .314 | .233 | .208 | .129 | .185 | 1.000 | | | | | | | |
| Q7 | .157 | .168 | .156 | .114 | .128 | .210 | 1.000 | | | | | | |
| Q8 | .224 | .286 | .169 | .245 | .220 | .236 | .169 | 1.000 | | | | | |
| Q9 | .158 | .232 | .128 | .135 | .094 | .175 | .130 | .197 | 1.000 | | | | |
| Q10 | .098 | .133 | .091 | .124 | .082 | .100 | .064 | .130 | .100 | 1.000 | | | |
| Q11 | .173 | .198 | .107 | .381 | .232 | .133 | .175 | .207 | .132 | .111 | 1.000 | | |
| Q12 | .255 | .283 | .157 | .364 | .327 | .254 | .201 | .304 | .188 | .124 | .265 | 1.000 | |
| Q13 | .218 | .280 | .194 | .157 | .170 | .261 | .240 | .250 | .179 | .094 | .194 | .255 | 1.000 |

The following five participant demographic variables were evaluated in the study: sex, age, marital status, attained education level, and household income. The choice to include these variables as sample descriptors was informed by the risk-tolerance and risk-taking literature that shows these variables to be particularly useful in describing risk attitudes and preferences (Fonseca, Mullen, Zamaro, & Zissimopoulos, 2012; Hirschl, Altobelli, & Rank, 2003; Ho, Milevsky, & Robinson, 1994; Yao & Hanna, 2004). Sex was coded 1 = female and 0 = male. Age was measured using the following five categories: (a) 35 to 44, (b) 45 to 54, (c) 55 to 64, (d) 65 to 74, and (e) 75 years of age or older. Marital status was assessed by asking participants to indicate their current marital status using one of six categories: (a) never married, (b) not married but living with significant other, (c) married, (d) separated or divorced, (e) widowed, and (f) shared living arrangement. Participant education level was evaluated using the following six education options: (a) some high school or less, (b) high school graduate, (c) some college/trade/vocational training, (d) associate degree, (e) bachelor's degree, and (f) graduate or professional degree. Household income was measured using five income categories: (a) less than $25,000, (b) $25,000 to $49,999, (c) $50,000 to $74,999, (d) $75,000 to $99,999, and (e) $100,000 or more. The descriptive statistics associated with these variables are presented in Table 2.

Participants were also asked to indicate the percent of personal and retirement savings and investments held in the following categories: (a) cash, such as savings accounts, certificates of deposit, or money market mutual funds; (b) fixed-income investments, such as corporate bonds, government bonds, or bond mutual funds; (c) equities, such as stocks, stock mutual funds, direct business ownership, or investment real estate (not including a participant's personal residence; and (d) other assets such as gold or collectibles. Finally, participants were asked to specify who in their household was responsible for making investment allocation decisions at the time they completed the survey. Participants were asked to choose from three options: (a) I, and/or someone in my household, make these decisions; (b) I rely on the advice of a professional (e.g., broker, financial planner, or other consultant); and (c) I currently have no investment assets. Descriptive data for the asset allocation and help-seeking variables are shown in Table 2.

## Procedure

Data from the risk-tolerance questionnaire were used to classify participants into one of three ISD groups: (a) hyper-consistent, (b) conscientious, and (c) random according to the procedure outlined by Marjanovic et al. (2015). Specifically, an ISD score was estimated using participant scores on the financial risk-tolerance assessment. The mean ISD score was 0.7899. The standard deviation of ISD scores was 0.1690. Next, confidence intervals using a two standard deviation interval around the mean risk-tolerance score were determined. The confidence intervals ranged from 0.4519 to 1.1279. Participants whose ISD score fell within this confidence interval were classified as *conscientious* responders. Those with a score of 0.4518 or lower were classified as *hyper-consistent*, whereas those whose score was equal to or greater than 1.1280 were classified as *random* responders. An ANOVA test was used to compare financial risk-tolerance scores by ISD classification.

Two analytic approaches were used to test the second and third purposes of the study (i.e., to identify differences in investment behavior across response classifications and to describe the characteristics of those who were classified as hyper-consistent, conscientious, and random responders). ANOVA tests were conducted to identify differences in investment behavior across the response classifications. The choice to use ANOVA tests, rather than

**Table 2** Sample descriptive statistics

| Variable | % | *M* | *SD* |
|---|---|---|---|
| Sex | | | |
| Male | 39.9 | | |
| Female | 60.1 | | |
| Age | | | |
| 25 to 34 | 40.3 | | |
| 35 to 44 | 20.6 | | |
| 45 to 54 | 17.5 | | |
| 55 to 64 | 14.7 | | |
| 65 to 74 | 5.2 | | |
| 75 years of age or older | 1.7 | | |
| Marital status | | | |
| Never married | 24.3 | | |
| Not married but living with significant other | 8.2 | | |
| Married | 55.8 | | |
| Separated or divorced | 8.6 | | |
| Widowed | 1.7 | | |
| Shared living arrangement | 1.5 | | |
| Education | | | |
| Some high school or less | 1.6 | | |
| High school graduate | 5.0 | | |
| Some college/trade/vocational training | 16.2 | | |
| Associate degree | 9.3 | | |
| Bachelor's degree | 50.5 | | |
| Graduate or professional degree | 17.5 | | |
| Household Income | | | |
| Less than $25,000 | 9.1 | | |
| $25,000 to $49,999 | 17.9 | | |
| $50,000 to $74,999 | 20.1 | | |
| $75,000 to $99,999 | 16.2 | | |
| $100,000 or more | 36.7 | | |
| Personal and retirement savings and investment allocation | | | |
| Cash (%) | | 41.52 | 36.05 |
| Fixed income (%) | | 15.24 | 19.81 |
| Equities (%) | | 38.38 | 32.59 |
| Other (%) | | 4.86 | 12.31 |
| Responsibility for investment allocation decisions | | | |
| I, and/or someone in my household | 70.7 | | |
| I rely on the advice of a professional | 15.4 | | |
| I currently have no investment assets | 13.9 | | |

logistic regression methods, was based on the desire to identify mean differences among participants rather than differences based on the unit of measurement within variables. Next, Chi-square square tests were used to identify the characteristics of responders by sex, marital status, and responsibility for financial decision making. (These variables were measured categorically.) ANOVA tests were also conducted to identify similarities and differences among responders by age, education, and income. For the purposes of this study, although measured as ordinal variables, given the characteristics of the items (i.e., descriptively, the variables shared qualities typically associated with interval level constructs) (Agresti, 2010), age, education, and income were considered continuous for use in the ANOVA tests. All analyses were bootstrapped. As a robustness check, the ANOVA results were confirmed using Kruskal–Wallis H tests.

## Results

Table 2 shows the descriptive profile of those in the sample. The table shows frequencies for the categorically measured variables and the mean and standard deviation for the personal and retirement savings and investment allocation variable (i.e., percent of assets held in different asset classes). Although the sample was not representative of the larger US population, the sample was nonetheless diverse. Approximately 40% and 60% of participants were men and women, respectively. The modal age category was 25 to 34 years,

with the majority of participants being married at the time of the survey. The attained educational profile of those in the sample ranged from some high school or less to a graduate or professional degree. The majority of participants indicated holding a Bachelor's degree. Likewise, household income was widely distributed from less than $25,000 to more than $100,000. The majority of participants reported household income greater than $75,000.

In relation to the primary purpose of the study, it was determined that approximately 96% of participant financial risk-tolerance scores fell within two standard deviations of the mean ISD score. Those fitting this classification were classified as consistent. About 2% of participants were found to be hyper-consistent, with the other 2% being classified as random responders.

A one-way between-subjects ANOVA test was conducted to compare ISD classifications on financial risk-tolerance scores. A significant effect at the $p < 0.001$ level was noted for the three conditions [$F_{2,131703} = 130.95$, $p < 0.001$]. Post hoc comparisons using Tukey HSD and Bonferroni tests indicated that the mean score for hyper-consistent participants ($M = 26.67$, $SD = 11.24$) was significantly different from the mean score for those classified as conscientious ($M = 28.03$, $SD = 5.04$) and random ($M = 29.10$, $SD = 3.80$) responders. Furthermore, the mean risk-tolerance score for those who were conscientious was different from the mean score of those who were classified as random responders. As such, support was found for the first two research hypotheses (i.e., financial risk-tolerance scores for hyper-consistent and random responders will be significantly different from those classified as conscientious). When viewed holistically, random responders were found to be the most risk tolerant. Those who were hyper-consistent were found to be more risk averse. Conscientious participants fell between the extremes.

Differences in portfolio holdings were noted across the ISD groups. Based on ANOVA post hoc comparisons using Tukey HSD and Bonferroni tests, it was determined that random responders held more cash in their portfolios than those in the other groups. Conscientious responders held the least cash. Random responders held less fixed-income investments. No fixed-income difference was noted between hyper-consistent and conscientious participants. Random responders also held fewer equities compared to those in the other ISD groups, whereas random responders were more likely to report holding other types of investment assets compared to hyper-consistent and conscientious responders. In total, support for the third and fourth research hypotheses was noted (i.e., hyper-consistent and random responders will exhibit investment behavior that is significantly different from those classified as conscientious).

Table 3 shows the characteristics of participants by ISD category. The number of participants in each category is shown for sex, marital status, and responsibility for financial decision making. The mean and standard deviation are shown for age, education, income, and household asset holdings. As noted in the last column of Table 3, significant differences across the groups were noted for each participant characteristic. Results from the tests described below provide support for the fifth research hypothesis (i.e., the demographic characteristics of random, hyper-consistent, and conscientious responders will differ).

A Chi-square test of goodness of fit was performed to determine whether the three categories of ISD were similar for: (a) men and women, (b) across marital categories, and (c) among those who made their own investment decisions compared to those who relied on others and those who had no investable assets. Based on the standardized residuals for each test, it was determined that men were more likely to be hyper-consistent responders. The relationship between marital status and ISD classifications was more nuanced. Those who were classified as hyper-consistent were more likely to be married, separated/divorced, or widowed. Participants classified as random responders were less likely to be married or separated/divorced and more likely to be never married, widowed, or residing in a shared living arrangement. Those who reported making their own financial decisions were more likely to be classified as hyper-consistent and less likely to be classified as random responders. Participants who relied on someone else when making financial decisions were less likely to be classified as either hyper-consistent or random when responding. Participants with no assets were more likely to be random responders.

Based on ANOVA post hoc comparisons using Tukey HSD and Bonferroni tests, it was determined that older participants were more likely to be hyper-consistent responders. No age difference between those classified as conscientious and random responders was noted. Educational differences were observed across the three ISD classifications. Random responders reported the lowest levels of attained education, whereas conscientious responders were found to have the highest education levels. Hyper-consistent responders fell between the two categories. Random responders reported the lowest household incomes. No income difference was noted between hyper-consistent and conscientious responders in terms of household income.

## Discussion

As noted by Marjanovic et al. (2015), random responses to survey questions can result in an increased number and severity of Type II errors. In the case of financial risk-tolerance assessment, this can be especially problematic because risk-tolerance scores are widely used in the investment management process. Misidentification of a financial decision-maker's willingness to take on financial risk can

**Table 3** ISD category comparisons across participant characteristics

| Variable | *Hyper-consistent* | *Conscientious* | *Random* | *Test* | *Sig* |
|---|---|---|---|---|---|
| Sex | N = | N = | N = | | |
| Male | 1144 | 42,220 | 504 | $\chi^2 = 23.16$ | .001 |
| Female | 1427 | 63,874 | 766 | | |
| Age (mean category) | 3.49 (1.46) | 3.29 (1.35) | 3.21 (1.47) | $F_{2,131703} = 34.86$ | .001 |
| Marital status | N = | N = | N = | | |
| Never married | 3542 | 210,481 | 6442 | $\chi^2 = 1080.47$ | .001 |
| Not married/living w/sig other | 344 | 18,761 | 4768 | | |
| Married | 1778 | 75,544 | 27 | | |
| Separated or divorced | 265 | 11,368 | 211 | | |
| Widowed | 92 | 2671 | 118 | | |
| Shared living arrangement | 77 | 3788 | 117 | | |
| Education (mean category) | 4.45 (1.26) | 4.56 (1.18) | 3.96 (1.49) | $F_{2,131703} = 200.74$ | .001 |
| Household income (mean category) | 3.56 (1.39) | 3.54 (1.37) | 3.07 (1.49) | $F_{2,131703} = 89.01$ | .001 |
| Personal/ret savings/investments: | | | | | |
| Cash (mean) | 43.95 | 41.35 | 51.18 | $F_{2,131703} = 63.82$ | .001 |
| | (38.57) | (35.93) | (38.94) | | |
| Fixed income (mean) | 13.02 | 15.32 | 12.50 | $F_{2,131703} = 34.54$ | .001 |
| | (19.56) | (19.83) | (18.53) | | |
| Equities (mean) | 38.75 | 38.55 | 24.41 | $F_{2,131703} = 144.53$ | .001 |
| | (35.49) | (32.51) | (30.31) | | |
| Other (mean) | 4.28 | 4.79 | 11.92 | $F_{2,131703} = 261.21$ | .001 |
| | (11.26) | (12.16) | (21.62) | | |
| Responsible for decisions: | N = | N = | N = | | |
| I, and/or someone in my household | 2179 | 89,536 | 1001 | | |
| I rely on the advice of a professional | 379 | 19,773 | 169 | $\chi^2 = 156.00$ | .001 |
| I currently have no investment assets | 399 | 17,515 | 367 | | |

result in problematic asset allocation recommendations and choices. Results from this study expand the work of Marjanovic et al. (2015) by showing that (a) financial risk-tolerance scores for hyper-consistent responders were significantly different from those classified as conscientious; (b) financial risk-tolerance scores for random responders were significantly different from those classified as conscientious; (c) hyper-consistent responders exhibited investment behavior that was significantly different from those classified as conscientious; and (d) random responders exhibited investment behavior that was significantly different from those classified as conscientious. Additionally, results from this study provide insights into the profile of hyper-consistent, conscientious, and random risk-tolerance assessment responders.

Those classified as hyper-consistent responders in this study tended to be older married men who make their own financial and investment decisions. Those classified as hyper-consistent responders were found to be the most risk averse. In some respects, this profile is consistent with the notion that financial decision-makers who have a strong vested interest in personal portfolio outcomes ought to spend more effort when answering risk-tolerance questions. That is, hyper-consistent responders may strive to be very precise and consistent.

Two characteristics were common among conscientious responders. First, they tended to rely on someone else when making financial and investment decisions, and second, they reported a high level of attained education. Those fitting this profile exhibited a mean risk-tolerance score that fell between hyper-consistent and random responders.

The profile of those classified as random responders was significantly different from that of hyper-consistent and conscientious responders. Random responders were more likely to report holding no investable assets. Among those in this category that did own assets, random responders held more cash, fewer fixed-income investments, and fewer equity assets; however, random responders held significantly more in other assets (e.g., collectibles, gold, etc.). This may help explain the randomness of responses. Specifically, being a priori overtly cautious (i.e., holding high levels of cash) or lacking a financial basis in which to differentiate between and among investment choices may make questions that are designed to assess a financial decision-maker's willingness to make a risky financial decision superfluous. These questions may not resonate with some unfamiliar with investing

concepts. Random responders were also found to have the lowest levels of attained education and household income. They were also more likely to be single or residing in a shared living arrangement. Compared to hyper-consistent and conscientious responders, those classified as random responders were the most willing to take financial risk.

In terms of assessing financial risk tolerance, financial service professionals and firms that rely on risk-tolerance questionnaires, scales, surveys, and tests when formulating financial recommendations should be cautious when interpreting results from those who currently have no investable assets. It appears that those who do not hold investments may lack the perspective to answer financial risk-taking questions in a conscientious manner. This may help explain some of the discrepancies noted in the 2002 Sandler Report, which showed a growing and significant savings deficit in the UK. Similarly, holding a sizable portion of one's portfolio in cash should warrant an additional risk-tolerance evaluation or discussion by a financial service professional. Exhibiting a revealed preference for cash holdings may be an indicator of potential random response in a financial risk-tolerance questionnaire. Other indicators of possible random response include a lower level of attained education and low household income.

## Conclusion

The notion that financial risk tolerance is neither stable nor uniform across individuals has been reported in the literature (e.g., Hatch et al., 2018). Additional evidence from the literature suggests that financial service professionals often have a hard time evaluating their clients' willingness to take risk (Clark-Murphy & Soutar, 2008). The issue of misidentification and categorization based on risk-tolerance scores gets even more complex when the possibility of random responding is entered into the assessment equation. As shown in this study, the inter-item standard deviation (ISD) technique proposed by Marjanovic et al. (2015) provides a meaningful way to identify three groups of risk-tolerance questionnaire respondents: hyper-consistent responders, conscientious responders, and random responders. Given that identifying who might fall into which category a priori is a difficult task, this study adds additional evidence supporting the proposition that response variance scores can be used to recognize survey participants and questionnaire scores that may be problematic.

Overall, results from this study were in line with the study's hypotheses. In this study, random responders exhibited significantly different characteristics from those classified as either hyper-consistent or conscientious. Specifically, they held more cash assets and had the highest risk-tolerance scores. Those classified as hyper-consistent had the lowest risk-tolerance scores, whereas those classified as conscientious fell between the other categories in terms of risk tolerance. This information can be used by end users of risk-tolerance questionnaires, scales, surveys, and tests to select participants for further evaluation or as a mechanism to remove problematic survey data from ongoing analyses. For example, rather than move forward with a financial recommendation based, in part, on a client's random selection of answers on a risk-tolerance questionnaire, a best practice would be to engage the client in a discussion about the nature of risk. This type of discussion should focus on identifying reasons that may have prompted the client to respond randomly. The client can then be asked to complete the questionnaire again with the second score being used to guide future recommendations. Alternatively, the financial service professional could use their professional judgment to adjust the client's financial risk-tolerance score based on information obtained during the discussion. The process of dealing with random responders is easier for researchers. Researchers who identify random responders should consider removing associated data from further analyses.

Given the ease of which an ISD score can be calculated, those who use a financial risk-tolerance questionnaire, either in the context of establishing best practice policies or as a tool to guide financial recommendations made to others, should consider following the ISD estimation approach recommended by Marjanovic et al. (2015). As illustrated in this study, the estimation procedure can be used to provide meaningful insights into the response characteristics of survey responders.

**Acknowledgements** The authors wish to acknowledge Dr. Barbara O'Neill for her help in collecting data used in this study.

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