Measuring the Perception of Financial Risk Tolerance: A Tale of Two Measures

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The assessment of financial risk tolerance, as a tool for managing expectations of portfolio volatility, is essential to goal attainment. This study compares two empirical measures of risk tolerance and separately examines the association between these measures of risk tolerance and asset allocation. The instruments used to determine investors' perception of financial risk tolerance are the Survey of Consumer Finance's (SCF) single-question measure and a 13-item, multidimensional measure developed by Grable and Lytton (1999). A sample comprised of 328 respondents, predominantly faculty and staff at colleges and universities in the Southwest, completed a 38-question, web-based survey. Results suggest that, while both scales are associated with preference for risky or non-risky asset allocation among respondents, the 13-item scale has greater explanatory power.

Key Words: financial risk tolerance, investment risk, risky assets, Survey of Consumer Finances

Introduction

The assessment of financial risk tolerance as an attitudinal input into the financial decision-making process is increasingly regarded as an important factor of interest to researchers, practitioners, and policy makers. This is particularly true given the economic uncertainties present in the consumer financial marketplace. Even so, the role and importance of assessing financial risk tolerance is often viewed differently among various stakeholders involved in the regulatory reform of the financial services industry (LRN-RAND, 2008). Investors and financial planning professionals alike are seeking to mitigate adverse reactions to market fluctuations. To do so, these individuals need valid and reliable estimates of risk tolerance. Simultaneously, regulators are increasingly taking steps to hold the financial services industry to fiduciary standards requiring advisors to utilize methods that justify the suitability of their recommendations. Therefore, regulators and those subject to fiduciary standards also require measures of risk tolerance that meet prudent investment management standards.

Public policy has changed in the last decade to emphasize the importance of assessing financial risk tolerance. For example, in 2001, the Australian government enacted legislation requiring financial planners to assess investors' risk tolerance "when identifying a client's financial objectives, situation and needs as the 'reasonable' basis for subsequent investment advice" (McCrae, 2004, p. 1). The U.S. has adopted this approach. As outlined in the Pension Protection Act of 2006, the U.S. Department of Labor (DOL) stressed the importance of risk tolerance as an element for eligible investment advice when using computer models to advise participants and beneficiaries regarding investments in retirement plans. More recently, the Securities and Exchange Commission (SEC) sponsored a study by the LRN-RAND Center for Corporate Ethics, Law and Governance, recognizing that "any future regulatory reform would have to be based on a clearer understanding of the industry's complexities, including the changing business practices of broker-dealers and investment advisers and how the investors perceive these practices" (LRN-RAND, 2008, p. 13).

Accurately and efficiently assessing a client's financial risk tolerance has traditionally been seen as a critical component of the financial counseling and planning process. Since so many constituencies have expressed the importance of

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assessing financial risk tolerance, one might assume that there is a unanimously accepted method for determining an individual's tolerance for investment risk. However, this has been, and continues to be, a subject of debate among financial counselors, financial planners, and academicians. In the personal finance research community, individual financial risk tolerance has been measured in a variety of ways. Methods ranging from Choice Dilemmas (Wallach & Kogan, 1959) to multidimensional risk measures (Barsky, Juster, Kimball, & Shapiro, 1997; Hanna & Lindamood, 2004) have been used to obtain estimates of a person's willingness to engage in risky financial behaviors. The Barsky et al. (1997) and Hanna and Lindamood (2004) assessment tools are particularly useful for researchers who use large datasets or prefer to generate estimates of risk aversion as an extension of expected utility theory. In financial planning and counseling practice, however, there are two more widely used measures of risk tolerance. The first involves the use of the single risk-tolerance item found in the Survey of Consumer Finances (SCF). The other is a 13-item financial risk-tolerance scale developed by Grable and Lytton (1999). These measures are widely used because they are (a) available in the public domain, (b) easy to administer, and (c) relatively easy for respondents to answer. The purpose of this study was to determine the degree to which each of these risk tolerance measures is associated with the investors' portfolio allocation.

Literature Review

The SCF Risk-Tolerance Item

One of the most common and widely used assessment instruments in the risk-tolerance literature is the SCF single-question measure. The question, as used in most surveys, reads:

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 risk expecting to earn above average returns
3. take average financial risk expecting to earn aver age returns
4. not willing to take any financial risk.

The question is part of a large national survey sponsored by the Federal Reserve Board and administered by the National Opinion Research Center housed at the University of Chicago. Due to the wealth of information available in this survey, the dataset has been a productive resource for consumer behavior research.

While the SCF item has been a popular measure, it has not gone without criticism. Chen and Finke (1996) were among the first to suggest that the SCF measure might be a better indicator of an investor's "financial situation" instead of "a good proxy for risk aversion" (p. 94). Since that time, other researchers have questioned the use of this measure. Hanna and Chen (1997) restated the concern about the situational nature of the measure, adding that "it does not necessarily reveal pure preferences" (p. 19). Hanna, Gutter, and Fan (2001) criticized the fact that the SCF question, as well as other risk-tolerance measures, was "not rigorously linked to the concept of risk tolerance in economic theory" (p. 54).

Grable and Lytton (2001) undertook a study to test the concurrent validity of the SCF item. They made comparisons between the SCF item and a 13-item risk-tolerance measure including the scale's three sub-measures. Rather than criticizing the use or application of the SCF item, Grable and Lytton concluded that the measure was most likely a proxy for the more narrow aspect of investment risk tolerance within the broader concept of financial risk tolerance. That is, they noted a modest correlation between the two instruments (p = .54) and a moderate association between the SCF item and the investment subscale (p = .57). They cautioned researchers to use the SCF item with care, because extrapolating results based on item scores beyond the narrow confines of investments might lead to inaccurate conclusions.

Until recently, no reports of the SCF item's reliability had ever been reported. Grable and Schumm (2007) undertook a study to examine the item's Cronbach's alpha. They performed five tests in an effort to determine the reliability of the measure. Their results suggested an estimated range of .07 to .78 with the probable reliability estimate range existing from .52 to .59. Grable and Schumm concluded that the reliability of the single-item measure tends to be "relatively low" (p. 15); however, it should be noted that Grable and Schumm did not rule out the use of the item based on the reliability tests. Instead, they concluded that researchers ought to take prudent measures to account for standard error variances whenever the item is used in research.

Notwithstanding the critiques of the SCF item published in the literature, the measure continues to be widely used by researchers and policy makers. The primary reason for this

is that the item is the only direct measure of risk attitudes in the SCF. As long as the SCF continues to be the dominant data source for personal, consumer, and household finance research, it is likely that the item will continue to be widely used both by SCF researchers and those who utilize the item in direct consumer surveys. For this reason, acquiring additional information about the association between financial risk tolerance measures and financial decisions is important.

Nearly all researchers familiar with the SCF item acknowledge its inherent weaknesses in the question but choose to use the item because of its modest levels of validity. Continued use is further based on the assumption that the results from the item can be compared across research studies. A second outcome from this study means to aid researchers, practitioners, and policy makers in better understanding the item's usefulness in estimating behavior.

A Multidimensional Risk Measure

While researchers have examined the reliability and validity of the SCF measure, others have noted that the complex nature of financial risk tolerance should not, and possibly cannot be measured by a single question (Bonoma & Schlenker, 1978; Culter, 1995; Grable & Lytton, 2001; Roszkowski, Davey, & Grable, 2005). In 1999, Grable and Lytton began the development of a measure that would consider multiple dimensions of financial risk tolerance. The method they followed in developing the measure was outlined by Babbie (1983) and originally included 100 items selected by reviewing industry and academic journals. Based on a review of each item's face validity, the number of questions was reduced to 50 by removing those items that seemed to measure constructs other than financial risk tolerance. Through the use of bivariate and multivariate item analyses, the final set was reduced to 20 questions. There were eight dimensions of risk measured by these 20 items, which included guaranteed versus probable gambles, general risk choice, choices between sure loss and sure gain, risk as experience and knowledge, risk as a level of comfort, speculative risk, prospect theory, and investment risk. A principle component factor analysis was performed in order to further refine the measure. The result produced a 13-item measure that tests the constructs of investment risk, risk comfort and experience, and speculative risk. A test of reliability showed a Cronbach's alpha coefficient score of .75 for the index. The last process in the development of the 13-item measure involved testing for construct validity. This was accomplished by comparing scale scores to the SCF measure, which indicated a correlation coefficient of .54.

In a follow-up study, Grable and Lytton (2003) sought to test their measure for validity by comparing the summated scores of the 13 items to the asset allocation choices of investors. Their hypothesis was based on Modern Portfolio Theory (Markowitz, 1952), which predicts that higher risk tolerance results in greater equity ownership. The results showed a significant positive association between risk tolerance, as measured by the 13-item instrument, and equity ownership. There was also a significant negative relationship with fixed income and cash ownership. Similar results were shown in a regression analysis that identified the risk-tolerance score as the most significant explanatory variable in the study. The reliability of the scale, based on Cronbach's alpha, was .70. Yang (2004) reported a similar level of reliability in a study of adult residents and undergraduate students in Georgia.

Summary

It is important to note that while there are a number of risk-tolerance assessment techniques, tools, and models available for researchers to use, the SCF item and the 13-item scale have grown in importance over the past decade. For example, nearly all personal finance reports in the literature that utilize SCF survey data also reported respondents' risk tolerance via the risk item (Chaulk, Johnson, & Bulcroft, 2003; Coleman, 2003; Ding & DeVaney, 2000; Finke & Huston, 2003; Grable & Lytton, 2001; Sung & Hanna, 1996; Wang & Hanna, 2007; Yao, Gutter, & Hanna, 2005). Grable and Lytton (2001) found the SCF risk tolerance scale to be a modestly stable measure. On the other hand, the 13-item measure has been accessed on the Internet more than 15,000 times via an online risk-assessment site hosted by Rutgers University[a]. Data from the 13-item measure has been used in numerous studies by policy makers at the state and federal level, and by financial planning firms when working with clients. Given the use of these two assessment tools and the potential, as well as real policy implications resulting from studies utilizing one or both assessment methods, it is imperative that these measures occasionally be reviewed and evaluated. Doing so adds to Grable and Lytton's (2001) original work by establishing a validity benchmark for the SCF item. The remainder of this paper describes a methodological process designed to review and evaluate these measures.

Methodology

Data

The data for the current study were collected in the fall of 2006 using a web-based survey tool. The respondents were chosen from a convenience sample of faculty and staff drawn primarily from a large Southwestern public university. Data on socioeconomic, demographic, and asset allocation related information of participants were collected using the web-based survey, which was comprised of 30 questions. The survey also included risk tolerance measures similar to the one used in the SCF and the 13-item Grable-Lytton Risk Tolerance Scale (GL-RTS). While responses to the asset allocation questions were recorded over a range of 0 to 100%, the remaining questions in the survey were recorded as categorical variables. The sample consisted of 328 married respondents who individually answered the survey. The sampling method matched closely with the one used by Grable and Lytton (2001) when they attempted to establish the validity of the SCF item.

Reliability and Validity Tests

Reliability tests were performed to test whether the 13 items in the GL-RTS are internally consistent and whether the scale is truly measuring risk accurately. Similarly, a concurrent validity test of the GL-RTS was also performed to ensure that the scale's measure of risk tolerance is sound and is consistent with the measure obtained through other widely used scales, such as the SCF measure of risk tolerance. The reliability of the two scales was measured using Cronbach's alpha measures. Reliability tests were conducted using both standardized and non-standardized values of the GL-RTS.

A concurrent validity test was then conducted to examine whether the GL-RTS instrument is able to fully measure financial risk tolerance. It is possible to use a concurrent validity test to determine the correlation of the instrument being tested with the measurement criterion (Litwin, 1995). We applied this statistic to compare the measures of GL-RTS with the SCF risk tolerance measure. The concurrent validity test compared the SCF measure with each of the 13 items in the GL-RTS. Finally, the correlation between the GL-RTS and the SCF scale was determined. Additionally, correlations of the SCF scale with the investment, financial, and speculative risk components of the GL-RTS were measured. This analysis approach closely followed the methodology suggested by Grable and Lytton (1999).

Empirical Analysis of Risk Tolerance on Portfolio Allocation

Outcome Variables. In this research, the outcome variables used were continuous and comprised of the percentage of assets held in stocks for the first model and the percentage of assets held as cash in the second model, with 0% being the lowest possible allocation and 100% being the highest. The stock holdings included investments in savings, checking, 401(k), broker accounts, and company stocks. A cash variable was included in the second model that comprised the percentage of cash holdings, including all the investment, savings, checking, brokerage and other tax advantaged accounts held by respondents.

Independent Variables

Risk-Tolerance Measures. The independent variables of interest in this study were the risk-tolerance scores of respondents. Scores were determined by assessing respondents' self-reported answers to question(s) that represented their perception of financial risk tolerance. The measures used in this research were calculated using the risk-tolerance items from the SCF and the GL-RTS.

Responses to the SCF item were reverse coded. Those willing to take substantial risk were coded 4, while those not willing to take any financial risk were coded 1. Risk-tolerance scores, based on the GL-RTS (see Appendix), were reverse coded as well for items 1 - 10, so that higher scores reflected greater risk tolerance. The scale was composed of three subscales. Questions 4, 5, 8, 11, and 12 addressed investment risk; questions 1, 3, 6, 7, and 13 evaluated financial risks; and questions 2, 9, and 10 addressed speculative risk. Total risk-tolerance scores were obtained by summing the individual scores from the 13 questions. Finally, both risk-tolerance measures were scaled on a range of 1 to 4, with 1 being most risk averse and 4 being most willing to take risk.

Other Control Variables. There is a large and growing body of literature suggesting that age, gender, income, and education are significantly associated with risky asset ownership (Chaulk et al., 2003; Grable & Lytton, 2003; O'Neill, Xiao, Bristow, Brennan, & Kerbel, 2000; Sung & Hanna, 1996; Wang & Hanna, 2007; Xiao, 1996; Zhong & Xiao, 1995). Specifically, younger males with high income and higher levels of educational attainment are generally assumed to hold riskier assets. We controlled for these fac-

tors in our model. For the purpose of this analysis, age was split into quintiles in order to demonstrate the differences in asset holdings across age groups (Finke, Huston, & Sharpe, 2006; Heaton & Lucas, 2000; Shorrocks, 1975). The lowest quintile of respondents, below 36 years of age, was used as the reference group. The reference group was compared against age groups 36 to 41, 42 to 47, 48 to 55, and greater than 55. Past studies have found that age is a predictor of savings and investment participation (Ameriks & Zeldes, 2000; Haurin, Hendershott, & Wachter, 1996) with younger individuals being more likely to take risks in pursuit of their savings and investing goals.

Gender was included as a control variable because of its significant association with risky asset ownership and wealth in previous literature. Previous studies have found that men are more likely to invest in risky financial assets when controlling for other factors than women (Embrey & Fox, 1997; Sunden & Surrett, 1998; Yuh & DeVaney, 1996; Zagorsky, 2005). Male primary income earners were included in the model, using female primary income earners as the reference group. The primary income earners were the spouses responsible for greater than 50% of the household's income. The male primary income earner variable included males who earned more than 50% of the family's income. Conversely, the female primary income earner variable included females who earned more than 50% of the family's income. Joint ownership of assets was included in the model, after controlling for asset ownership by only the husband or the wife as the reference group. This categorical variable was created by coding as 1 when majority of the assets in the household are held jointly by both spouses and as 0 if otherwise. These variables were included to control for the effects of income and wealth on risky asset ownership (Gutter & Fontes, 2006; Zagorsky, 2005).

In previous studies, presence of human capital, as evidenced through educational attainment, was found to be a predictor of savings and retirement planning behavior (Springstead & Wilson, 2000; Yuh & DeVaney, 1996). Educational attainment was controlled for by using a binary variable, coded as 1 if the respondent had an educational attainment of a college degree or higher, and as 0 if otherwise.

Analysis

This research compared the measure of the SCF risk-tolerance item with that of the GL-RTS for determining the investment behavior and risky asset allocation among households. We have reported the descriptive statistics along with the chi-square and *t*-tests for the groups. The chi-square and *t*-tests were performed to detect any significant variation that may exist in risk tolerance based on different demographic and asset allocation characteristics. When comparing two groups, chi-square was first calculated followed by pair wise comparisons within the groups (age, educational attainment). The *t*-tests were used to identify significant differences in the mean scores for the two groups. In the case where there were multiple groups, as with educational attainment, one of the groups was held as a reference category and *t*-tests were computed to compare other groups against this control group. For investment ownership comparisons, ownership of the majority of the assets in one asset class was coded as 1 and as 0 if otherwise. The *t*-tests measured the differences in risk tolerance for individuals who held a majority (> 50%) of their assets in one particular type of asset class (e.g., stocks) against those who had a majority allocation in other asset classes.

Empirical Tests. A notable portion of respondents owned no stocks (13%), but the majority (87%) held at least some stock, with 25% of respondents holding no cash investment assets. As a result, models run using the ordinary least squares (OLS) regression technique may violate the normal distribution assumption of the sample. A more appropriate statistical technique for examining this type of distribution is the tobit model (Wooldridge, 2006). Therefore, tobit regression models were used in this study to determine the extent to which these risk-measurement instruments (i.e., SCF item and the GL-RTS) were associated with investment in risky and non-risky assets, controlling for age, educational attainment, and other demographic variables. Another tobit model was run to examine the extent to which the investment component of the GL-RTS was associated with asset allocation behavior.

Results

Descriptive Statistics

Table 1 shows the results from the descriptive statistics and the means tests. The results indicated that women (M_{SCF} = 2.21; $M_{GL\text{-}RTS}$ = 25.85) had a significantly lower risk-tolerance score than men (M_{SCF} = 2.58; $M_{GL\text{-}RTS}$ = 27.96, respectively) on both scales ($t = -5.03$, $p < .05$; $t = 4.03$, $p < .05$). The chi-square statistics were significant for age in both scales ($\chi^2 = 9.9$, $p < .05$; $\chi^2 = 80.2$, $p < .05$) Compared to the reference age group of 35 or lower, those in the 36 - 41 age group had a significantly higher risk-tolerance score on both scales. Conversely, those in the age group of above 55 years reported a much lower risk-tolerance score on

Table 1. Descriptive Statistics (*N* = 328)

	Overall		SCF Risk			GL-RTS		
Variables	**Coding**	**%**	***M***	**χ^2**	***t* - test**	***M***	**χ^2**	***t* - test**
Risk scores			2.39			26.91		
Gender								
Male (reference group)	1 = yes; 0 = no	50	2.58			27.96		
Female	1 = yes; 0 = no	50	2.21		–5.03***	25.85		–4.03***
Age				9.89**			80.2**	
< 36 (reference group)	1 = yes; 0 = no	21	2.47			26.81		
36 - 41 years	1 = yes; 0 = no	22	2.52		1.63**	27.86		1.77**
42 - 47 years	1 = yes; 0 = no	20	2.37		–0.22	26.16		–1.20
48 - 55 years	1 = yes; 0 = no	18	2.32		–0.81	26.13		–1.27
> 55 years	1 = yes; 0 = no	19	2.26		–1.81**	26.61		–0.21
Use financial advisor	1 = yes; 0 = no	43	2.47		1.77**	26.99		0.69
Educational attainment				42.6***			100.3**	
College degree (ref. group)	1 = yes; 0 = no	39	2.43			27.08		
High school or lower	1 = yes; 0 = no	10	1.93		–3.81***	24.32		–3.16***
Associate degree	1 = yes; 0 = no	15	2.18		–2.23**	25.92		–1.55**
Postgraduate	1 = yes; 0 = no	36	2.53		3.06***	27.71		2.53***
Female primary earner	1 = yes; 0 = no	37	2.32			26.12		
Male primary earner	1 = yes; 0 = no	63	2.43		2.33**	27.38		2.28**
Jointly held assets	1 = yes; 0 = no	71	2.35			26.89		
Asset allocation								
Invest > 50% in stocks	1 = yes; 0 = no	55	2.62		3.61***	27.59		1.40**
Invest > 50% in bonds	1 = yes; 0 = no	12	1.89		–3.12***	23.58		–3.17***
Invest > 50% in REIT	1 = yes; 0 = no	7	2.28		1.03	26.46		0.61
Invest > 50% in cash	1 = yes; 0 = no	16	2.25		–1.57*	25.9		–1.58*

* $p < .10$. ** $p < .05$. *** $p < .01$.

the SCF scale. This relationship was not significant in the GL-RTS. The chi-square results for educational attainment were also significant for both scales ($\chi^2 = 42.6$, $p < .01$; $\chi^2 = 100.3$, $p < .05$). Further, compared to the reference group of respondents who had completed their undergraduate college degree ($M_{SCF} = 2.43$; $M_{GL\text{-}RTS} = 27.08$), those with less educational attainment had lower risk tolerance. Conversely, those who had attained a postgraduate degree ($M_{SCF} = 2.53$; $M_{GL\text{-}RTS} = 27.71$) had a significantly higher risk-tolerance score on both scales ($t = 3.06$, $p < .01$; $t = 2.53$, $p < .01$).

The risk tolerance scores of respondents on the SCF item were higher ($t = 1.77$, $p < .05$) for those who used a financial planner (2.47) when compared with respondents who did not use the services of a financial planner (2.22). This relationship, however, was not significant in the GL-RTS. Furthermore, respondents who had invested greater than 50% of their wealth in stocks recorded a significantly higher risk tolerance ($t = 3.61$, $p < .01$; $t = 1.40$, $p < .05$) on both scales ($M_{SCF} = 2.62$; $M_{GL\text{-}RTS} = 27.59$) when compared with those that did not invest greater than 50% of their wealth in stocks. However, those who had greater than 50% of their assets invested in bonds ($M_{SCF} = 1.89$; $M_{GL\text{-}RTS}$

Table 2. Reliability Estimates for the GL-RTS (Cronbach's Alpha)

GL-RTS (Non Standardized)	GL-RTS (Non-Standardized)	GL-RTS (Standardized)
Average inter-item covariance	0.10	0.19
Reliability coefficient (Cronbach's Alpha)	0.74	0.75

= 23.58) had a lower risk-tolerance score ($t = 3.12$, $p < .01$; $t = 3.17$, $p < .01$) as compared to those who did not invest greater than 50% of their assets in bonds.

Reliability Test

Reliability tests were conducted for both standardized and non-standardized scores on the GL-RTS (see Table 2). The results showed a Cronbach's alpha of .74 for the non-standardized scores and a Cronbach's alpha of .75 for the standardized scores on the scale. The scores indicated an acceptable level of reliability.

Concurrent Validity

Concurrent validity of the SCF item was measured by calculating the correlation of the GL-RTS with the SCF measure. The results (see Table 3) indicated that the GL-RTS had a significant positive correlation with the SCF scale ($\rho = 0.60$, $p < .01$). Correlation of the SCF item was also measured with each item in the GL-RTS. The results indicated that items 1, 4, 5, 6, and 12 had a correlation of greater than 0.40, where item 12 had the highest correlation (0.61) with the SCF item.

As explained in the Grable and Lytton (1999) study, the GL-RTS is composed of three components: (a) investment risk tolerance, (b) financial risk tolerance, and (c) speculative risk tolerance. Correlations with the SCF item were measured with each of these three components of the GL-RTS. The results showed that the correlation between the investment risk component and the SCF scale was 0.62, whereas the correlation between the financial risk component of the GL-RTS and the SCF scale was 0.48. Finally, the correlation between the speculative risk component and the SCF scale was 0.22. These results confirmed the Grable and Lytton (2001) hypothesis that the SCF item appears to be a much better indicator of investment risk tolerance than general financial risk tolerance.

Investments in Stocks

Tobit regression analysis was used to analyze association between risk tolerance and portfolio allocation. The dependent variable in each regression was the proportion of an investor's portfolio held in stocks. The independent variables included a number of socio-demographic factors and risk tolerance (see Table 4). Risk tolerance was measured with the SCF risk tolerance measure in the first model, the 13-item measure in the second model, and the investment component of the risk tolerance scale in the third regression. The third model was introduced because of the high correlation between the SCF item and the investment risk component of the GL-RTS.

Results showed that in the first model, risk tolerance was positively associated with allocation of stocks in the portfolio. Further, risk tolerance measured by the GL-RTS in the second model and the investment risk component of the GL-RTS in the third model were both significant and positively associated with stock holdings within the respondents' portfolios. Among the control variables, those in the 48–55 age group, when compared with the reference age group of respondents less than 36 years old, were more likely to allocate a higher proportion of their assets into stocks. This relationship was significant across all three models. Additionally, all three models indicated that respondents who jointly held the majority of their assets with their spouse, as opposed to the reference group of respondents who did not do so, were more likely to allocate a higher proportion of their assets into stocks. Among other control variables, being male was positively associated with greater portfolio allocation into stocks across all three estimation models.

The major difference in the three models was the risk-tolerance measure that was used after controlling for the same set of variables. However, the explanatory power of the model using the GL-RTS (.082) and the investment risk component of the GL-RTS (.118), as evidenced by their pseudo R^2 measures, were higher than the pseudo R^2 of the model that used the SCF risk-tolerance scale (.076).

Table 3. Criterion (Concurrent) Validity Estimates

Correlation matrix	SCF risk	*p*
SCF risk	1.00	
GL-RTS	0.60	***

*** $p < .001$.

Correlation of SCF measure with the GL-RTS		Correlation: SCF versus 3 components of GL-RTS	
GL-RTS Questions	**Correlation (ϱ) with SCF**	**Risk components**	**Correlation (ϱ) with SCF risk**
Q 1	0.45	Investment risk (4, 5, 8, 11, 12)	0.62
Q 2	0.18	Financial risk (1, 3, 6, 7, 13)	0.48
Q 3	0.11	Speculative risk (2, 9, 10)	0.22
Q 4	0.45		
Q 5	0.46		
Q 6	0.43		
Q 7	0.23		
Q 8	0.32		
Q 9	0.13		
Q 10	0.13		
Q 11	0.30		
Q 12	0.61		
Q 13	0.23		

Asset Allocation in Non-Risky Assets

Three separate tobit regressions were used to analyze the association between risk tolerance and the cash proportion of the portfolio and its association with the respondents' risk tolerance after controlling for other variables (see Table 5). The first model used the risk-tolerance score measured by the SCF item. The second model examined the allocation percentage in cash given one's risk tolerance as measured by the GL-RTS. Similarly, the third model was run using investment risk tolerance, measured by the investment risk component of the GL-RTS.

The results showed that in the first model, higher risk tolerance was negatively associated with allocating a larger proportion of one's portfolio in cash. Risk tolerance, measured by the GL-RTS in the second model and the investment risk component of the GL-RTS in the third model, were also negatively associated with holding cash within the respondents' portfolios. Among other control variables, when compared with the reference age group (respondents who were less than 36 years old), all other age groups were significantly less likely to hold their assets in cash. This relationship was significant across all three models. As in the previous estimations from Table 4, the major difference among the three models in Table 5 was the use of risk-tolerance measures after controlling for the same set of variables. The explanatory power of the model using the GL-RTS (.102) and the investment risk component of the 13-item scale (.120), as evidenced by their pseudo R^2 estimates, were higher than the pseudo R^2 of the model that uses the SCF risk-tolerance scale (.094).

Table 4. Tobit Analysis of Risky Asset Allocation (Stocks) *N* = 328

Variables	Coefficients	*SE*	Coefficients	*SE*	Coefficients	*SE*
Reference age < 36						
36 - 41	9.55	5.93	9.03	6.03	7.90	5.72
42 - 47	7.23	7.66	6.51	6.46	9.07	6.19
48 - 55	16.61***	4.30	16.63***	4.41	14.97**	6.07
> 55	8.92	5.72	6.48	5.72	5.83	5.48
Male	9.78***	1.10	7.20***	1.08	9.97***	0.89
Jointly held assets	0.12**	0.05	0.13**	0.05	0.10**	0.05
College and higher	0.71	4.75	1.97	4.7	2.71	4.58
SCF risk	17.41***	2.97				
GL-RTS			8.82***	0.84		
Investment risk					7.19***	0.92
Intercept	–1.18	8.91	15.32**	6.74	18.16**	9.31
Pseudo R^2	0.08		0.08		0.12	

* $p < .10$. ** $p < .05$. *** $p < .01$.

Table 5. Likelihood (Logistic) of Non-Risky Asset Allocation (Cash) *N* = 328

Dependent Var. Cash > 50%	Coefficients	*SE*	Coefficients	*SE*	Coefficients	*SE*
Ref. Age < 36						
36 - 41	–9.90*	5.50	–9.65*	5.62	–9.16*	5.47
42 - 47	–9.89*	5.80	–9.96*	5.93	–10.90*	5.86
48 - 55	–21.67***	5.93	–21.51***	6.06	–20.50***	5.88
> 55	–21.83***	5.31	–19.75***	5.38	–19.61***	5.24
Male	–0.93	0.64	–0.81	0.67	–0.86	0.73
Jointly held assets	0.01	0.04	0.00	0.05	0.01	0.04
College and up	3.43	4.45	1.15	4.47	3.89	4.43
SCF risk	–11.53***	2.76				
GL-RTS			–4.49***	–1.71		
Investment risk					–4.00***	0.87
Intercept	45.57***	8.13	31.91***	7.11	51.57***	8.69
Pseudo R^2	0.09		0.10		0.12	

* $p < .10$. ** $p < .05$. *** $p < .01$.

Table 6. Multi-Collinearity Test (VIF)

Variable	*M*	1/VIF
SCF risk	1.73	0.579
GL-RTS	1.60	0.625
Age > 55	1.59	0.627
Age 36 – 41	1.49	0.673
Age 47 – 55	1.44	0.695
Age 42 – 47	1.43	0.699
Male	1.32	0.758
College & up	1.11	0.897
Household assets	1.05	0.954
Mean VIF	1.47	

Discussion

The reliability of the GL-RTS in this study (.75) was similar to estimates reported in the literature (e.g., Grable & Lytton, 1999, 2001; Yang, 2004). The concurrent validity of the SCF item, based on a correlation analysis between the GL-RTS and the SCF measure, was .60, which suggests a moderate association between the two measures. While there was also a correlation between the SCF and the investment risk component of the GL-RTS (.62), the explanatory power of the GL-RTS was 6.54% greater than the SCF (.0814 versus .0764) when examining the preference for allocating the majority of one's assets into stocks, and 8.5% greater for association with risk-free asset allocation (.1015 versus .0935). A separate analysis was conducted with only the investment risk component of the GL-RTS scale. The results using this subscale, as shown in Tables 4 and 5, had an even higher explanatory ability when examining the preference for holding wealth in stocks (.118) and cash (.121). All three models in the study indicated that higher risk-tolerance scores were associated with greater ownership of risky assets and negatively associated with ownership of risk-free assets. These results confirm findings previously reported in the literature about the relationship between risk tolerance and asset allocation decisions (Finke & Huston, 2003; Grable & Lytton, 1999, 2001; Gutter, Fox, & Montalto, 1999; Sung & Hanna, 1996; Xiao, 1996). However, the findings from this study demonstrate, for the first time, that the GL-RTS appears to provide a measure of individual asset allocation comparable with the more widely used risk-tolerance measure from the SCF.

Study Limitations

There are several limitations associated with this study. First, the sample size was relatively small. However, in order to control for possible multicollinearity issues that might have existed, variable inflation factors (VIF) were calculated for the variables included in the models. According to O'Brien (2007), a VIF score of greater than 5 indicates potential multicollinearity. Garson (2008) finds that a VIF of greater than 4 could be a cause for concern, whereas Myers (1990), in his seminal work, indicates that a VIF of 10 could be an indicator of multicollinearity. The VIF measures demonstrated that there was no evidence of multicollinearity among the variables (see Table 6). Further, while the sample was limited, the method and demographic characteristics of the sample resembled those found in the Grable and Lytton studies from 1999 and 2001; however, it is important to acknowledge that the findings may not be made general to the population at large. Despite this limitation, this research provides an initial examination on these two financial risk measures. Further research is recommended to replicate this study with a larger and more diverse sample. Only in this way will it be possible to help researchers who use the SCF item better understand the unique implications of the item's use in policy-oriented studies.

Conclusion and Implications

The primary purpose of the current research was to compare the SCF risk measure and the GL-RTS. While the findings from this research concur with previous results reported by Grable and Lytton (1999; 2001), this study adds to the body of research in several ways. First, the study was able to replicate Grable and Lytton's (2001) SCF item validity research. Using data from a completely different sample, the results reported here show interesting similarities, suggesting that while caution should be observed whenever the SCF item is used, the item does indicate a person's investment risk tolerance reasonably well. Second, this study separately examined the three components of the GL-RTS and compared them to the SCF measure. The correlation of the SCF measure to the investment risk component of the GL-RTS empirically confirmed Grable and Lytton's (2001) suggestion that the SCF measure might be more closely related to investment risk than the broader concept of financial risk tolerance. Therefore, caution should be used whenever estimates or observations about non-investment risk behaviors or attitudes are reported with the SCF item. While the measure does a relatively nice job as an indicator of investment risk tolerance, it does less well as an attitudinal measure for other types of financial risk tolerance.

When one considers the complexity of human decision making with regard to uncertainty, the explanatory power of each measure is not unreasonable. However, results from this study suggest that further research using these and other measures should be conducted with a larger and more diverse population to refine the assessment of financial risk tolerance for the benefit of consumers as well as financial planning professionals. It would be particularly useful to test the SCF item and the GL-RTS against other measures of risk tolerance, including the Barsky, Juster, Kimball, and Shapiro (1997), Hanna and Lindamood (2004), and Weber, Blais, and Betz (2002) measures. This and similar research adds to the existing body of knowledge in a way that can benefit financial planners and counselors, researchers, and policy makers. The stakeholders involved in promoting efficient market transactions understand the importance of accurately and efficiently measuring the risk tolerance of investors. Until recently, assessment efforts have relied on multiple approaches and techniques, few of which have been empirically tested. Results from this study help address this gap in the literature. Findings confirm that the SCF item and the GL-RTS offer practitioners and researchers a reasonable way to gauge the risk tolerance of survey respondents. The use of these items adds validity to policy recommendations that stem from research which includes these assessment tools. If an option is available, the use of the longer GL-RTS measure should provide a better estimate of risk tolerance. However, in situations where only the SCF item is available, it appears that the item can be use to estimate tolerance of investment risk. The caveat is that the estimated Cronbach's alpha for the SCF item suggests that the item's reliability is rather low, which could influence confidence interval estimates around mean scores.

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Appendix

The Grable and Lytton Risk Tolerance Scale (G/L-RTS)

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

Endnote

[a] http://njaes.rutgers.edu/money/riskquiz/