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The Grable and Lytton risk-tolerance scale: A 15-year retrospective

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Abstract

Over a decade ago, Grable and Lytton (1999) developed, tested, and published a financial risk-tolerance scale in *Financial Services Review* that has since been widely used by consumers, financial advisers, and researchers to evaluate a person's willingness to engage in a risky financial behavior. Analysis of data ($n = 160{,}279$) spanning the timeframe 2007 to 2013 provides evidence that the risk-tolerance scale's reliability and validity have remained robust since the scale was first developed. The scale's estimated Cronbach's α was 0.77 during this time period. Consistent with the literature, high scale scores (representing a greater willingness to take risks) were found to be associated with equity ownership and negatively related to cash and bond holdings.

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1. Introduction

In 1999, Grable and Lytton published an article in *Financial Services Review* that presented a 13-item financial risk-tolerance scale that has, according to Google Scholar Analytics (Google, 2014), been referenced in hundreds of research publications. The scale, which is available online through Rutgers New Jersey Agricultural Experiment Station

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(https://njaes.rutgers.edu/money/riskquiz/), has been used by over 200,000 consumers, educators, and researchers. When the Grable and Lytton (G&L) risk scale was first published, there were few publically available measures of financial risk tolerance. Those that did exist tended to be based on income gambles, choice dilemmas, or demographically driven heuristics. The Grable and Lytton article was among the first to provide published risk scale reliability and validity estimates. Since first being published, the scale has been adopted as a client data intake instrument by a variety of firms operating in the financial and investment planning domain. Financial advisers often use the measure when providing comprehensive planning services as a way to measure and understand their clients' risk attitudes before allocating client assets. For individuals, the risk scale is often used to understand their own willingness to take financial risk and analyze investment preferences.

The purpose of this article is to provide a 15-year anniversary review of the G&L scale. Specifically, this article provides readers with data regarding historical scale response patterns and reliability and validity estimates. As will be shown below, the scale has held up relatively well as a consumer tool and research instrument since first being introduced to the public. This article adds additional evidence that the scale, whereas certainly not perfect, does provide financial planning practitioners and researchers with an acceptable, valid, and reliable assessment of a person's willingness to take financial risk.

2. Background review

2.1. Development of the scale

When Grable and Lytton (1999) set out to measure financial risk tolerance they were originally faced with the challenge of finding questions that (1) were germane to the concept of risk, (2) would allow anyone to combine question answers into a risk scale, (3) were relevant to situations faced by typical consumers making financial decisions, (4) were easy to administer, and (5) offered both validity and reliability when combined into a scale. Grable and Lytton used guidance provided by MacCrimmon and Wehrung (1986) to help identify and develop appropriate questions. These requirements included ensuring that (1) the multidimensionality of risk tolerance was assessed through the inclusion of simple and complex situational items, (2) the items were consistent and not redundant, (3) the items were interesting to answer, and (4) completion times would be reasonably short.

Their efforts at building a financial risk-tolerance assessment tool were based primarily on scale development theory and propositions found in Modern Portfolio Theory (MPT). In Markowitz's 1952 article describing the basis of MPT, the theoretical relationship between risk and investment returns was clearly outlined. Markowitz noted that risk and return are positively related, and as such, investors who demand a higher return must be willing to accept a higher level of risk (i.e., volatility) in their portfolios. This insight has since been used as a key benchmark of validity whenever a risk-assessment tool has been created. Grable and Lytton (1999) noted that, as such, any new and useful risk-tolerance measure must align with the prediction that high scores will correspond with a general willingness to take more financial risk. In the context of a financial risk-tolerance scale, risk scores should

be positively associated with, say, equity ownership. In addition to this baseline measure of validity, a scale ought to exhibit strong psychometric characteristics.

Grable and Lytton's (1999) efforts at establishing the reliability and validity of a new scale started by selecting over 100 risk-assessment items from the literature. Based on pilot study data, they were able to identify 50 items that matched all of the screening criteria. Grable and Lytton (1999) used these 50 items to begin the development of a risk-tolerance questionnaire. Using traditional item-response procedures, Grable and Lytton culled the list of items to 20 risk questions. They then grouped items into one of eight categories: (1) guaranteed versus probable gambles, (2) general risk choice, (3) choice between sure loss and sure gain, (4) risk as experience and knowledge, (5) risk as a level of comfort, (6) speculative risk, (7) prospect theory, and (8) investment risk. These efforts were taken to ensure that, at a minimum, the new scale would provide high face validity for practitioners and researchers. That is, their review of the literature indicated that a person's risk attitude was most closely associated with these eight domains.

Factor analysis procedures were then used to evaluate data from a convenience sample to obtain a more parsimonious number of items. Grable and Lytton (1999) were able to reduce the number of items to 13. The final version of the scale was found to represent three factors: (1) investment risk, (2) risk comfort and experience, and (3) speculative risk. Scale reliability was measured using Cronbach's α. Grable and Lytton reported an initial $\alpha = 0.75$. As noted by Cortina (1993) and Peterson (1994), this level of reliability matched what is typically found in psychological and marketing studies.[1]

Grable and Lytton (1999) took additional steps to measure the scale's construct validity, which is defined as the extent to which a measure actually assesses its intended purpose. They were able to correlate scores on the 13-item scale to responses to the well-known Survey of Consumer Finances (SCF) risk assessment item. The SCF item has been used extensively in the literature as a proxy measure of consumer risk attitudes (Yao, Hanna, and Lindamood, 2004). The SCF asks:

Which of the following statements on this page comes closest to the amount of financial risk that you are willing to take when you save or make investments?

1. Take substantial financial risk expecting to earn substantial returns
2. Take above average financial risks expecting to earn above average returns
3. Take average financial risks expecting to earn average returns
4. Not willing to take any financial risks

The two items were found to be positively correlated ($r = 0.54$). This was the first reported validity estimate of the new scale. Grable and Schumm (2010), using a different sample, also conducted a construct validity test using the SCF item. They noted, similar to Grable and Lytton (1999), that the scale was positively and statistically significantly related to the SCF item. They were also able to estimate the relative reliability of both the 13-item scale and the SCF item. While the Cronbach's α for the scale remained relatively constant, Grable and Schumm noted that the estimated reliability of the SCF item was most likely between $\alpha = 0.52$ and $\alpha = 0.59$. As such, they concluded that practitioners and researchers who were interested in obtaining a more robust measure of someone's willingness to engage

in a risky financial behavior, and had the space constraints to do so, would be better served using the larger 13-item scale.

Grable and Lytton (1999) concluded their original article by encouraging other researchers to continue to test the scale with diverse audiences. They asserted that their hope was that further research using the scale would lead to a better understanding of risk tolerance, which they defined as a person's willingness to engage in financial behavior when the outcomes are not known. They noted that with further tests, users of the scale would obtain more confidence in the validity and reliability of the scale.

2.2. Further tests of the scale

Four years later, Grable and Lytton (2003) revisited the instrument to test the scale's concurrent validity. Concurrent validity refers to how well a scale corresponds with actual behavior. In theory, a financial risk-tolerance scale should exhibit a statistically significant correlation with financial behavior, such as investing. They were able to document that scale scores were positively associated with equity ownership and negatively related to fixed-income and cash ownership. This finding held true in both bivariate and multivariate analyses, controlling for age, gender, marital status, education, income, and other factors. Their work helped to support the validity of the original scale.

Yang (2004) conducted a reliability and validity test of the scale using a college student and adult sample. As expected, she noted that younger respondents scored differently than older respondents, but the differences were not consistent. Younger respondents were less averse to investing in hard assets, whereas older respondents were risk seeking in relation to stocks and bonds. Yang did note, however, that overall scale scores were not significantly different based on the age of respondents. Additionally, both the younger and older samples generated Cronbach's α scores greater than $\alpha = 0.70$. Although Yang provided suggestions for new items and refinement to existing questions, her overall conclusion was that the scale worked reasonably well with both younger and older respondents.

Gilliam, Chatterjee, and Grable (2010) also conducted a concurrent validity test of the G&L scale. They correlated the scale against responses to the SCF risk item. Similar to Grable and Schumm (2010), they reported a statistically significant correlation ($r = 0.60$). Additionally, Gilliam and his associates noted that the G&L scale was positively associated with the ownership of risky investment assets. Overall, they concluded the scale provides an acceptable indication of a person's willingness to take on investment risks and that the scale does a better job of assessing financial risk tolerance than a single item measure such as the SCF item.

2.3. Summary

Currently, there are a limited number of peer-reviewed risk-tolerance assessments available in the public domain. Some instruments and scales are new and lacking historical reliability and validity data (e.g., Carr, 2014). Other scales were developed primarily for research interests (e.g., Grable, 2004; Grable and Joo, 2001). Still other items, instruments, and scales tend to measure financial risk tolerance indirectly through income gambles (e.g.,

Barsky, Juster, Kimball, and Shapiro, 1997; Hanna and Lindamood, 2004) or other forms of risk taking (e.g., Weber, Blais, and Betz, 2002). The G&L scale is one of the only peer-reviewed public—no cost—assessment tools available to consumers, practitioners, and researchers. Since its introduction in 1999, more than 200,000 consumers have used the scale to evaluate their tolerance for financial risk. A question of interest for those who use the scale is whether the instrument's original psychometric properties have changed since the scale was first published. The remainder of this article provides information to help answer this question. Evidence of the scale's validity and reliability, based on a multiyear data collection process, is presented below.

3. Methodology

3.1. Sample

Data for this project were obtained from a multiyear proprietary data collection project sponsored by Rutgers New Jersey Agricultural Experiment Station. For nearly 10 years, Rutgers University has hosted a free web-based site that allows anyone with internet access to answer the G&L risk scale items. The system provides a risk score and a basic review of how the score can be used in practice by consumers. Response data from over 160,000 individuals, beginning in late 2007 and ending in 2013, were incorporated into this study. Basic demographic data regarding the sample are provided in Table 1. In general, the sample was diverse, and in many ways, unique in its coverage of different gender, marital status, education, income, and age cohorts.

3.2. The survey

Appendix A shows the 13 questions asked online. The survey instrument can be accessed at: njaes.rutgers.edu/money/riskquiz/. Scores on the scale can range from 13 to 47. Higher scores are descriptive of increased financial risk tolerance. The mean score, among the 160,279 respondents, was 27.53 ($SD = 5.48$). The reliability of the scale, as measured with Cronbach's α, was $\alpha = 0.77$. Fig. 1 shows the distribution of risk scores across the sample.

3.3. Statistical approach

As discussed above, the purpose of this article was multifaceted. The first purpose was to present descriptive response data for the G&L risk scale. The second purpose was to evaluate the scale's overall reliability. As reported earlier, the scale's reliability (i.e., Cronbach's α), using the full sample, was $\alpha = 0.77$. Table 1 provides more nuanced reliability estimates based on demographic categories. The final purpose was to provide additional evidence of the scale's validity. Correlation and regression procedures were used to help support previous assertions regarding the scale's criterion-related validity. Results from these tests are reported below.

Table 1 Descriptive statistics for respondents by characteristic

Variable	Respondent characteristic		Scale data		
	Frequency	Percent	Mean	SD	Cronbach's α
Risk-tolerance score			27.53	5.48	.77
Gender					
Female	66,996	41.8%	25.94	4.95	.73
Male	91,383	57.7%	28.70	4.54	.77
Age					
Under 25	85,380	53.9%	27.35	5.53	.77
25 to 34	38,398	17.9%	27.94	5.38	.77
35 to 44	14,300	9.0%	28.25	5.39	.78
45 to 54	13,691	8.6%	27.75	5.27	.78
55 to 64	11,654	7.4%	27.02	5.09	.77
65 to 74	3,818	2.4%	26.59	5.20	.78
75 and older	1,190	0.8%	27.56	8.38	.90
Marital status					
Never married	36,545	23.2%	27.49	5.51	.77
Living with significant other	21,734	13.8%	27.54	5.42	.77
Married	26,954	17.1%	27.69	5.30	.78
Widowed	36,133	22.9%	26.94	6.62	.84
Shared living arrangement	25,357	16.1%	27.82	6.34	.82
Education					
Some high school or less	36,545	23.2%	27.28	5.86	.78
High school diploma	21,734	13.8%	27.15	5.51	.76
Some college	26,954	17.1%	26.88	5.21	.76
Associate's degree	10,751	6.8%	26.80	5.27	.77
Bachelor's degree	36,133	22.9%	28.10	5.20	.77
Graduate or professional degree	25,357	16.1%	28.43	5.39	.78
Household income					
Less than $25,000	35,531	22.9%	27.08	5.58	.77
$25,000 to $49,999	30,441	19.6%	26.59	5.35	.76
$50,000 to $74,999	30,135	19.4%	27.28	5.32	.76
$75,000 to $99,999	20,644	13.3%	27.71	5.27	.76
$100,000 or more	38,597	24.8%	28.65	5.53	.78
Decision making					
Make own investment decisions	92,803	57.9%	27.87	5.53	.78
Rely on the advice of professional	18,387	11.5%	27.77	5.12	.75
Do not have investment Assets	46,157	28.8%	26.75	5.40	.76
Seasonal effects					
Summer	19,239	12.0%	27.72	5.39	.77
Fall	47,656	29.7%	27.61	5.50	.77
Winter	49,449	30.9%	27.26	5.39	.76
Spring	43,935	27.4%	27.67	5.53	.77

4. Results

4.1. Sample characteristics

As shown in Table 1, the sample was over-represented by male respondents; however, this was not surprising given the general tendency of men to exhibit more intense investing

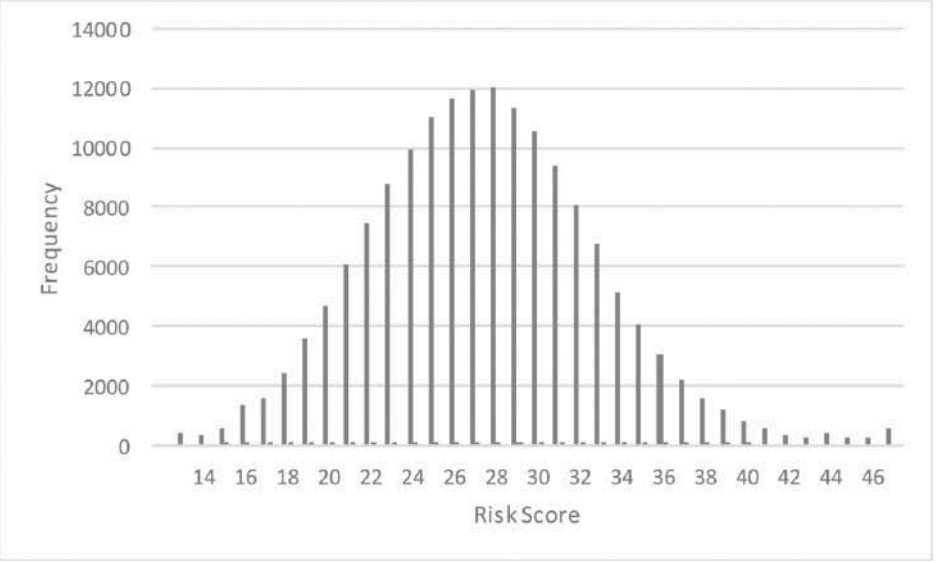

Fig. 1. Distribution of risk-tolerance scores across the sample.

behavior. The age profile of respondents was skewed towards those under age 25. Even so, other age groups were also widely represented. The dataset included a diverse representation of marital status. In terms of educational profile, the sample was fairly representative of the population, with a slight tilt towards those who had completed some form of college education. Given who is typically interested in financial planning and investing topics, this educational characteristic was not unexpected. Household income patterns showed that respondents tended to cluster into low and high income categories.

Table 1 also provides data related to financial decision making as reported by respondents. The majority of respondents (57.9%) indicated making their own investment decisions. Nearly 30% of those responding indicated having no investment assets at the current time. The remainder reported that they relied on the advice of another person, such as a stock broker or financial planner, when making investment decisions. These data are important in helping establish a profile of the type of person who may be seeking information about their tolerance for risk. Finally, Table 1 shows seasonal patterns of response. As expected, data collection was lowest during the summer months. This was likely because of fewer college age people completing the survey and the tendency among investors to postpone investment decision making during the summer. Seasonally, use of the online survey in fall, winter, and spring was similar.

4.2. Response patterns

Based on *t* and analysis of variance (ANOVA) tests, nearly all of the risk scores were statistically significantly different across characteristic categories. It is important to note, however, that much of the statistical significance was likely because of the large sample size. As such, within-sample random sampling procedures were used to confirm results. The random sample was chosen using a sampling protocol in SPSS 22.0. The SPSS random

sampling algorithm was based on equal probability estimates. In general, the demographic profile of those in the random sample matched that of the full dataset. Some interesting significant differences were noted when random samples were used. For instance, the gender difference was meaningfully significant, $t(15{,}767) = 31.57$, $p < 0.001$. Men, as has been reported in the literature (e.g., Arano, Parker, and Terry, 2010; Grable, 2008; Neelakantan, 2010), were more risk tolerant than women. A difference in risk tolerance scores across income categories was also noted. As shown in Fig. 2, a curvilinear (U-shaped) relationship was observed, $\beta = 0.12$, $t(15{,}574) = 15.17$, $p < 0.001$. A similar curvilinear effect was found for education, $\beta = 0.09$, $t(15{,}687) = 11.87$, $p < 0.001$ (Fig. 3).

4.3. Reliability estimates

Table 1 also provides information about the reliability of the G&L risk scale. Overall, the scale's Cronbach's α, as a measure of scale reliability, was $\alpha = 0.77$. This estimate is higher than that reported by Yang (2004) but in line with what Grable and Lytton (1999) originally reported. Additionally, the scale's reliability estimate falls squarely in the mean average for similar psychologically-based measures (Peterson, 1994).

The sixth column of Table 1 provides reliability estimates for each respondent characteristic. For example, when the analysis was delimited to include only women, the scale's α was $\alpha = 0.73$, whereas for men α was $\alpha = 0.77$. The highest reliability estimate was noted for those age 75 or older ($\alpha = 0.90$). Overall, the scale appears to be most reliable for: (1) males, (2) older respondents, (3) those who are married or have been previously married, and (4) those who make their own financial and investment decisions. When viewed holistically, this profile matches the description of many investors today. It is important to note, as well, that the variation in reliability estimates was quite small across the respondent characteristics. This supports the notion that the scale provides users with a relatively consistent level

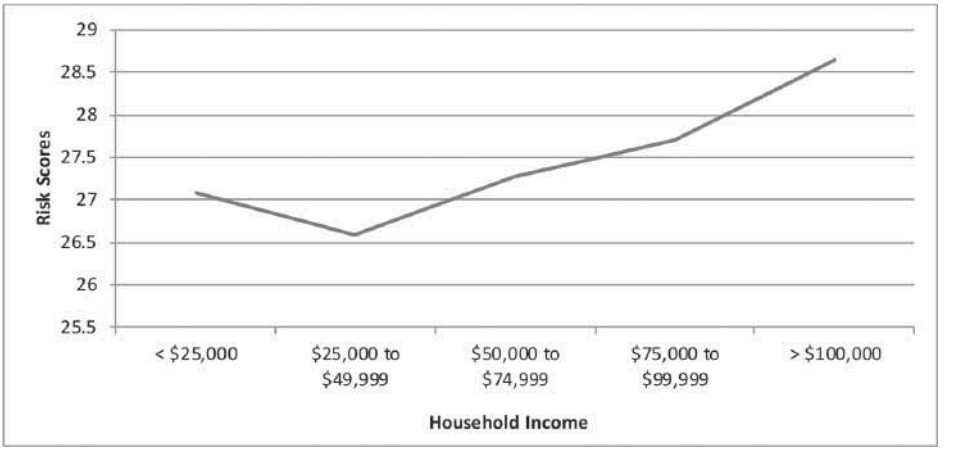

Fig. 2. G&L risk scores by household income.

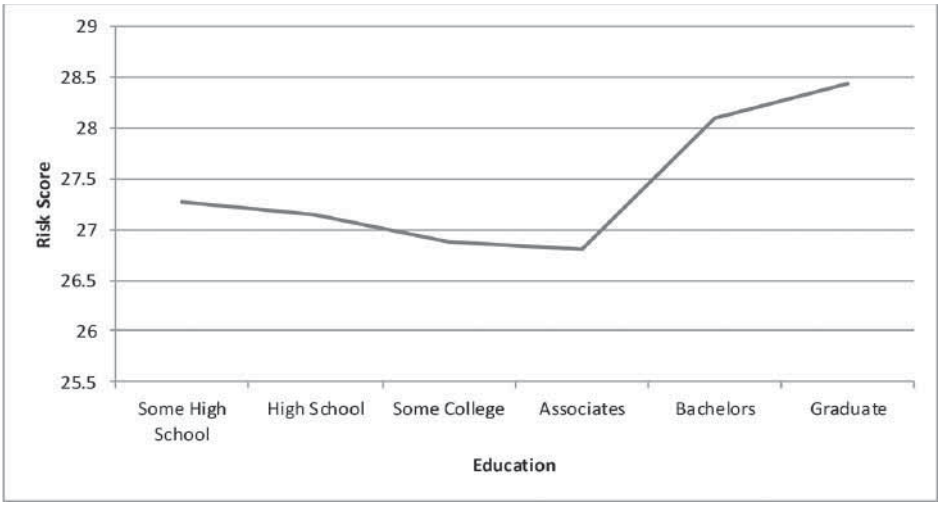

Fig. 3. G&L risk scores by education.

of response measurement across gender, age, marital status, education, income, and decision making characteristics.

4.4. Validity estimates

The scale's validity was evaluated using a combination of correlation and regression tests. The first criterion-related validity test (i.e., an evaluation of the relationship between scale scores and an anticipated outcome or behavior) results are shown in Table 2. Respondents were asked to think about their current financial situation and to indicate, "Approximately what percentage of your personal and retirement savings and investments are in the following categories: (1) cash, such as savings accounts, CDs, or money market mutual funds; (2) fixed income investments, such as corporate bonds, government bonds, or bond mutual funds; (3) equities, such as stocks, stock mutual funds, direct business ownership or investment real estate (not your personal residence); and (4) other, such as gold or collectibles. Responses to these four categorical assessments were summed. Scores ranged from zero to 100%.

As shown in Table 2, risk scores were negatively associated with cash holdings and positively related to equity ownership. This matched the relationship between risk tolerance and portfolio composition predicted in MPT and the Capital Asset Pricing Model (Hariharan, Chapman, and Domian, 2000). The relationship between risk scores and bonds was almost

Table 2 Correlation of risk score with investment allocation ($N = 160{,}279$)

	Risk score	% Cash	% Bonds	% Equities	% Other
Risk score	1.00				
% Cash	−0.26	1.00			
% Bonds	−0.01	−0.53	1.00		
% Equities	0.27	−0.77	0.03	1.00	
% Other	0.13	−0.33	0.05	−0.10	1.00

All coefficients significant at $p < 0.001$.

zero; however, when cash and fixed-income holdings were summed and correlated to risk scores, the relationship was negative ($r = -0.31$, $p < 0.001$). Holding other assets, such as gold or collectibles, was also found to be positively associated with risk scores. These results mirrored those from Grable and Lytton (2003). These findings add support to the relative power of the G&L risk scale to explain investment asset holdings at the household level.

Although the effect size of the associations reported in Table 2 were not large, the relationships were as expected. Further, the strength of associations reflects the notion that financial risk tolerance is only one input into investment allocation decisions. Other factors, including financial capacity and a person's general socioeconomic profile, also play an important role in shaping investment decisions. Based on this concept, a second criterion-related validity test was undertaken. In this case, it was hypothesized that G&L risk scores should be positively associated with equity ownership, holding gender, age, marital status, education, household income, and investment decision making constant. An ordinary least squares regression model was developed to test this possibility. For the purposes of the test, only those respondents who indicated owning investable assets were included in the analysis. This reduced the sample to approximately 105,000 respondents. Given the size of the sample and the possibility of obtaining highly significant results with very small effect sizes, a random sample equal to approximately 10% of the delimited sample was used in the analysis. The demographic profile of this sample matched the characteristics of the larger delimited dataset.

Within the regression, females were coded 1, otherwise 0. Age was coded (1) under 25, (2) 25 to 34, (3) 35 to 44, (4) 45 to 54, (5) 55 to 64, (6) 65 to 74, and (7) 75 and older. The under age 25 category was the reference category. Marital status was coded categorically using the following groups: (1) single, (2) living with significant other, (3) married, (4) separated or divorced, (5) widowed, and (6) shared living arrangement. The single group was the reference category. Education was coded as follows: (1) some high school or less, (2) high school diploma, (3) some college, (4) Associate's degree, (5) Bachelor's degree, and (6) graduate or professional degree. The graduate and professional degree category was the reference group. Household income was coded (1) less than $25,000, (2) $25,000 to $49,999, (3) $50,000 to $74,999, (4) $75,000 to $99,999, and (5) $100,000 or more. The less than $25,000 group was the reference category. Financial decision making was recoded so that those who made their own investment decisions, rather than relying on the advice of another person, were coded 1, otherwise 0. It is worth noting that those in this group were more likely to report holding cash, although many also reported holding some fixed-income or other assets, such as gold or collectibles. As such, it was conjectured that financial decision making ought to be negatively associated with equity ownership. Results from the regression analysis are shown in Table 3.

The model was statistically significant, $F(23,10898) = 1976.06$, $p < 0.001$. The model explained ~31% of the variance in total equity ownership ($R^2 = 0.31$). As shown, G&L risk scores were positively associated with equity ownership at a $p < 0.001$ level. Although not of primary importance in this study, it is worth noting that women were less likely to hold equities. This finding matched that of Hallahan, Faff, and McKenzie (2004). The association between age and equity ownership was positively concave. Equity ownership increased by age category up until age 55 to 64. Even so, those in the oldest age group still held a higher

Table 3 Regression results of equity ownership

Variable	b	SE	β
Gender			
Female	−3.78	0.17	−0.06***
Age			
25 to 34	9.64	0.27	0.13***
35 to 44	18.15	0.34	0.19***
45 to 54	21.55	0.34	0.22***
55 to 64	20.61	0.36	0.20***
65 to 74	18.79	0.51	0.11***
75 and older	12.26	0.85	0.04***
Marital status			
Living with significant other	−0.21	0.34	−0.00
Married	2.15	0.25	0.03***
Separated or divorced	1.60	0.41	0.01***
Widowed	−1.18	0.75	−0.00
Shared living arrangement	−0.24	0.72	−0.00
Education			
Some high school or less	−9.43	0.31	−0.12***
High school diploma	−7.34	0.32	−0.08***
Some college	−5.26	0.27	−0.06***
Associate's degree	−5.38	0.34	−0.05***
Bachelor's degree	1.07	0.23	0.02***
Household income			
$25,000 to $49,999	0.50	0.26	0.00
$50,000 to $74,999	3.63	0.26	0.05***
$75,000 to $99,999	5.80	0.29	0.07***
$100,000 or more	7.99	0.26	0.12***
Decision making			
Make own investment decisions	−3.50	0.21	−0.04***
Financial risk tolerance	1.38	0.02	0.25***
Constant	−12.22	0.57	

**$p < 0.01$ ***$p < 0.001$.

proportion of investable wealth in equities compared with those in the lowest age category. The relationship between education and equity ownership was as expected, with those exhibiting low levels of attained education holding fewer equities. Overall, income was positively associated with equity ownership; however, respondents in the $25,000 to $49,999 were not significantly different from those whose income was $25,000 or less. Respondents who were married and separated/divorced were significantly more likely to hold equities compared to those who were single. No differences were noted among singles, those living with a significant other, respondents who were widowed, and those who were living in a shared arrangement. As hypothesized, respondents who made their own investment decisions were less likely to report holding equities. For confirmation purposes, a similar model was developed (not shown) using the combination of cash and fixed-income asset ownership as the outcome variable. The coefficient for the risk score changed from positive to negative at the $p < 0.001$ level. This result confirmed that G&L risk-tolerance scores were associated with objective risk taking within the sample, holding other factors constant.

5. Conclusion

After conducting an extensive review of the literature, Grable and Joo (2004) reported that the term risk tolerance should be used as a description of a person's willingness to take part in a behavior in which one or more outcomes are both uncertain and potentially negative. Individuals, households, cultures, and societies engage in risky behavior on an hour-by-hour basis. Some risks are taken on as a normal part of daily life. Other risks are reluctantly taken. In the domain of financial and investment planning, the concept of financial risk tolerance has come to be seen as an important element in shaping the development of strategies designed to help households meet their financial goals. Risk tolerance serves as an input into nearly all consumer and household finance decisions. While there have been attempts over the past 50 years to both describe and measure financial risk tolerance, the number and types of assessment instruments available publically has been limited. In 1999, Grable and Lytton published what was, at the time, a unique scale that they argued offered consumers, financial professionals, and researchers a reasonable level of reliability and validity.

Since 1999, numerous researchers have taken steps to test the reliability and validity of the G&L risk scale. Most studies, however, were based on small convenience samples. This article extends these tests by using data ($N = 160{,}279$) collected from late 2007 through early 2014 to better describe scale response patterns, as well as provide an update on reliability and validity estimates for the scale. When evaluating findings reported in this article, it is worth remembering that data were collected over periods that included significant market volatility, and that a degree of self-selection bias was likely present in the data collection process. It is possible that the reported results might have been different had data from the Great Recession been excluded from the analyses and had others without internet access been asked to complete the assessment.

Overall, using data from more than 160,000 scale users, and subsequent random samples taken from this sample frame, the findings from this study provide additional evidence that the G&L risk scale has performed reasonably well over its 15 years of public use. Based on the full sample, a Cronbach's α of $\alpha = 0.77$ was estimated. Further reliability estimates were made using respondent characteristics. The majority of reliability estimate fell within a range of 0.73 to 0.90, with $\alpha = 0.77$ being the most typical estimate. Validity tests showed that scores on the G&L scale were positively associated with equity ownership and negatively related to cash and fixed-income ownership. These results provide evidence that the scale continues to offer users an economical way to differentiate between individuals who are more or less likely to take financial risk.

Notes

1. Reliability refers to "the extent to which [assessments] are repeatable and that any random influence which tends to make measurements different from occasion to occasion is a source of measurement error" (Nunnally, 1967, p. 206). Reliability provides an indication of how consistent responses are or will be over time. Cron-

bach's α represents the lower bound of reliability (Cortina, 1993). Peterson (1994) noted that the average reported Cronbach's α in the psychological and marketing literature ranges from .76 to .77. Generally, scores below $\alpha = .70$ are considered to be useful only in exploratory studies. Scores greater than $\alpha = .90$ are also considered problematic because of item redundancy (Boyle, 1991).

Appendix A. 13-Item risk tolerance scale

1. In general, how would your best friend describe you as a risk taker?
   a. A real gambler
   b. Willing to take risks after completing adequate research
   c. Cautious
   d. A real risk avoider
2. You are on a TV game show and can choose one of the following, which would you take?
   a. $1,000 in cash
   b. A 50% chance at winning $5,000
   c. A 25% chance at winning $10,000
   d. A 5% chance at winning $100,000
3. You have just finished saving for a "once-in-a-lifetime" vacation. Three weeks before you plan to leave, you lose your job. You would:
   a. Cancel the vacation
   b. Take a much more modest vacation
   c. Go as scheduled, reasoning that you need the time to prepare for a job search
   d. Extend your vacation, because this might be your last chance to go first-class
4. If you unexpectedly received $20,000 to *invest*, what would you do?
   a. Deposit it in a bank account, money market account, or an insured CD
   b. Invest it in safe high quality bonds or bond mutual funds
   c. Invest it in stocks or stock mutual funds
5. In terms of experience, how comfortable are you investing in stocks or stock mutual funds?
   a. Not at all comfortable
   b. Somewhat comfortable
   c. Very comfortable
6. When you think of the word "risk," which of the following words comes to mind first?
   a. Loss
   b. Uncertainty
   c. Opportunity
   d. Thrill
7. Some experts are predicting prices of assets such as gold, jewels, collectibles, and real estate (hard assets) to increase in value; bond prices may fall, however, experts tend to agree that government bonds are relatively safe. Most of your investment assets are now in high interest government bonds. What would you do?
   a. Hold the bonds

b. Sell the bonds, put half the proceeds into money market accounts, and the other half into hard assets
c. Sell the bonds and put the total proceeds into hard assets
d. Sell the bonds, put all the money into hard assets, and borrow additional money to buy more

8. Given the best and worst case returns of the four investment choices below, which would you prefer?
   a. $200 gain best case; $0 gain/loss worst case
   b. $800 gain best case; $200 loss worst case
   c. $2,600 gain best case; $800 loss worst case
   d. $4,800 gain best case; $2,400 loss worst case
9. In addition to whatever you own, you have been given $1,000. You are now asked to choose between:
   a. A sure gain of $500
   b. A 50% chance to gain $1,000 and a 50% chance to gain nothing
10. In addition to whatever you own, you have been given $2,000. You are now asked to choose between:
   a. A sure loss of $500
   b. A 50% chance to lose $1,000 and a 50% chance to lose nothing
11. 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?
   a. A savings account or money market mutual fund
   b. A mutual fund that owns stocks and bonds
   c. A portfolio of 15 common stocks
   d. Commodities like gold, silver, and oil
12. If you had to invest $20,000, which of the following investment choices would you find most appealing?
   a. 60% in low-risk investments, 30% in medium-risk investments, 10% in high-risk investments
   b. 30% in low-risk investments, 40% in medium-risk investments, 30% in high-risk investments
   c. 10% in low-risk investments, 40% in medium-risk investments, 50% in high-risk investments
13. Your trusted friend and neighbor, an experienced geologist, is putting together a group of investors to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the mine is a bust, the entire investment is worthless. Your friend estimates the chance of success is only 20%. If you had the money, how much would you invest?
   a. Nothing
   b. One month's salary
   c. Three month's salary
   d. Six month's salary

Scoring

1. a = 4; b = 3; c = 2; d = 1
2. a = 1; b = 2; c = 3; d = 4
3. a = 1; b = 2; c = 3; d = 4
4. a = 1; b = 2; c = 3
5. a = 1; b = 2; c = 3
6. a = 1; b = 2; c = 3; d = 4
7. a = 1; b = 2; c = 3; d = 4
8. a = 1; b = 2; c = 3; d = 4
9. a = 1; b = 3[a]
10. a = 1; b = 3
11. a = 1; b = 2; c = 3; d = 4
12. a = 1; b = 2; c = 3
13. a = 1; b = 2; c = 3; d = 4

Source: Grable, J., & Lytton, R. H. (1999). Financial risk tolerance revisited: The development of a risk assessment instrument. *Financial Services Review, 8,* 163–181.

[a] Answers to questions 9 and 10 can be averaged to obtain a combined score.

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