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The Development of a Risk Assessment Instrument: A Follow-Up Study

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Abstract

The purpose of this paper is to offer empirical evidence regarding the validity of a 13-item financial risk tolerance assessment instrument originally published by Grable and Lytton (1999) in this Journal. Bivariate and multivariate analyses were used to evaluate data from a sample of individuals who reported both having investment assets and making their own investment decisions. The analysis indicated that responses to the 13-item instrument were correlated with portfolio asset ownership as explained by Modern Portfolio Theory. These findings offer support for the concurrent validity (i.e., one form of criterion-related validity) and the construct validity of the assessment instrument. The paper concludes with a recommendation for further study, such as using the instrument in a longitudinal study to ascertain predictive validity. © 2003 Academy of Financial Services. All rights reserved.

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1. Introduction

Financial planners and advisers have a fiduciary responsibility to assess the level of financial risk that can be tolerated by an individual investor (Morse, 1998). Until recently, the assessment of financial risk tolerance attitudes was conducted primarily through the use of one-dimensional measures (e.g., asking "do you gamble?"), qualitative assessments (e.g., asking "how risk tolerant are you?"), or proxies and heuristics (e.g., age is inversely related

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to risk tolerance). Researchers have long questioned the accuracy of these kinds of assessment techniques; moreover, the general consensus now suggests that attention turn towards the development of a psychographic-based standard assessment instrument (e.g., Hanna & Gutter, 1998; Roszkowski, 1996).

Grable and Lytton (1999) presented a scale development framework and an instrument consisting of 13 items in response to the need for a valid and reliable (i.e., psychometrically designed) risk assessment instrument (Appendix 1). The research was noteworthy because the final version of the assessment instrument offered users a scale that was multidimensional, relatively easy to administer, and reliable. Grable and Lytton also offered support for the construct validity of the instrument (i.e., how meaningful an item or index is in multiple situations); however, they were unable to test for criterion-related validity (i.e., how accurate an item or index is in explaining actual behavior) because of sample limitations.

Expanded use of the 13-item instrument has potentially been hampered by a lack of evidence related to the instrument's criterion-related validity. The purpose of this paper is to expand upon Grable and Lytton's (1999) original research by examining the criterion-related validity of the 13-item financial risk tolerance assessment instrument. Carmines and Zeller (1979) defined this aspect of validity as how accurately an instrument can estimate some type of behavior. This study was undertaken to test the accuracy of the 13-item risk instrument when explaining actual investment behavior. Obviously, from a practitioner point of view, this level of validity is very important.

2. Theoretical background

Understanding and testing the validity of a risk tolerance scale builds on two disciplines of study. On the one hand, psychometric scale development and measurement of validity for a construct such as risk tolerance must be considered. On the other hand, the theoretical and practical implications of risk tolerance in influencing the choice of asset allocation models, investment products, and portfolio accumulation strategies must also be considered. A review of both topics follows.

2.1. Measuring validity of a risk tolerance scale

Central to the development of any data-gathering instrument is a discussion of the quality of the scale as reflected by the characteristics of reliability and validity. Huck and Cormier (1996) summarize the essence of these measurement-related concepts, respectively, as *consistency* and *accuracy*, and go on to state, "accuracy requires consistency" (p. 88). In other words, a scale could reliably produce the same results over repeated uses, but each time, fail to accurately measure the construct it purports to reflect. Conversely, if the scale produces an accurate measurement of the construct, the results would, therefore, be consistent.

To measure the accuracy of a data-gathering tool, the joint committee of the American Psychological Association (APA), American Educational Research Association (AERA), and National Council on Measurement in Education (NCME) acknowledged content-related,

criterion-related, and construct-related validity as the categories, or types of validity, for evaluation (Ary, Jacobs, & Razavieh, 1990). Evidence in support of content-related validity, unlike the other two, is usually not reported numerically on the basis of empirical analysis.

As implied, content-validity reflects the extent to which the content, or topics, included in the measure are representative of the body of knowledge surrounding the construct. Based on the theoretical background or universe of content to be reflected in the measure, experts compare this known body of content to the data-gathering tool. The resulting subjective judgments establish the content-related validity of the instrument, which might also be referred to as logical or sampling validity. Face validity is also associated with content validity, but reflects yet another consideration. A scale is considered to have face validity if it appears to be valid to the research subjects or others unfamiliar with psychometric scale development.

Criterion-related validity reflects the relationship between the data-gathering tool and one or more criteria, or measurements, known or believed to be representative of the attribute or behavior under study. The criteria may be measured at the same time as the completion of the data-gathering tool, or at some future time. Thus, there are two kinds of criterion-related validity: concurrent and predictive. Typically, a Pearson product-moment correlation coefficient is calculated to reflect the association between the data-gathering tool and the criterion measure, which is called a validity coefficient. Criterion-related validity may also be referred to as predictive validity, empirical validity, or concurrent validity. Criterion-related validity is considered to be especially important when the data-gathering tool is associated with practical problems or outcomes where decisions are based on the result (Kerlinger, 1973).

Traits, abilities, behaviors, or other attributes that have evolved from theory are typically referred to as constructs and are measured through data-gathering tools. Construct-related validity assesses the extent to which the tool reflects the personality or psychological construct it purports to measure. Both logical and empirical approaches are used to generate construct-related evidence. Logically, the items included in the tool must represent the larger elements that comprise the construct. Furthermore, the individual items that make up the tool must be an appropriate measurement of those elements.

Empirically, relationships of the items within the tool should be consistent with the theory. Similarly, relationships suggested by the theory should be supported by empirical tests between the data-gathering tool and other external observations. Empirical studies might focus on the relationship between the construct and selected other variables or on the construct scores reported by different segments of the population. To establish construct validity, results of the analysis must be independently consistent with the hypothesized theoretical relationships. Correlation coefficients are calculated to measure convergent validity or discriminant validity.

In summary, the assessment of the validity of a data-gathering tool is a complex process that is critical to determining the quality of the tool. As it pertains to a measurement of risk tolerance, two observations are important to consider. As a personality attribute, risk tolerance is a construct that "is not itself directly measurable but that explains observable effects" (Ary et al., 1990, pp. 261–262). Theories attempt to explain the relationships between risk tolerance and other investment and financial management decisions. Finally, risk tolerance measures result in decisions that influence practical problems, such as financial

strategies as implemented by individuals or their advisors. Thus, it is important that a risk tolerance scale offer evidence of content-related, criterion-related, and construct-related validity.

2.2. Risk tolerance in theory and practice

While a test of the validity of an assessment instrument can be conducted in a nontheoretical setting, the outcome of a validity test is strengthened if the criterion and predictor variable(s) are founded in a theoretical framework. Modern Portfolio Theory provides an ideal theoretical framework when identifying and evaluating criterion, both predicted and predictive, related to financial risk tolerance attitudes and behaviors.

Mayo (2000) described Modern Portfolio Theory as a form of economic theory of consumer behavior where individual investors develop a trade-off between risk and return when developing a portfolio. This theory, according to Mayo, "indicates that investors require ever-increasing amounts of additional return for equal increments of risk to maintain the same level of satisfaction" (p. 184).

The development of the capital asset pricing model (CAPM), as an extension of Modern Portfolio Theory, is considered one of the "most important theoretical concepts in finance" according to Mayo (2000, p. 187). This theory of portfolio construction further refines the relationship between risk and return by indicating that to obtain larger rates of return investors are required to take greater risks. The Capital Market Line exemplifies this proposition as each point on the line represents a combination of risk-free and risky assets (i.e., securities). The implicit result of Modern Portfolio Theory and the CAPM is that the choice of a portfolio asset allocation depends on an "individual's willingness to bear risk" (Mayo, p. 189).

According to Hariharan, Chapman, and Domian (2000) and others (e.g., Irwin, 1993; Morse, 1998; Trone, Allbright, & Taylor, 1996), Modern Portfolio Theory and the CAPM predict that financial risk tolerance, as an attitudinal construct, and financial behaviors should be highly correlated. This principle has been confirmed in the literature. For example, Hariharan et al. (1999) concluded that an "increased risk tolerance reduces an individual's propensity to purchase risk-free assets" (p. 159). Hanna and Gutter (1998) also suggested that financial planners and investment advisors should assume that financial risk tolerance attitudes and asset allocation composition are positively related, holding all other factors constant.

The assumption of a positive relationship between a person's financial risk tolerance and risk-taking behavior is well established in the literature. Trone et al. (1996) summarized the financial decision making process as depending on inputs related to an individual's (1) time horizon, (2) financial position, (3) expectations, and (4) tolerance for risk. They suggested that the assessment of each of these constructs should precede the implementation of an investment plan, with the key determinant of behavior being a person's tolerance for risk. Other researchers studying personal financial behaviors have verified this conclusion (Callan & Johnson, 2002).

As predicted by Modern Portfolio Theory, high-risk tolerance tends to be associated with high savings rates (Chang, 1994; Chen & Finke, 1996; Huston & Chang, 1997). Average to

higher risk tolerance has also been found to be associated with the likelihood of owning investment assets (Xiao, 1996). Yuh and DeVaney (1996) concluded that risk tolerance is directly related to pension plan participation and accumulated retirement savings. As Irwin (1993) pointed out, it is entirely possible that a person may severely underestimate the risks associated with a behavior or overestimate their own risk tolerance for a given situation; however, at the moment the behavior takes place, a subjective assessment of one's own risk attitude must have taken place.

As such, one can hypothesize that financial risk tolerance should be correlated with actual financial risk-taking behaviors. More specifically, if the Grable and Lytton (1999) 13-item financial risk assessment instrument is valid, scores resulting from this data-gathering tool should be related to actual investment behaviors.

3. The 13-item instrument development revisited

Grable and Lytton (1999) originally compiled risk assessment items from the literature in an effort to develop a financial risk-tolerance instrument. Their original instrument consisted of 20 items. They examined the effectiveness of these 20 risk assessment items, both individually and as a scale, using a non-random convenience sample of university faculty and staff. Based on a comprehensive review of the literature and existing risk tolerance scales, an attempt was made to develop a scale that from the outset could be logically judged to have content and construct validity. Further empirical analysis of the individual items and the scale score offered additional construct-validity evidence (Grable & Lytton, 1999, 2001).

Factor analysis is often recommended as a useful procedure for establishing construct validity (Ary et al., 1990; Huck & Cormier, 1996). Grable and Lytton (1999; 2001) used a principal components factor analysis to both reduce the number of items in the instrument and to extract subfactors represented by the instrument. The factor analysis resulted in 13 items being included in the final instrument (Appendix 1). The following three factors were extracted: (1) Investment Risk, (2) Risk Comfort and Experience, and (3) Speculative Risk. The extraction of three factors was interpreted to mean that the instrument measured more than one dimension of financial risk tolerance, an important consideration given the consistent observation that risk tolerance is a multidimensional construct (Callan & Johnson, 2002). While the three factors were correlated with the SCF item, Grable and Lytton made no assertion that the factors should be used individually to predict financial risk tolerance behaviors. Instead, a summated scale, consisting of the multidimensional items (i.e., the three factors) was determined to be the best measure of financial risk tolerance attitudes. It is this summated scale, rather than the separate factors, that is used to assess risk attitudes. The reliability of the overall instrument, using Cronbach's alpha, was 0.75, suggesting an adequate level of internal consistency.

The researchers next attempted, in an exploratory manner, to examine the instrument's criterion validity by testing for construct validity by proxy. Grable and Lytton (1999, 2001) conducted a validity test to compare the final 13-item instrument against the following Survey of Consumer Finances (SCF) risk assessment item:

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.

This one item measure is widely used by researchers, especially those who work with the SCF. This item is generally considered to be reliable as well as valid (note: these assumptions have recently come under scrutiny [Chen & Finke, 1996; Hanna & Chen, 1997]). Grable and Lytton (1999, 2001) concluded that a positive correlation did, in fact, exist between the two measures. They also suggested that their multidimensional instrument might offer a better indication of actual financial risk tolerance attitudes than the SCF item. This initial empirical evidence offered some support for the criterion validity of the 13-item instrument.

Recall that criterion-related validity can be assessed by comparing the data from the instrument to that generated by another data-gathering tool with established validity or to another behavior or manifestation of the measured attribute. The comparison of the 13-item instrument with the proxy of the SCF item offered initial evidence of the former method. In the case of the 13-item instrument, one would expect to accurately assess the actual financial risk-taking attitudes of individuals, which, in turn, should affect behavior (Irwin, 1993). This is naturally the case because an "accurate" risk assessment instrument should lead to the correct classification of individuals into appropriate risk tolerance groupings. As such, financial risk-taking behaviors, as represented by investment portfolio asset allocations, are the relevant criterion of interest to those interested in studying financial risk tolerance. Furthermore, because the relationships are explained by theory, empirical analysis should offer evidence of the construct validity of the instrument.

4. Methodology

This research was designed to yield additional empirical evidence on the validity of the Grable and Lytton 13-item financial risk tolerance instrument. A two-part analysis plan was developed. First, validity coefficients were calculated between risk tolerance scores and investment portfolio asset allocations. Because the data for both measurements were collected at the same time, the analysis offered evidence of concurrent, and not predictive, criterion validity. Second, multivariate analyses using ordinary least squares regression were used to consider the same relationships in the context of selected demographic factors which have been thought to be influential.

4.1. Procedure

An Internet-based survey was used to collect data for this research. Data were collected during fall 2002. The self-administered survey was designed to collect attitudinal, behav-

ioral, and demographic data. The survey was developed and distributed using a university funded online survey distribution Web site.

Several thousand emails were purchased from an email-marketing firm. All emails were obtained from public sources, such as focused search engine extraction, list serves, web malls, and various other Web sites. The final purchased email list contained email addresses from general consumer lists. Approximately 15,000 emails were initially distributed. Slightly more than 2,000 emails were returned as unusable. Of those that received an email, 378 completed and returned the online survey. The useable response rate to surveys distributed was low (approximately 3%); however, this response rate corresponds closely with other national confidential email surveys (Smith, 2003). In addition to the inclusion of the 13-item assessment instrument, the survey also asked potential respondents about their job satisfaction, economic outlook, level of creativity, sports participation (i.e., measure of sensation seeking), and current asset allocation situation. Other variables measured in the survey included gender, age, occupation, marital status, race/ethnic background, and income.

4.2. Respondents

This research was based on a subsample of the 378 survey respondents. The subsample was delimited using two criteria. First, only those respondents who indicated that they had investable assets at the time of the survey were included. Second, the subsample was limited to those who indicated that they were responsible for investment allocation decisions in their household. This resulted in a sample size of 303 individuals. Limiting the validity test to those respondents who both had investable assets and made their own investment decisions helped to insure that the criterion was relevant, reliable, and free from bias as recommended by Ary et al. (1990). For example, the external influence of financial service providers on client's risk tolerance attitudes or asset allocation decisions was reduced with the screening criteria. The demographic profile of the sample is provided in Table 1.

Respondents were, by the very nature of the survey process, "technologically savvy" (Smith, 2003, p. 2). This is exemplified by the divergence in the educational background and occupational status of respondents in the sample as compared to the national average. Overall, respondents had a higher level of education and occupational status than the average American (Bureau of Labor Statistics, 2003); however, in almost every other respect, sample characteristics followed the same trend as national averages (Census Bureau, 2003). The $60,000 median income of the sample was only slightly higher than the U.S. population median of $58,208.

4.3. Dependent variables

The dependent variables (i.e., criterion) used in this study were based on a sequence of two questions. Participants were first asked to respond to the following question: "Suppose that you were to take a snap shot of your current financial position. Approximately what percentage of your total savings and investments are in the following categories?" Options included: (1) cash; (2) fixed income, including government bonds and bond mutual funds; (3) equities, including stock mutual funds, individual stocks, direct business ownership, and real

Table 1
Demographic characteristics of the sample (N = 303)

Background factor	Percent of respondents	Mean/median/SD of respondents	U.S. population estimates
Gender		n.a.	
Women	53%		51%
Men	47%		49%
Age	n.a.	37.12/34.50/11.88	35.30 Years (mean)
Ethnic background		n.a.	
White	90%		75%
Non-White	10%		25%
Marital Status		n.a.	
Married	60%		77%
Not married/other	40%		23%
Household Income	n.a.	$60,100/$60,000/$31,116	$41,994 (mean)/ $58,208 (median)
Home ownership		n.a.	
Own home	64%		68%
Rent or other	36%		32%
Educational background		n.a.	
At least college Education	75%		26%
Less than college Education	25%		74%
Occupation		n.a.	
Professional	56%		30%
Technical/Other	42%		70%

n.a. = not applicable.

estate not including the principal residence; and (4) other, including gold and collectibles. Respondents indicated having, on average, 25%, 21%, 50%, and 4% of assets in cash, fixed income, equities, and other, respectively.

Modern Portfolio Theory was used as the theoretical basis of this research. The criterion of interest in this study was actual risk-taking behavior. As such, the basic hypothesis of this research, using Hariharan et al.'s (2000) postulation, was that risk tolerant investors should, holding other factors constant, own a higher proportion of high-risk, high expected return assets (such as stocks) rather than low-risk, low expected return assets (such as bonds or cash). As such, the theoretical proposition was tested two times, independently.

First, the equity variable, as described above, was used as the dependent variable. Next, the fixed income and cash variables were combined into a single variable. The percentage of assets held in this combined variable was approximately 46% for the sample as a whole. The regression analysis was repeated using this new variable. The "other" component of the portfolio was omitted from the study. The analyses were based on the assumption that asset allocation differences, as measured by the participant's proportion of equity or bond and cash investment ownership, should reflect higher and lower risk tolerance scores, respectively.

4.4. Independent variables

Eleven independent variables were used in this study. The first variable consisted of summated rating scale scores for respondents to the 13-item risk-tolerance assessment. The average scale score was 28.83, with a standard deviation of 4.49. The variance in scores ranged from a low of 16.00 to a high of 41.00. The median score was 29.00. The reliability coefficient alpha for the limited sample was calculated to be 0.70. The mean scores for the 13-item instrument were consistent with previous results, while the reliability coefficient was slightly less than previously reported by Grable and Lytton (1999). This finding was hypothesized to be the result of the socioeconomic status of the limited sample. Respondents were well educated and had investment knowledgeable experience. This may have reduced the variance in item choices selected by respondents, which would have reduced the reliability coefficient.

Other independent variables included age, gender, marital status, attained educational level, ethnic background, occupational status, and household income. Three moderator effect variables (i.e., used to measure interaction effects) were also used. These variables were used to account for possible interactions between (1) income and occupation, (2) income and education, and (3) education and occupation. Certain relationships, based on a review of the literature (see Leimberg, Satinsky, LeClair, and Doyle [2002] for a comprehensive review of the factors related to risk tolerance and risk aversion) were hypothesized to exist between the independent variables and the dependent variables (Callan & Johnson, 2002; Cicchetti & Dubin, 1994; Haliassos & Bertaut, 1995; Powell & Ansic, 1997; Sung & Hanna, 1996). These variables were utilized solely to account for other commonly used determinants of risk-tolerance attitudes and behaviors. While these variables were included to create multivariable models, hypotheses regarding the relationships among these additional independent variables and the dependent variables were secondary to the purpose of this research. Given this, however, certain theoretical relationships are of relevance to this research. For example, it is difficult to hypothesize about the expected relationship between marital status and risk tolerance. On the one hand some researchers argue that single individuals have less to lose by accepting greater risks with investments, while others argue that married couples have a greater ability, both financially and emotionally, to take greater risk. In this research, it was hypothesized, based on work conducted by Sung and Hanna (1996) and others (e.g., Chang & DeVaney, 2001; Haliassos & Bertaut, 1995), that married individuals would be more risk tolerant. This and other hypothesized relationships among the variables are presented in Table 2.

4.5. Methods of analysis

Bivariate and multivariate analyses were used to test the theoretical relationships between participants' financial risk tolerance attitudes and actual risk-taking behavior. The bivariate analysis was limited to the generation of validity coefficients. The decision to use a multivariate analysis, in addition to a simple correlation analysis, was made to take into account other factors that have historically proven influential in determining risk-taking behaviors. Ordinary least squares regression analyses were employed in this study. Regres-

Table 2
Hypothesized relationships between independent and dependent variables

Variable	Equity dependent variable	Fixed-income & cash dependent variable
Financial risk tolerance	Positive	Negative
Age	Negative	Positive
Gender (female = 1)	Negative	Positive
Marital status (married = 1)	Positive	Negative
Education (college or higher = 1)	Positive	Negative
Ethnic background (White = 1)	Positive	Negative
Occupation (professional = 1)	Positive	Negative
Household income	Positive	Negative
Income × occupation	Positive	Negative
Income × education	Positive	Negative
Education × occupation	Positive	Negative

sion analysis was used to better determine the relationship between risk tolerance attitudes and asset ownership, holding other relevant factors constant (Hair, Anderson, Tatham, & Black, 1995).

Tests to uncover multicollinearity between and among the independent variables were conducted before the regression analyses. Correlation coefficients were generated to assess relationships between and among the core independent variables. Moderate (i.e., 0.35 to 0.40) correlations were noted between income and occupation and income and education. As a result, moderator effect variables were generated based on these relationships. Separate condition indices and eigenvalues were generated using procedures in SPSS to further test for multicollinearity among the variables. No additional multicollinearity problems were identified using these procedures.

5. Results

5.1. Correlation analysis

Calculation of the Pearson product moment coefficients (i.e., validity coefficients) offered moderate support for the concurrent validity of the 13-item Grable and Lytton risk tolerance scale. The validity coefficient between the scale score and the percentage of equities comprising respondents' portfolios was 0.31 ($p < 0.001$). The positive correlation suggests that as the score increased—indicating greater risk tolerance—so did the ownership of equities. Conversely, the correlation between the scale score and the percentage of fixed income securities and cash owned by a respondent was -0.32 ($p < 0.001$). This validity coefficient between the scale score and the percentage of the portfolio held in fixed income securities and cash suggests an inverse relationship. Both correlation relationships were congruent with the theoretical propositions.

Table 3
Regression results of equity ownership

Variable	b	SE	Beta
Risk tolerance	2.0027	.4048	.2658*
Age	.0779	.1660	.0270
Gender (women = 1)	−5.0025	3.7614	−.0725
Marital status	7.6248	4.2547	.1099***
Education (college or higher = 1)	−3.6688	8.3594	−.0472
Racial/Ethnic background (White = 1)	10.8934	6.0523	.0945***
Occupation (professional = 1)	14.9384	11.3488	.2157
Household income	.4123	1.3315	.0378
Income × occupation	−1.3104	1.3749	−.1536
Income × education	2.1177	1.5311	.2330
Education × occupation	−2.6501	10.4319	−.0384
Constant	−44.8276	15.5000	

*$p < 0.01$; **$p < 0.05$; ***$p < 0.10$; $F = 7.2443$; $R^2 = 0.2099$.

5.2. Regression analyses

Although the literature suggests that simple correlation coefficients can be sufficient to validate criterion-related validity, it was determined by the researchers that a multivariate analysis was needed to account for other variables that have been shown to influence both risk tolerance attitudes and asset allocation choices. Results from the first regression estimation are provided in Table 3. Financial risk tolerance was positively related to equity ownership. In fact, this attitudinal measure explained the greatest amount of variance in reported equity ownership among the respondents. Marital status and ethnic/racial background were found to have a marginal, but not statistically significant, effect. Those who were married and White tended to own a greater percentage of equity assets compared to others. These reported relationships support the research hypotheses presented in Table 2 (see Chang & DeVaney [2001] for an analysis of socioeconomic factors related to subjective risk tolerance attitudes). None of the other predictor variables were found to be significant in this equation. Overall, the variables used to predict equity asset ownership explained approximately 21% of respondents' actual ownership of equities. The regression equation was statistically significant ($F < 0.0001$).

Table 4 summarizes the findings from the second regression analysis based on the percentage of the portfolio held in fixed income securities and cash. Financial risk tolerance was negatively related to fixed income and cash ownership. As was the case with equity ownership, risk tolerance attitudes explained the greatest percentage of variance in the dependent variable. Age and marital status were found to be statistically significant predictors in this model. Specifically, age was negatively associated with fixed income and cash ownership. The relationship was opposite of the research hypothesis stated in Table 2. Older respondents reported a decreasing level of portfolio assets held in fixed income and cash holdings. Married respondents reported owning less fixed income securities and cash than others. This relationship was found to correspond to the hypothesized relationship reported in Table 2 (see Sung & Hanna, 1996). Overall, this model explained approximately 16% of

Table 4
Regression results of fixed income security & cash ownership

Variable	*b*	SE	Beta
Risk Tolerance	−2.2959	.4140	−.3073*
Age	−.5259	.1697	−.1850*
Gender (Women = 1)	−5.2916	3.8758	−.0772
Marital Status	−8.4850	4.3810	−.1230**
Education (College or Higher = 1)	−.0483	8.6419	−6.214E-04
Racial/Ethnic Background (White = 1)	.3697	6.1987	.0032
Occupation (Professional = 1)	10.7375	11.9052	.1559
Household Income	.4701	1.3767	.0433
Income × Occupation	−1.5781	1.4086	−.1862
Income × Education	.3033	1.5782	.0335
Education × Occupation	−5.7409	10.9296	−.0837
Constant	128.7626	16.0147	

$^{*}p < .01$; $^{**}p < .05$; $^{***}p < .10$; $F = 5.2120$; $R^2 = .1614$.

respondents' ownership of these investment assets. The regression equation was statistically significant ($F < 0.0001$).

6. Discussion

Holding all other factors constant, the scale scores from the 13-item financial risk tolerance assessment instrument were related to the ownership of assets as predicted by Modern Portfolio Theory (Table 2). On average, as respondents' financial risk tolerance increased their ownership of equities, as a proportion of savings and investment assets, also increased. The inverse relationship was supported for the proportion of the portfolio committed to fixed income securities and cash. These results offer evidence in support of the criterion-related and construct-related validity of the 13-item financial risk tolerance instrument.

Findings from this study add to the existing body of financial risk assessment literature. First, the results from this study support the criterion and construct validity of the Grable and Lytton (1999) risk assessment measure. This is not to say that the instrument is perfect or without flaws. Rather, findings from this study suggest that researchers and practitioners who use this instrument, concurrently with other client assessment tools, may be in a better position to understand a client's willingness to invest disproportionately in equity versus fixed income securities and cash. Specifically, clients with high scores on the instrument should be more willing, holding all other factors constant, to invest in equity securities.

Second, findings suggest that other commonly used demographic and socioeconomic factors used to explain financial risk tolerance are problematic in their effectiveness. Consistent patterns did not emerge. Marital status was the only common demographic factor to have a marginal effect in the two models used in this study. Married individuals were, holding other factors constant, more willing to take risks than others.

Finally, the results suggest that other factors may also play a role in determining risk

choices. For example, psychosocial constructs (e.g., locus of control, personality, or money ethics), socio-economic factors, or other factors not yet identified may play an important role in explaining a person's actual risk-taking behavior. These questions are yet to be explored.

As suggested above, researchers and practitioners, in particular, need assurance that any risk assessment instrument, tool, item, or measure that they use is both reliable and valid. Grable and Lytton (1999), in their original study, concluded that the 13-item risk instrument was reliable. They also took steps to verify the instrument's validity. This follow-up study adds further support to the instrument's validity. Regardless, some potential users of the instrument may be concerned with the amount of explained variance in the models used in this study. This concern may be unjustified. The ideal situation might be a single instrument that could explain 70% or more of a person's risk-taking behavior. Unfortunately, no single instrument, item, or measure has been developed to do this. The fact that an instrument designed to assess risk-taking attitudes explains less than 25% of actual risk-taking behavior is not surprising, given the complexity of the construct. First, according to Pedhazur and Schmelkin (1991), "the interpretation of R^2 is not as simple and straightforward as many practitioners seem to believe" (p. 380). Looking for a single item or instrument to explain a large proportion of variance can be a perilous way to assess the usefulness of a measure, especially in social science research. Pedhazur and Schmelkin and others (e.g., Hair et al., 1995) note that R^2 is population and sample specific. "Making matters even worse is the fact that R^2 provides no information about what is probably of greatest interest, namely the effects of specific variables" (Pedhazur & Schmelkin, 1991, p. 448). While the level of explained variance in the models was modest, it is equally important to recognize that in this research, financial risk tolerance, as measured by the 13-item instrument, was the most important factor differentiating between risky behaviors. What is needed is additional research using the instrument, with other variables to further test the effect of risk tolerance attitude on behaviors.

7. Summary

The purpose of this research was to expand upon Grable and Lytton's (1999) original financial risk tolerance research by examining other evidence to support the criterion-related and construct-related validity of the 13-item financial risk tolerance assessment instrument. The study results indicated, using data from a sample of technologically savvy respondents, that the 13-item instrument was accurately correlated with actual investment behavior on the basis of the theoretical propositions. Specifically, it was concluded that there was a significant and positive relationship between scores on the 13-item instrument and increased levels of equity ownership among this sample. Conversely, and consistent with Modern Portfolio Theory, there was a statistically significant inverse relationship between the risk tolerance score and the proportion of the respondents' portfolios held in fixed income securities and cash.

Consistent with other research, the findings indicated that, holding all other factors constant, equity ownership was marginally related to a respondent's marital status and racial/ethnic background. White married respondents reported owning more equity assets. On average, respondents' age was negatively related to the proportion of the portfolio held

in fixed income securities and cash. Also, those who were married reported owning less fixed income securities and cash in their portfolios.

Taken as a whole, the findings from this research support the use of the 13-item assessment instrument as a measure of the risk tolerance construct among those who have investable assets. These finding are consistent with the theoretical premise of Modern Portfolio Theory. This theory states that risk and return are positively linked, and that individual investors should determine their asset allocation, at least in part, on the basis of financial risk tolerance. In this study, those who reported higher levels of risk tolerance did, indeed, hold more equity assets than others, while those with lower levels of risk tolerance held more fixed income securities and cash.

8. Recommendations for further research

Grable and Lytton (1999) originally published the 13-item financial risk tolerance assessment instrument in an attempt to "move the financial service profession closer to the ultimate development and adoption of a standardized financial risk-tolerance assessment instrument" (p. 164). Their original presentation established a foundation for this objective. The research presented here moves this effort one step further. Specifically, the findings suggest that the criterion-related and construct-related validity of the instrument is sufficiently strong. When considering asset ownership, the instrument offers potential for both practitioners and researchers.

However, three particular research needs continue to be of importance. First, a predictive criterion-related validity test is needed. Recall that the survey used in this study was cross-sectional, which limited the criterion-related test to a concurrent validity analysis. A longitudinal or panel study is needed to determine the predictive usefulness of the instrument.

Second, research attention should be directed towards the development of a new form of risk assessment. This new form should offer the following attributes: readability and applicability to those with lower reading and cognitive abilities, and ease of administration. Important to content validity is the assertion that the instrument must be "free from the influence of factors that are irrelevant to the purpose of the measurement" (Ary et al., 1990, p. 258). Because risk tolerance may include an assessment of dollar loss, the inclusion of various dollar amounts in the items may inordinately bias the responses. Alternate methods for measuring dollar loss need to be considered.

Finally, ongoing national surveys of risk attitudes and behaviors are needed. Results from national surveys could then be used to norm assessment scores to representative national and subsample cohorts. Ultimately, this information could be used to better educate investors and financial consultants about the risk and return tradeoffs inherent in asset allocation decisions.

Grable and Lytton (1999) concluded their paper by stressing the need for the continued use, evaluation, and adaptation of the original 13-item instrument with different samples and constituencies. This conclusion applies to this study as well. Retesting the reliability and validity of the instrument can lead to improvements in the assessment of financial risk tolerance. Such research can only further the efforts of practitioners and researchers as they attempt to link risk-tolerance attitudes to risk-taking behaviors.

Appendix

13-Item risk tolerance measure

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

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