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Financial risk tolerance revisited: the development of a risk assessment instrument☆

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Abstract

This paper explores conceptual, methodological, and empirical issues related to the development of a financial risk-tolerance assessment instrument. Financial risk tolerance is a significant factor in a number of household financial decisions, yet few recognized, valid, and reliable methods of assessment are available for use by financial service providers and educators. Empirical results from a multistage development of a 13-item risk assessment instrument are discussed. The multidimensional instrument is presented as the foundation for the development of a more widely used and accepted index. Future use by practitioners and researchers is encouraged to further validate the usefulness of the instrument.

JEL classification: D81

Keywords: Risk Tolerance; Risk Assessment; Heuristics

1. Introduction

Whether measured for the purpose of self-assessment or for documentation of investment suitability, financial risk tolerance is assumed to be a fundamental issue underlying a number of financial decisions. For this reason, researchers have long been interested in understanding

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the relationship between personal financial risk tolerance and factors as diverse as the life cycle and asset allocation choice decisions.

Unfortunately, according to Droms (1988), MacCrimmon and Wehrung (1986), Roszkowski (1995), and Roszkowski, Snelbecker, and Leimberg (1993), there are few, if any, generally recognized measures or instruments designed to ascertain someone's financial risk tolerance or preference. According to Roszkowski et al. "most existing devices appear to have been created by various financial planning concerns for their local 'in-house' use or are adaptations of techniques that were meant for use in scientific studies . . . no one measure has yet emerged as the standard by which the others can be evaluated" (Roszkowski et al., 1993, p. 230).

The need for a widely accepted and commonly used instrument is as great today as any time in the past. Without such an instrument financial service providers and researchers have been forced to use other assessment techniques that may not adequately measure the underlying construct of financial risk tolerance. Furthermore, according to risk-tolerance researchers (e.g., Droms, 1988) and financial planning practitioners (e.g., Opiela, 1996), the lack of a widely accepted risk-assessment instrument has been an ongoing problem slowing the pace of research in the area of financial management within the larger context of personal financial planning and investment management.

The purpose of this paper is to present a framework for the development of a financial risk tolerance assessment instrument, and, based upon this framework, propose a financial risk-tolerance assessment instrument with corresponding reliability and validity estimates. The concepts presented in this paper are offered with the hope of moving the financial service profession closer to the ultimate development and adoption of a standardized financial risk-tolerance assessment instrument.

2. Financial risk-tolerance assessment: a review

The study of risk has been of interest to investors and academics for hundreds of years (Bernstein, 1996); however, most research attempts to understand financial risk tolerance are relatively recent. Over the 75 years of study in the United States, the assessment of financial risk tolerance has tended to revolve around five methodologies: choice dilemmas, utility theory, objective measures, heuristic judgments, and subjective assessment. The following discussion briefly describes these methods.

Choice dilemmas were a popular method of risk assessment until the mid-1970s. Basically, choice dilemmas are scenarios where respondents are asked to make a risk choice for themselves or someone else regarding an everyday life event. After years of use these tests were found to generate little evidence of general risk-taking propensity across situations because the items were one-dimensional. MacCrimmon and Wehrung (1986) summarized findings related to choice dilemmas by concluding that items that ask someone "how risk tolerant are you?" measure only a small part of the multidimensional nature of risk and that most people misstate their risk tolerance in these situations.

Utility theory continues to be a popular method of assessing financial risk tolerance; however, recent research challenges the standard utility function assumption by showing that

most people do not have a constant risk aversion throughout the entire domain of wealth (Shefrin and Statman, 1993). It has been suggested that utility theory cannot adequately represent risk-taking preferences and tolerances because "the magnitudes of potential loss and gain amounts, their chances of occurrence, and the exposure to potential loss contribute to the degree of threat (versus opportunity) in a risky situation" (Kahneman and Tversky, 1979, p. 266). In other words, people tend to be consistently more willing to take risks when certain losses are anticipated, and are more willing to settle for a sure gain when absolute gains are anticipated (Statman, 1995).

The difficulty of measuring and assessing someone's risk tolerance has prompted some researchers to recommend that "financial planners should focus on measurements of objective risk tolerance" (Sung and Hanna, 1996, p. 228). Objective measure analysis appears to offer great potential in the assessment of financial risk tolerance (Schooley and Worden, 1996); however, objective risk-tolerance measures that require researchers to deduce someone's risk tolerance via their asset holdings may also pose serious validity problems. Objective measures assume that investors act in a rational way and that a person's asset allocation is a result of personal choice rather than the advice of a third party. As a result, objective measures 1) tend to be descriptive rather than predictive, 2) do not account for the multidimensional nature of risk, and (c) often fail to explain actual investor behavior (Elvekrog, 1996; Train, 1995).

Financial services professionals commonly use heuristic judgments to assess and predict financial risk tolerance (Roszkowski et al., 1993). This method assumes strong correlation's between demographic and socioeconomic characteristics and financial risk tolerance (Grable and Lytton, 1998). For example, it is commonly assumed that older investors are inherently less risk tolerant than younger investors are. Based on this heuristic, older individuals are typically advised to invest less of their assets in equities and more in fixed income securities. Although often assumed to be based on empirically tested assumptions, heuristic judgments often fail to adequately explain or predict actual investor behavior. In many cases heuristic judgments are little more than commonly accepted myths (Cutler, 1995). As Haliassos and Bertaut (1995) and Yoo (1994) concluded, "the current body of theoretical literature does not adequately describe the behavior of individuals" (Yoo, 1994, p.1), leaving many to conclude that past research gives limited insight into the relationship between demographic and socioeconomic characteristics and risk tolerance.

Research findings related to choice dilemmas, utility analysis, objective functions, and heuristic judgments have led some researchers and practitioners studying risk-tolerance theory to conclude that these methods are not entirely appropriate when attempting to assess a person's financial risk tolerance (e.g., Grable and Lytton, 1998; MacCrimmon and Wehrung, 1986; Statman, 1995). Instead, it has been argued that the best way to concisely and accurately identify a person's financial risk tolerance is to use an assessment instrument designed specifically to measure subjective risk tolerance using multidimensional financial scenarios and situations (MacCrimmon and Wehrung, 1986). However, as noted above, there are few, if any, widely accepted and commonly used measures or instruments designed to ascertain someone's financial risk tolerance (Roszkowski, 1995).

MacCrimmon and Wehrung (1986) recommended the use of a questionnaire type instrument over other types of measures or experiments because a questionnaire does not subject

a respondent's tolerances to "subtle influences of the decision analyst during the assessment process" (MacCrimmon and Wehrung, 1986, p. 65). Questionnaires also were recommended because they allow large numbers of subjects to participate in assessments, thus eliminating response biases that can arise when multiple analysts are used to assess tolerances on an interactive basis. Additionally, instead of relying on a single item, MacCrimmon and Wehrung recommended that surveys and experiments include situation items where respondents are asked to make financial decisions concerning lotteries, stocks, bonds, mutual funds, real estate, options, commodities, and other types of investments.

2.1. A review of instrument development issues

Roszkowski (1998) noted that assessing someone's level of risk tolerance is a difficult process because risk tolerance is an elusive, ambiguous concept. Some researchers have suggested that risk taking is constant across situations, but evidence indicates that, for example, a person's level of risk tolerance for physical activities is not a good gauge of risk taking in financial situations (Roszkowski, 1998; Rowland, 1996). Because many people are unsophisticated about investments, it is essential that assessment instruments consider different classes of assets and situations. Without this consideration and the addition of multidimensional questions, research indicates that people will tend to overestimate their actual level of risk tolerance because of a desire to appear socially acceptable. A greater range of financial choices also permits researchers to make more specific distinctions among individuals.

When making risky financial choices, the literature suggests that people consider four distinct elements: 1) the probability of gains, 2) the probability of loss, 3) the dollar amount of potential gains, and 4) the potential dollar loss (MacCrimmon and Wehrung, 1986). To assess risk tolerance accurately, Roszkowski et al. (1993) suggest that risk-tolerance assessments include items querying respondents' tolerances for guaranteed versus probable gambles, minimum probability of success items that require a risky course of action, and items offering minimum returns that require respondents to undertake a risky course of action. Others have suggested including financial assessment items that elicit a choice between a sure loss of a definite amount and the probable loss of a larger amount. Most people become risk seeking in "the sense that they are more willing to risk a large loss than to accept a small, but certain, loss" (Roszkowski, 1995, p. 44).

It also has been recommended throughout the literature that multidimensional situations remain within the context of personal finance rather than including situations outside the realm of personal finance (Rowland, 1996). Roszkowski and Snelbecker (1989) found "that to gauge risk-taking propensity, it is necessary to ask many different items and to integrate the answers. Diversifying the items used to assess risk tolerance is a sound procedure to follow" (Roszkowski and Snelbecker, 1989, p. 118); however, it is important to keep in mind that a questionnaire need not be too long. Roszkowski and Bean (1990), based on the results of a comprehensive review of response biases found in the literature, concluded that questionnaire length is inversely related to response rate, and that shorter questionnaires are almost always better than longer ones.

2.2. A review of validity and reliability issues

The concurrent issues of validity and reliability play an important role in the development of financial risk-tolerance assessment instruments (MacCrimmon and Wehrung, 1986; Roszkowski et al., 1993; Roszkowski, 1995). The following discussion provides a brief outline of validity and reliability concepts as they relate to the development of a financial risk-tolerance assessment instrument.

Validity issues play a critical role in the creation and use of instruments designed specifically to predict and measure behavioral attitudes (Babbie, 1983). Face validity must be assured by combining, modifying, and integrating successfully used financial risk-tolerance items. These types of items generally emerge from a review of previous research, but they may also be developed from empirical observation. It also is important that an instrument obtain convergent validity by comparing different measures of the same trait in tests to assure that they are correlated significantly and substantially with one another. If an index is created from answers obtained from an instrument, it is crucial to test for internal validation. Internal validation assures researchers that a relationship between individual items and the measure itself exists.

Also of importance is the consistency offered by an instrument. According to Pedhazur (1982), in non-experimental research "the reliability of the measure of the independent variable tends to be low to moderate (i.e., ranging from about 0.5 to about 0.8). This is particularly so with some of the attributes used in such research (e.g., cognitive styles, self-concept, ego strength, and attitudes). Therefore, the bias in estimating the regression coefficient in non-experimental research may be considerable" (Pedhazur, 1982, p. 34). This indicates that for a "test to predict criterion, predictive validity is more important than reliability" (Isaac and Michael, 1995, p. 131). Although reliability plays a secondary role, compared to validity, when developing a financial risk-tolerance assessment instrument, it is still important to judge an instrument by how consistently findings emerge from one measurement to another. Future instruments designed to measure risk-tolerance attitudes should show alphas in the range of 0.5 to 0.8, with a correspondingly high criterion-related validity (Henerson, Morris, and Fitz–Gibbon, 1987; Isaac and Michael, 1995; Pedhazur, 1982).

2.3. Summary

The literature suggests that a financial risk-tolerance assessment instrument must include at least five elements: 1) some central concept of risk, 2) allowance for the derivation of a risk measure, 3) relevance to respondents, 4) ease of administration, and 5) adequate validity and reliability (MacCrimmon and Wehrung, 1986). Assessment items used within an instrument must also meet several other requirements as suggested by MacCrimmon and Wehrung: 1) cover a variety of risky financial situations in a multidimensional manner including standard versus natural occurring risks, behaviors, attitudes, threats, opportunities, and simple versus complex situations; 2) be consistent and non-redundant; 3) be interesting to complete; and 4) take a limited amount of time to complete. Of course, an instrument must also show a high degree of validity and reliability. Together the issues that guide the

development of any measurement index, as well as those issues unique to measuring the construct of financial risk tolerance, should serve as a starting point in the development of an assessment instrument.

3. The development and testing of an instrument

The following process, as originally outlined by Babbie (1983), was used as the framework for the development and testing of the instrument presented in this paper. Babbie recommended that an instrument be created by 1) selecting items for an instrument, 2) conducting an item analysis, 3) creating index scores, and 4) testing for index and instrument validity and reliability.

During the initial development stage of the instrument over 100 assessment items were originally selected from a review of academic and trade publications. The face validity of these initial items was examined by the researchers. Items that appeared to measure something other than financial risk tolerance (e.g., preferences for general risk seeking, tolerances for physical pain, etc.) were eliminated; however, special attention was made to assure that subtle differences in financial risk tolerance, such an investment risks and gambles, were represented. Using this method the original 100 items were reduced to 50.

Using a pilot study of undergraduate and graduate students, data were obtained to examine relationships among the remaining 50 assessment items. It was assumed that these items were valid on their face, and that the items were related to one another empirically. This assumption was based on the understanding that the majority of the items were selected from practitioner sources (e.g., financial planning trade publications and in-house brokerage assessments), and that as such, the items were useful in assisting financial planners and their clients in assessing risk-tolerance attitudes. The data were used to conduct bivariate and multivariate item analyses.

A bivariate item analysis was conducted to assure that items were empirically related to each other. Correlation coefficients were developed for each pair of the 50 items. It was hypothesized that respondents who appeared highly risk tolerant on one item should also appear highly risk tolerant on the other items. Items that showed inconsistency in correlation's (i.e., respondents who were generally highly risk tolerant tended to be less risk tolerant on an item) were removed from the pool of items. To avoid multicollinearity problems as outlined by Babbie (1983), items were also eliminated if there was a very strong relationship between two items.

Based on this bivariate analysis approximately 30 items were chosen for inclusion in the item pool. To further reduce the item pool two tests were conducted on these 30 items. First, each item that offered respondents a risk-free alternative or a non-response choice was eliminated. This was done to conform to research findings that suggest possible skewing of responses towards non-response categories (Kahneman and Tversky, 1979). Second, index scores were developed for each respondent using the remaining items. Answer choices for each item were given a weight (maximum range 1 to 4) according to the riskiness of the response. Higher weightings indicated a riskier choice, whereas lower weightings indicated a less risky choice. The index was constructed by summing the weights corresponding to

each response. These items were evaluated using a multivariate item analysis. Specifically, financial risk-tolerance composite scores were regressed on each of the remaining items. This test indicated that 20 items had a strong relationship with the final composite index. This evaluation confirmed that respondents who scored low (or high) on one item generally scored similarly on other items. The final 20 items are shown it Table 1. A discussion of each item, as a measure of a dimension of financial risk tolerance, follows Table 1.

3.1. Item justification

The 20 items in Table 1 were originally selected from published measures as reported by Bernstein (1993), Epstein and Garfield (1992), Goldberg (1995), Malkiel (1994), Mehrabian (1991), Mellan (1994), 1995), Pring (1993), Shefrin and Statman (1985), 1993), Statman (1995), Tobias (1978), *Pioneer News* (1996), Yamauchi and Templer (1982), and other researchers. In addition to meeting validity and reliability requirements, the items 1) offer a high degree of face validity, 2) allow for the derivation of a risk measure, 3) offer relevance to potential respondents, and 4) offer ease of administration (MacCrimmon and Wehrung, 1986).

The items in Table 1, if used individually, will tend to measure a distinct dimension or limited dimensions of financial risk tolerance. Table 2 indicates the dimension of risk each item was originally thought to assess. By understanding how each item works alone, it is possible to see how an instrument using the items in a concurrent assessment of risk tolerance will be more likely to accurately measure a person's overall financial risk tolerance. Note that in some cases an item is useful in measuring more than one dimension of risk. These types of assessment items tend to offer a more accurate measure of someone's risk tolerance, although items that measure only one dimension are useful as well. A brief description of each risk dimension, and how items within each dimension work to assess financial risk tolerance, follows Table 2.

Guaranteed versus probable gambles require a respondent to make risk calculations. For example, in item 2, the probable chance of winning $100,000 is less than any of the other options; however, in terms of a mathematical calculation, the payout of $5,000 ($100,000 $\times$ 5%) is greater than the mathematical payout offered in the other answers. As a result, a respondent who chooses the most risky choice, on its face, is considered to have a higher risk tolerance compared to someone who chooses another answer. In addition to item two, items 11, 13, 14, 15, and 20 all offer a respondent a guaranteed safe option with a corresponding probable gain. In every case, a respondent who chooses a gamble over the guaranteed return should be considered more risk tolerant.

General risk taking propensity, or general risk choice, can be measured by using items four and 13. For example, according to Mellan (1995), a respondent who finds it easy to pass up a bargain when shopping is thought to have a relatively high tolerance for financial risk. This correlation between general risk choice and financial risk tolerance is based on the concept that some individuals view money as a source of anxiety, and because anxiety can be a hindrance to making risky financial choices, an inverse relationship exists between anxiety and risk tolerance. Similarly, the interpretation of item 13 suggests that the more risk tolerant individuals would "borrow money from friends and relatives. . . [to] qualify for a

Table 1
Financial risk tolerance assessment items

Items
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. How would you respond to the following statement? "It's hard for me to pass up a bargain." a. Very true b. Sometimes true c. Not at all true
5. 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
6. 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
7. Which situation would make you the happiest? a. You win $50,000 in a publisher's contest b. You inherit $50,000 from a rich relative c. You earn $50,000 by risking $1,000 in the options market d. Any of the above—after all, you're happy with the $50,000
8. When you think of the word "risk" which of the following words comes to mind first? a. Loss b. Uncertainty c. Opportunity d. Thrill
9. You inherit a mortgage-free house worth $80,000. The house is in a nice neighborhood, and you believe that it should increase in value faster than inflation. Unfortunately, the house needs repairs. If rented today, the house would bring in $600 monthly, but if updates and repairs were made, the house would rent for $800 per month. To finance the repairs you'll need to take out a mortgage on the property. You would: a. Sell the house b. Rent the house as is c. Remodel and update the house, and then rent it
10. In your opinion, is it more important to be protected from rising consumer prices (inflation) or to maintain the safety of your money from loss or theft? a. Much more important to secure the safety of my money b. Much more important to be protected from rising prices (inflation)

Table 1 *(continued)*

Items
11. You've just taken a job at a small fast growing company. After your first year you are offered the following bonus choices. Which one would you choose? a. A five year employment contract b. A $25,000 bonus c. Stock in the company currently worth $25,000 with the hope of selling out later at a large profit
12. 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
13. Assume you are going to buy a home in the next few weeks. Your strategy would probably be: a. To buy an affordable house where you can make monthly payments comfortably b. To stretch a bit financially to buy the house you really want c. To buy the most expensive house you can qualify for d. To borrow money from friends and relatives so you can qualify for a bigger mortgage
14. 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
15. Assume that you are applying for a mortgage. Interest rates have been coming down over the past few months. There's the possibility that this trend will continue. But some economists are predicting rates to increase. You have the option of locking in your mortgage interest rate or letting it float. If you lock in, you will get the current rate, even if interest rates go up. If the rates go down, you'll have to settle for the higher locked in rate. You plan to live in the house for at least three years. What would you do? a. Definitely lock in the interest rate b. Probably lock in the interest rate c. Probably let the interest rate float d. Definitely let the interest rate float
16. 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
17. 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
18. 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
19. 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

Table 1 *(continued)*

Items
20. 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	11.	a = 1; b = 2; c = 3
2.	a = 1; b = 2; c = 3; d = 4	12.	a = 1; b = 2; c = 3; d = 4
3.	a = 1; b = 2; c = 3; d = 4	13.	a = 1; b = 2; c = 3; d = 4
4.	a = 1; b = 2; c = 3	14.	a = 1; b = 2; c = 3; d = 4
5.	a = 1; b = 2; c = 3	15.	a = 1; b = 2; c = 2; d = 3
6.	a = 1; b = 2; c = 3	16.	a = 1; b = 3
7.	a = 2; b = 1; c = 3; d = 1	17.	a = 1; b = 3
8.	a = 1; b = 2; c = 3; d = 4	18.	a = 1; b = 2; c = 3; d = 4
9.	a = 1; b = 2; c = 3	19.	a = 1; b = 2; c = 3
10.	a = 1; b = 3	20.	a = 1; b = 2; c = 3; d = 4

bigger mortgage" as opposed to an individual who would choose the affordable house with a comfortable monthly payment.

Financial risk tolerance, as a choice between a sure loss and a sure gain, can be measured effectively by framing questions that require respondents to choose among alternatives without complete information. Items seven and 14 are based on findings which suggest that risk-tolerant individuals are more likely to feel a sense of satisfaction when they make money by taking some sort of action with incomplete information (Malkiel, 1994; Pring, 1993; Rowland, 1996). On the other hand, a person who is less proactive in earning a gain because of limited information, yet still receives a significant payout (e.g., receiving an inheritance), is generally less risk tolerant.

The literature also suggests that respondents who perceive themselves as experienced investors or more knowledgeable about personal finance issues also tend to be more risk tolerant than others (Goldberg, 1995; Grable and Joo, 1997). Items one, five, six, eight, nine, 10, 12, 15, and 18 all have aspects of the question that require some degree of expertise or knowledge to answer the item. For instance, several of these items require specific knowledge and expertise about interest rates, mortgage markets, and investing. These type of assessment items are useful because, if it is true that experience and knowledge are positively related to risk tolerance, a respondent who answers aggressively to these items should, on average, be more risk tolerant than others.

Highly related to expertise and knowledge is a respondent's overall comfort level when making a risky choice. Items one, three, four, six through nine, 11, 13, 15, and 19 all assess attitudinal temperament towards risk taking. These items fit well with the general consensus that certain individuals share psychological traits that allow them to make risky choices (Carducci and Wong, 1998). For example, someone may be inherently more comfortable

Table 2
Dimensions of risk assessed by each item

Item	Guaranteed vs. probable gambles	General risk choice	Choice between sure loss and sure gain	Risk as experience and knowledge	Risk as a level of comfort	Speculative risk	Prospect theory	Investment risk
Item 1				X	X			
Item 2	X					X		
Item 3					X			
Item 4		X			X			
Item 5				X				X
Item 6				X	X			X
Item 7			X		X			
Item 8				X	X			
Item 9				X	X	X		X
Item 10				X				
Item 11	X				X			
Item 12				X		X		X
Item 13	X	X			X			
Item 14	X		X			X		
Item 15	X			X	X			
Item 16							X	
Item 17							X	
Item 18				X				X
Item 19					X		X	
Item 20	X					X		

investing in hard assets such as real estate compared to equity investments such as stocks. It is important to assess these varying dimensions of financial risk tolerance. One way to do this is to use word associations. For example, as measured by item 8, respondents who perceive risk as synonymous with loss are generally more risk averse than those who perceive risk as an opportunity or thrill (Bernstein, 1993; Mehrabian, 1991; Pring, 1993). In general, risk tolerant respondents are likely to feel a sense of confidence and satisfaction when making a risky choice; less risk tolerant respondents will tend to shy away from taking risks.

Items that measure speculative risk, as the name implies, assume that respondents who have a higher propensity to make a speculation are more risk tolerant in terms of their finances than others. Items two, nine, 12, 14, and 20 combine other aspects of risk taking by forcing a respondent to either take a safe course of action or speculate on the degree of return offered by a situation. Generally, respondents who elect to forgo higher rates of return in pursuit of stability or sure gains are considered to be less risk tolerant than others (Malkiel, 1994; Mehrabian, 1991).

Items 16 and 17 were adapted from Prospect Theory. Prospect Theory states that investors evaluate their choice in terms of potential gains and losses relative to some reference point (Shefrin and Statman, 1993). Item 16 is described in terms of gains, whereas item 17 is

described in terms of losses. This distinction is subtle but profound. In both cases the mathematical payout (i.e., cash flows) are identical. Individuals who choose the sure choice act consistent with risk aversion theory, whereas those who choose the gamble in both cases are most likely risk takers (Statman, 1995). When combined together by averaging answer weights into a single score, these two items work well in predicting financial risk tolerance. Most individuals, assuming they have no prior knowledge of the items, choose the sure gain in item 16 and the chance in item 17. This would indicate a person with moderate risk tolerance. Again, a person who chooses both the sure gain in item 16 and sure loss in item 17 will generally exhibit risk-aversion characteristics, whereas someone who takes a chance in both situations will exhibit risk-taking characteristics.

A respondent's propensity to take direct investment risks is assessed through items five, six, nine, 12, 18, and 19. These items combine the attributes of knowledge and temperament in the assessment of risk tolerance. Knowledge and temperament tend to determine a respondent's ability to deal successfully with emotional investments (Mehrabian, 1991). As such, a person who is willing to invest money, either earned or gifted, into equities, real estate, or hard assets, instead of choosing to hold less volatile investments, is considered to be more risk tolerant than others (Bernstein, 1993).

In summary, the 20 individual items were originally determined to measure either one or several dimension of financial risk tolerance. At a minimum, the 20 items measured at least eight dimensions of risk, including: 1) guaranteed versus probable gambles, 2) general risk choice, 3) choice between sure loss and sure gain, 4) risk as related to experience and knowledge, 5) risk as a level of comfort, 6) speculative risk, 7) prospect theory, and 8) investment risk. Although individually no one item was sufficient to accurately assess financial risk tolerance, it was concluded that when combined together these items could provide a useful and accurate measure of a person's financial risk tolerance.

3.2. Initial use of the instrument with a research sample

The next phase of this study involved administering the 20-item instrument to a larger group of respondents. A convenience sample of faculty and staff from a southern state university ($N = 1{,}075$) was chosen. A modified Dillman (1978) method was used to direct the management of the survey. Specifically, one-half of all employees (approximately 2,000) received an instrument. A reminder card was mailed two weeks after the first instrument was sent. A duplicate instrument was then mailed one week later. After adjusting for missing data and unusable responses it was determined that the survey had a useable response rate of 54%.

Approximately 55% of respondents were female. Seventy-two percentage were married. Respondent ages ranged from a low of 20 to a high of 75 years, with an average of 43 years. Incomes ranged from less than $20,000 to over $90,000. Respondents who were employed in staff positions outnumbered members of the faculty (61% and 39%, respectively). The majority of respondents (63%) possessed a four year college degree or higher, whereas the remainder (37%) had an Associate degree, high school diploma, or less than a high school education. Seventy-seven percentage of the sample indicated that they had a somewhat vague or moderate knowledge of investments and personal finance issues. Likewise, 77% of the sample indicated that they expected future economic conditions over the next five years to

Table 3
Means, standard deviations, and correlations for the 20 risk assessment items ($N = 1,075$)

Item	Mean	Standard deviation	Item correlation with index score
Item 1	2.48	0.64	0.54
Item 2	1.87	0.94	0.58
Item 3	1.85	0.87	0.43
Item 4	2.00	0.64	0.20
Item 5	2.13	0.84	0.67
Item 6	1.83	0.97	0.53
Item 7	1.46	0.76	0.28
Item 8	2.12	0.57	0.44
Item 9	2.47	0.78	0.35
Item 10	1.93	1.00	0.43
Item 11	2.31	0.65	0.49
Item 12	1.55	0.58	0.27
Item 13	1.45	0.56	0.42
Item 14	2.27	0.94	0.63
Item 15	1.78	0.52	0.30
Item 16	1.66	0.94	0.47
Item 17	2.39	0.92	0.41
Item 18	2.02	0.80	0.52
Item 19	1.68	0.65	0.62
Item 20	1.58	0.71	0.45
Index	37.00	6.40	n.a.

be about the same or worse. In general, this convenience sample represented populations found on most four-year college campuses, namely, a group with slightly higher attained education, income, and socioeconomic levels, on average, than the general population. Future research using the items and instrument should incorporate different sample frames and populations to confirm the generalizability of findings.

Financial risk-tolerance scores were determined by each respondent's score on the 20-items in Table 1. An index was constructed by summing the weights corresponding to each response. Higher scores represented higher levels of risk tolerance whereas lower scores represented lower levels of risk tolerance. The average risk-tolerance score was 37, with a standard deviation of 6.40, and a range of 20 to 63. The reliability estimate for the 20-item instrument was 0.78, indicating an acceptable level of consistency (Henerson et al., 1987; Pedhazur and Schmelkin, 1991).

These data were useful in confirming that, overall, 27% of respondents were classified as having low risk tolerances. The majority of respondents (60%) were classified as having moderate risk tolerances, with 13% being classified as having high-risk tolerances. These results were consistent with distributions of financial risk-tolerance scores found in the literature (MacCrimmon and Wehrung, 1985).

Table 3 shows the mean and standard deviation scores from the sample for each of the 20 items, as well as correlation's between each item and the composite score. The correlation range (0.20−0.67) indicated a weak to moderately strong relationship between the individual items and the index score. These bivariate analyses suggested the need for further analysis to refine the scale.

As was the case in the original pilot study, a multivariate item analysis was conducted by regressing financial risk-tolerance composite scores on each of the 20 assessment items. This test indicated that indeed each assessment item had a strong relationship with the final composite index. External item analysis was measured by comparing individual assessment item scores to other item scores and the total index score. This test was conducted to confirm that individual index items provided similar scores for both those with high and low levels of risk tolerance. Results of these item analyses were consistent with the pilot study findings. In general, it was determined that persons who were categorized as having low risk tolerances tended to be less confident in their investment behaviors, less aggressive in their investing behaviors, and more likely to avoid risky financial situations than those who were categorized into higher risk-tolerance categories.

3.3. Factor analysis application

To further explore the issue of multidimensionality in the instrument and to ensure a parsimonious measure, principal components factor analysis was performed on the 20 items. The purpose of factor analysis is to reduce and summarize data by identifying the underlying, or common interrelationships, which can then be conceptually explained, or named, as factors. As such, this phase of the analysis served two purposes relative to the risk tolerance assessment recommendations offered by MacCrimmon and Wehrung (1986). The first purpose of the factor analysis was the identification of the underlying dimensions, or factors; this ensured that within the 20 items the instrument offered a multidimensional approach to financial situations yet focused on the central concept of risk. The second purpose of the factor analysis was the elimination of items that did not significantly contribute to the measurement of the underlying dimensions. This ensured that the instrument was brief, nonredundant, and interesting to complete.

Four statistical criteria are commonly considered in the analysis and interpretation of principal components factor analysis. The eigenvalue-one criterion, the screen test, the proportion of variance accounted for, and the interpretability of the resulting factors (i.e., composite dimensions) were each considered. The first three criterion are used to determine the optimum number of factors, or underlying dimensions, which can be extracted from the data. These are considered in conjunction with interpretability. Rotation, or the turning of the reference axes of the factors about the origin, is often used to effect a factor solution that is simpler or more theoretically meaningful. For this analysis, Varimax rotation was used to simplify the factor loading structure and to increase interpretability. With Varimax, an orthogonal rotation, the factors remain uncorrelated, and the sum of the variance accounted for by the factors does not change.

Based on the eigenvalue greater than one criterion, the principal components factor analysis generated a four-factor solution that accounted for 38.6% of the total variance. Results of both the unrotated and Varimax rotated solutions were considered for interpretability. Based on the screen test, additional factor analyses with unrotated and Varimax rotated solutions were limited to three factors. The latter results were interpretable, with clean loading across factors. This solution accounted for 33.3% of the variance, or a slight

Table 4.
Factor loadings for three-factor principal components solution[a]

	Factor 1	Factor 2	Factor 3
Factor 1. Investment Risk (α = .720)			
Item 5	.744	.193	0.162
Item 6	.635	.095	0.027
Item 19	.604	.268	0.192
Item 18	.472	.228	0.141
Item 14	.465	.401	0.211
Factor 2. Risk Comfort & Experience (α = .502)			
Item 1	.177	.590	0.210
Item 8	.142	.528	0.096
Item 12	.132	.503	−0.340
Item 20	.151	.492	0.129
Item 3	−.101	.459	0.387
Factor 3. Speculative Risk (α = .443)			
Item 16	.016	.234	0.587
Item 17	.134	.004	0.577
Item 2	.316	.237	0.444

[a] Total Instrument α = 0.7507.

reduction from the initial "best linear combination" solution generated solely on the basis of the eigenvalue-one criterion.

In interpreting the rotated factor pattern, shown in Table 4, an item "loaded" on a factor if the factor loading was equal to or greater than 0.45. These items were used in the labeling of the factors, with the exception of item two that was included although the loading equaled 0.4442. Excluding this item significantly reduced the Cronbach's coefficient alpha reliability measure for the factor (from 0.4425–0.3027), as well as for the index (from 0.7507–0.7274). The resulting three-factor solution consisted of 13 items. Consequently, seven items (numbers four, seven, nine, 10, 11, 13 and 15) were omitted from the instrument because they lacked sufficient loadings to support the internal consistency of the factors.

As noted earlier, other researchers have recommended that a risk-tolerance assessment index must produce a reliability coefficient in the range of 0.5 to 0.8 to insure consistency (e.g., Henerson et al., 1987; Isaac and Michael, 1995; MacCrimmon and Wehrung, 1985; Pedhazur, 1982). The Cronbach's coefficient alpha reliability measure of 0.7507 for the instrument falls within the upper end of this range. Reliability estimates for the three factors, as shown in Table 4, are not as strong. However, the underlying factors were not intended to be used as distinct measures. This analysis was done to demonstrate the multidimensionality of the instrument.

Results from the factor analysis suggest that the 13-item instrument measured financial risk tolerance on three constructs: 1) investment risk, 2) risk comfort and experience, and 3) speculative risk. These, in turn, encompassed all of the assumed dimensions as reported in Table 2. As such, it was concluded that the 13-item instrument offers a strong degree of multidimensionality in the measurement of financial risk tolerance. Specifically, the 13 items, when combined into one instrument work together in the assessment of 1) the probability of gains; 2) the probability of losses; 3) the dollar amount of potential gains; 4)

the potential dollar loss through the assessment of guaranteed versus probable gambles; 5) minimum probability of success given a risky course of action; and 6) minimum returns given a risky course of action. These situations are accounted for by the inclusion of assessment items that measure choices and tolerances for guaranteed versus probable gambles, prospect theory dilemmas, and potential versus probable gains and losses.

3.4. Validity issues

The final step in the development of the resulting 13-item parsimonious risk-tolerance assessment instrument involved a test of validity. This test was conducted by analyzing the instrument's construct validity, which is defined as the extent to which one can be sure the index represents financial risk tolerance (Henerson et al., 1987; Litwin, 1995; Silva, 1993). "Demonstrating concurrent validity of an instrument provides good evidence of its construct validity" (Henerson et al., 1987, p. 143). Concurrent validity tests a measure against another measure that has proven psychometric properties. Concurrent validity is calculated as a correlation coefficient (Litwin, 1995).

In addition to the 20 items in the data collection instrument, respondents were also asked to answer a risk-assessment item developed by the National Opinion Research Center at the University of Chicago under the sponsorship of the Federal Research Board as originally asked in the Survey of Consumer Finances (SCF). The SCF is used to gather data on assets, liabilities, financial attitudes, and financial behaviors of individuals and families. The SCF questions asks:

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

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

The SCF risk assessment item has been widely used as a proxy for financial risk tolerance, although no published documentation exists to substantiate the validity of this item. However, based on the use of the item in published research (e.g., Chang, 1994; Grable and Lytton, 1998; Sung and Hanna, 1996; Yuh and DeVaney, 1996), one can assume at least a moderate degree of item validity. Also, scores on the item have been very consistent over time, suggesting a high level of reliability.

Correlation analysis between the SCF item and the index scores derived from the 13-item instrument yielded a coefficient of 0.5383. It was determined that a single item, like that of the SCF, is not able to measure wide variations within the overall dimension of financial risk tolerance. Thus, it is not surprising that the coefficient was moderate. The positive correlation indicates that although both are measuring risk tolerance similarly, the larger 13-item index appears to be measuring multiple dimensions of financial risk tolerance that are not accounted for in the SCF item.

In summary, the 13-item financial risk-tolerance assessment instrument was found to meet the requirements for a multidimensional financial risk-tolerance assessment instrument as

outlined in the literature. Furthermore, the assessment of reliability and validity, based on testing with this convenience sample, support the potential usefulness of the instrument. In summary, the variety of items included, the high degree of validity and reliability, and the potential ease of administration make this a viable assessment tool for researchers, academics, and practitioners.

4. Conclusions

Financial service providers and researchers, in their respective roles as managers, consultants, and investors, share the common objective of quickly assessing individual financial risk tolerances and preferences (both their own and their clients). Unfortunately, according to Snelbecker, Roszkowski, and Cutler (1990) all too often financial service providers, researchers, and household financial managers have little more than qualitative descriptions and intuitive subjective judgments for use in understanding financial beliefs, feelings, needs, and aspirations that affect risk tolerances. Instead of relying on a standardized measure of risk tolerance or empirically tested risk and investment rules, many individuals rely on one-dimensional assessments, objective measures, and other heuristics to gauge their own or someone else's risk-taking propensities. As indicated above, these methods of risk assessment are less effective than using a multidimensional risk-assessment instrument.

The original 20-item, and the factor reduced 13-item, instrument extend previous research into risk assessment whereas offering a solid foundation in the development of a widely accepted instrument. Financial service providers, educators, and researchers are encouraged to use the instrument as a tool for quickly and accurately assessing the financial risk tolerances of clients and other respondents. Further tests of the instrument, both in random surveys and experimental settings, will lead to improved reliability and validity of the instrument, as well as to the eventual development of a financial risk-tolerance assessment instrument for use in private and public organizations. Ultimately the continued use, evaluation, and adaptation of this instrument will have a positive impact on the daily practices of financial service providers, and most importantly, on the lives of financial services clientele and constituencies.

References

Babbie, E. R. (1983). *The practice of social research.* Belmont, CA: Wadsworth Publishing Company.

Bernstein, J. (1993). *The investor's quotient: The psychology of successful investing in commodities and stocks.* New York: John Wiley & Sons.

Bernstein, P. L. (1996). *Against the gods: The remarkable story of risk.* New York: John Wiley & Sons.

Carducci, B. J. & Wong, A. S. (1998). Type A and risk taking in everyday money matters. *Journal of Business and Psychology, 12,* 355–359.

Chang, Y.R. (1994). Saving behavior of US households in the 1980s: Results from the 1983 and 1986 Survey of Consumer Finance. *Financial Counseling and Planning, 5,* 45–64.

Cutler, N. E. (1995). Three myths of risk-tolerance: what clients are not telling you. *Journal of the American Society of CLU & ChFC, 49,* 33–37.

Dillman, D. A. (1978). *Mail and telephone surveys.* New York: John Wiley & Sons.
Droms, W. G. (1988). Measuring investor risk capacity with a pass. *Journal of Financial Planning, 1,* 88–92.
Elvekrog, M. (1996). Psychological 'unbalance' in investing. A matter of emotion, not analysis. *Better Investing, October,* 9–11.
Epstein, I., & Garfield, D. (1992). *The psychology of smart investing.* New York: John Wiley & Sons.
Goldberg, S. T. (1995). Yes, but how do you feel about this investment? *Kiplinger's Personal Finance Magazine, August,* 68–71.
Grable, J. E. & Joo, S. (1997). Determinants of risk preference: Implications for family and consumer science professionals. *Family Economics and Resource Management Biennial, 2,* 19–24.
Grable, J. E. & Lytton, R. H. (1998). Investor risk tolerance: testing the efficacy of demographics as differentiating and classifying factors. *Financial Counseling and Planning, 9,* 61–74.
Haliassos, M. & Bertaut, C. C. (1995). Why do so few hold stocks? *The Economic Journal, 105,* 1110–1129.
Henerson, M. E., Morris, L. L. & Fitz–Gibbon, C. T. (1987). *How to measure attitudes.* Newbury Park, CA: Sage.
Isaac, S. & Michael, W.B. (1995). *Handbook in research and evaluation* (3rd ed.). San Diego, CA: Educational and Industrial Testing Services.
Kahneman, D. & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47,* 263–291.
Litwin, M. S. (1995). *How to measure survey reliability and validity.* Thousand Oaks, CA: Sage.
MacCrimmon, K. R. & Wehrung, D. A. (1985). A portfolio of risk measures. *Theory and Decision, 19,* 1–29.
MacCrimmon, K. R. & Wehrung, D. A. (1986). *Risk management.* New York: The Free Press.
Malkiel, B. G. (1994). *A random walk down Wall Street* (6th ed). New York: W.W. Norton & Company.
Mehrabian, A. (1991). *Your inner path to investment success: insight into the psychology of investing.* Chicago: Probus Publishing Company.
Mellan, O. (1994). *Money harmony: resolving money conflicts in your life and relationships.* New York: Walker and Company.
Mellan, O. (1995). Beyond reason: to build good rapport, consider your client's money personality. *Fee Advisor, November/December,* 62–65.
Opiela, N. (1996). Business practice management: Charles Haines, Jr. *Registered Investment Adviser, 2,* RIA1, 6.
Pedhazur, E. J. (1982). *Multiple regression in behavioral research* (2nd ed). Fort Worth, TX: Harcourt Brace Javanovich, Inc.
Pedhazur, E. J. & Schmelkin, L. P. (1991). *Measurement, design, and analysis: An integrated approach.* Hillsdale, NJ: Lawrence Erlbaum Associates.
Pioneer News. (1996). What type of investor are you? *Author, 10*(1), 1–2.
Pring, M. J. (1993). *Investment psychology explained: Classic strategies to beat the markets.* New York: John Wiley & Sons.
Roszkowski, M. J. (1995). *Risk tolerance assessment.* Bryn Mawr, PA: The American College.
Roszkowski, M. J. (1998). Risk tolerance in financial decisions. In: Cordell, D. M., editor. *Readings in financial planning* (pp. 281–328). Bryn Mawr, PA: The American College.
Roszkowski, M. J. & Bean, A.G. (1990). Believe it or not! Longer questionnaires have lower response rates. *Journal of Business and Psychology, 4,* 495–509.
Roszkowski, M. J. & Snelbecker, G. E. (1989). How much risk can a client stand? *Best's Review (Life/Health Insurance Edition), 90,* 44–119
Roszkowski, M. J., Snelbecker, G. E. & Leimberg, S. R. (1993). Risk tolerance and risk aversion. In: Leimberg, S. R., Satinsky, M. J., LeClair, R. T. & Doyle, R. J. Jr., editors. *The tools and techniques of financial planning* (4th ed., pp. 213–226). Cincinnati, OH: National Underwriter.
Rowland, M. (1996). The risk quiz. *Bloomberg Personal, 1,* 155–158.
Schooley, D. K. & Worden, D. D. (1996). Risk aversion measures: Comparing attitudes and asset allocation. *Financial Services Review, 5,* 87–99.
Shefrin, H. & Statman, M. (1985). The disposition to sell winners too early and ride losers too long: theory and evidence. *The Journal of Finance, 40,* 777–792.

Shefrin, H. & Statman, M. (1993). Behavioral aspects of the design and marketing of financial products. *Financial Management, 22*(2), 123–134.

Silva, F. (1993). *Psychometric foundations and behavioral assessment.* Thousand Oaks, CA: Sage.

Snelbecker, G. E., Roszkowski, M. J., & Cutler, N. E. (1990). Investors' risk tolerance and return aspirations, and financial advisors' interpretations: a conceptual model and exploratory data. *The Journal of Behavioral Economics, 19,* 377–393.

Statman, M. (1995). A behavioral framework for dollar-cost averaging. *The Journal of Portfolio Management, Fall,* 70–78.

Sung, J. & Hanna, S. (1996). Factors related to risk tolerance. *Financial Counseling and Planning, 7,* 11–20.

Tobias, A. (1978). *The only investment guide you'll ever need.* New York: Harcourt Brace Jovanovich.

Train, J. (1995). Buy them high, sell them low. *Financial Times, 12,* B14.

Yamauchi, K. T. & Templer, D. I. (1982). The development of a money attitude scale. *Journal of Personality Assessment, 46*(5), 522–528.

Yoo, P. S. (1994). Age dependent portfolio selection. *Federal Reserve Bank of St. Louis Working Paper* 94–003A, 22.

Yuh, Y. & DeVaney, S. A. (1996). Determinants of couples' defined contribution retirement funds. *Financial Counsel and Planning, 7,* 31–38.