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The Development of the Risky Financial Behavior Scale: A Measure of Financial Risk Tolerance

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THE DEVELOPMENT OF THE RISKY FINANCIAL BEHAVIOR SCALE:

A MEASURE OF FINANCIAL RISK TOLERANCE

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ABSTRACT

There is an increasing need for a more comprehensive instrument to measure risk

tolerance in human financial decision making studies. The traditional economic method

and the more recent psychometric method of examining risk tolerance were both reviewed

in the study. The purpose of this thesis was the initial development and validation of the

Risky Financial Behavior Scale (RFBS), with items taken from four different domains

noted in previous studies. Phase I and II consisted of item pool generation, construct

determination from content experts' review and cognitive interviews. Data from these

stages were collected and used for item revision prior to final data collection. Phase III

consisted of quantitative evaluation of the field administration data using factor analysis,

item analysis, Rasch analysis, and final revision based on item meanings and factor

loadings. Phase IV tested convergent validity and relationships with demographic variables.

A final version of the 20-item survey showed low but acceptable internal consistency

reliability for each of the subscales, and moderate convergent validity was found between

RFBS scale and a commonly used risk tolerance measure, the GL-RTS. Reasons for lower

than expected reliability and validity are discussed. Suggestions for improvement,

implications for use, and future research are also discussed.

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CHAPTER I: INTRODUCTION AND LITERATURE REVIEW

Human decision making has been a productive field for academic researchers in both social science and natural science domains in the past several decades. Of decision making topics, the study of human financial decisions has become an important focus due to its clear connection to our daily lives. Researchers examined how financial decisions were made: whether consciously or subconsciously, whether based on personal knowledge or based on others' opinions, whether they were affected by mood or were completely rational. There are two main approaches used for studying human financial decisions. One is considered to be the dominant traditional approach—using economic and financial normative models. The other approach relies on psychology and neuroscience (Fitzsimons et al., 2002; Hastie, 2001; Mellers, Schwartz, & Cooke, 1998; Weber & Johnson, 2009). The traditional approach assumes a rational and stable decision/choice process determined by utility and probability theories. These theories do not take into account psychological influences on decision making. On the other hand, the psychological and neuroscience model was not studied extensively until "Prospect Theory" (Kahneman & Tversky, 1979) was recognized in 1979 as well as the advancement of neuroscience technology in psychological research (Weber & Johnson, 2009). The current trend in the field of financial decision making relies on the later-developed psychological techniques, and incorporates

some of the traditional theories from the first economic model (Weber & Johnson, 2009).

In other words, the division between the two approaches is not as distinct when it comes to

more recent studies. These two methods are tightly connected, just as in real life we do not

separate consciousness from unconsciousness in practice.

Humans are social beings. A large part of our daily decisions are influenced not only

by our knowledge and rational thinking but also by psychosocial factors such as

stereotypes, norms, social values, human emotions, and confidence level (Byrnes, Miller &

Schafer, 1999; Carr & Steele, 2010; Fitzsimons et al., 2002; Glaser & Weber, 2007). Past

studies have focused on how financial decisions are influenced by our rational thinking and

the social factors around us. However, researchers still try to determine the best way to

measure psychosocial factors, such as level of financial risk tolerance. A psychometrically

sound measure of psychosocial factors in financial decision making is greatly needed,

because it is an important first step to effective study of human decision making. Although

advanced neuroimaging techniques have been introduced in the study of financial decision

making, the high cost and the limited access to the equipment are two major concerns

researchers consider before adopting this method. In addition, the outcomes of

neuroimaging techniques are only providing a general understanding of human behaviors.

Therefore, this study aimed to develop a self-report financial risk tolerance scale that can

be easily administered for research purposes to study the topic of financial decision making

in dealing with credit card and mortgage debt.

Background

As of now, over one million people filed for bankruptcy every year since the financial crisis of 2008, according to United States Court (2012). It is known that there are many causes that lead to the increasing numbers of bankruptcies, but it is not yet clear how psychological states played a role in these financial decisions that eventually led to bankruptcies. Among these cases of bankruptcy, one can guess that the majority of outcomes might result from unwise or risky financial decisions, as well as unexpected negative shocks such as sudden death or other emergencies. In fact, Garrett (2007) pointed out that bankruptcy usually goes with two main factors: high level of consumer debt and other unexpected events. As reported by the U.S. Census Bureau in the latest census report in 2012, home mortgages and consumer credit have been identified as the top two liabilities, holding 89.9% of the total liability of U.S. households. There were around one hundred and sixty million projected credit card holders in 2012. Both credit card purchase volume and credit card debt outstanding in 2012 increased considerably since 2000: credit card purchase volume was projected at 2,378 billion dollars and credit card debt outstanding was projected at 870 billion dollars (U.S. Census Bureau, 2012). Besides credit card payment, risk taking decisions for installment loans such as mortgage loans and college tuition loans have also been studied at the individual and household level (Jianakoplos & Bernasek, 2008; Robb, 2011). Overall, due to the increasing worries from the financial crisis and the increasing use of credit and loans, it seems even more necessary for

researchers to study the relationship between risk tolerance and people's daily financial spending that directly influence their lives.

Rationale

Questions about the best way to assess financial decision making remain unresolved. Researchers in the decision making field have been developing new measures, because financial decision making itself is a unique and domain-specific field in decision making (Gärling, Kirchler, Lewis & Raaij, 2010; Horvath &Zuckerman, 1993; Lucarelli & Brighetti, 2010; Rohrmann, 2005; Vlaev, Kusev, Stewart, Aldrovandi & Chater, 2010; Weber, Blais & Betz, 2002). Although researchers were able to obtain significant results by using these recently developed scales, these scales still faced the validity concern of being not domain-specific enough to reflect the construct of financial decision making. In addition, financial decision making is a complicated process and has been studied in terms of a variety of psychosocial factors, such as financial risk tolerance (Lucarelli & Brighetti, 2010), financial risk attitude (Weber, Blais & Betz, 2002), financial risk compulsiveness (Rohrmann, 2005), sensation seeking (Horvath & Zuckerman, 1993), past risky behaviors, and financial risk perception (Vlaev, Kusev, Stewart, Aldrovandi & Chater, 2010). Accordingly, several different scales have been developed to assess each of these factors. Because financial decision making has a complicated nature, it is crucial to develop a comprehensive scale that can systematically assess these different types of psychological factors. Thus, this study attempts to develop this new scale for use in future research.

Significance

The contribution of this study is to design and develop a domain-specific risky financial decision making scale that is psychometrically tested and, hopefully, shown to be a good instrument for future studies. As mentioned in the last paragraph, past studies have been examining different factors associated with financial decision making. Conflicting results using different measure hinders communication among researchers, and the establishment of overarching theories in the field of financial decision making. Therefore, the current study attempts to combine these similar constructs into one comprehensive scale.

Theoretical framework and operational definitions

In order to better understand the feasibility of the proposal and the study, some theoretical frameworks or conceptual frameworks need to be introduced.

Traditionally speaking, being able to accurately measure one's financial decisions has long been a goal for social scientists. Financial decisions have been studied from various angles, such as risk tolerance, risk attitude, risk compulsiveness, and sensation seeking. Traditional economic models could predict a financial decision from a theoretical expected utility formula. Decision making tasks such as trust games are often used and the assumption is that everyone maximized their return while making financial decisions. However, some researchers believed to accurately predict one's financial decision, personal characteristics (risk aversive versus risk seeking, compulsiveness) and situational

factors (past behaviors, confidence level, reference point, etc.) should both be taken into consideration (Gärling et al., 2010; Horvath & Zuckerman, 1993; Rohrmann, 2005; Vlaevet al., 2010; Weber et al., 2002).

To some economists, "risk" is defined as the possibility of loss attached to the choice of a given action (Brachinger, 2002). "Gain" is considered as any outcome beyond one's expected return, and "loss" as any outcome falling below one's expected outcome. Most economic studies examined ideal financial decisions by looking at the possible quantified combination of risk and return in order to maximize return for a given level of risk, or minimize risk for a level of return. However, these traditional normative methods have been shown to have some major limitations in explaining real world situations. This is discussed further in the literature review section. Similar to the general population's views, risk can be strongly connected with loss. However, it is also widely believed that without risk, one cannot expect enough gain. Depending on how people perceive risk, the meaning and the feeling attached to "risk" might be very different from person to person. Therefore, for most psychological and psychometric measurement studies on financial decision making and risk, the key point is how to define and measure financial risk taking. Financial risk tolerance, defined as "as the maximum amount of uncertainty someone is willing to accept when making a financial decision," (Grable, 2008, p.3) became the most widely used construct to represent one's risk attitudes, perceptions, and even related behaviors regarding financial decisions. People with different levels of risk tolerance can act

differently in making financial investment decisions (Xiao, 2008). As a popularly used

term for studying financial decisions, financial risk tolerance has been studied from both a

traditional normative method and a psychological method. More on the relationship of risk

tolerance with these two methods will be reviewed in a later chapter. Grable pointed out

that the first introduction of a questionnaire to assess financial risk tolerance was a major

improvement among studies of financial decisions related to risks.

Based on Irwin's risk taking behavioral model (1993), Grable and Joo (2004)

conducted a study examining factors affecting financial risk tolerance. Grable and Joo

summarized three important factors that would contribute to different levels of risk

tolerance. These three factors are: (1) Biopsychosocial factors, such as sensation seeking,

aggressiveness, locus of control, and self-esteem, (2) Environmental factors, such as

socioeconomic status, and family situation, and (3) Precipitating factors, such as personal

experience, knowledge, skills, and emotional responses. Financial risk tolerance, as one of

the risk tolerances, can also have strong relationships with these factors. In order to

understand financial risk tolerance, it seems necessary to consider the three factors

previously mentioned in the scale development process.

Purpose of the research

The main purpose of this study was to develop a scale that measures daily financial risk

taking behaviors from questions related to financial risk tolerance. Previous studies have

shown that there are five major methods used to measure one's risk tolerance in financial

decision making. Among these methods, a psychometrically validated scale is favored by most researchers. However, attitude toward financial risk is a complicated construct that is quite different from other kinds of risky behaviors in our life, and most instruments either have a limited focus on measuring participants' personality and risk perception or on measuring gambling behaviors. It is crucial to include both perspectives to provide a more precise measure of the construct.

The newly developed scale was validated with one of the frequently used and accepted measurements—the Grable and Lytton Risk Tolerance Scale (GL-RTS).The GL-RTS is one of the most reliable measures of financial decisions. It assesses individuals on simulated investment options. According to some researchers, the GL-RTS survey is preferred over other measures due to the advantages of easy administration and interpretation, as well as its accessibility to a general population (Gilliam, Chatterjee & Grable, 2010; Xiao; 2008). Although GL-RTS has been examined and showed a relatively high Cronbach's α at .75 by Gilliam et al., it is not known whether the survey is a strong measure from validity examination. By comparing the similarities and differences between the GL-RTS survey and the newly designed scale, the researcher obtained an estimate of convergent validity.

Literature review

　　Measuring financial decision making in Economics. Understanding how people make major financial decisions has been a fascinating area for many researchers in the

social sciences, especially psychology, economy, business, and the field of policy making around the world (Xiao, 2008). It is not known when people started to wonder if there is a pattern to their decisions, but it is known that the study of human decisions will continue as more comprehensive research methods and techniques are developed. It is also not known if there is a pattern to human decisions in the finance world or whether each individual is unique and not bound by rules.

Traditional economic normative studies consider a good financial decision as emotionless, objective, and thus "conscious" behavior that could lead to a maximized gain or minimized loss. There are two areas of interest among researchers in the field of judgment and decision making: (1) the study of how a particular decision was made, and (2) the way people perceive the situation while making their decision (Vitt, 2004).Historically, most economists researched the first area. Brachinger (2002) mentioned that how well a decision or a value preference can be understood depends on the amount of risk one can handle. The relationship between risk and value has been a main focus of researchers in economics. One of the best examples given by Brachinger (2002) was the "modern portfolio selection theory" in the field of finance and management. The term "Value at Risk (VaR)" was introduced to study the portfolio in the market with the probability α which is the occurrence of certain loss related to risk. Traditional standardized measurement of risk such as Fishburn's (1977) risk became less favored as it was pointed out that VaR failed to reflect the change in loss and the distribution of loss. Luce's (1980) and Sarin's (1987)

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measures of risk were developed. Following this, Fishburn developed two more measures in the 1980s. However, as Brachinger (2002) pointed out, more researchers rely on *partial probability information* which is another theoretical approach that focuses on the probability of an outcome. Although these assumptions of risk measurement have been frequently used in economics and business, more and more economists realized a risk prediction based on purely theoretical standpoints had major limitations: people may take different risks respectively in losing and gaining. This awareness became prevalent with the development of Kahneman and Tversky's prospect theory in 1979.

Meanwhile, not all economists were trying to quantify risk. Many other researchers studied riskiness and utility from the classic monetary gambling task or trust game. The study of gambling actually has a longer history than the study of human financial decision making. In 1738, Daniel Bernoulli came up with the notion of expected value from the related probability of an event, which can be a way of predicting one's decision (Beach & Connolly, 2005). Bernoulli also stated that the payoffs of a gamble were treated equally for a relatively wealthy person as for a poor person—that is, they were reference independent. Von Neumann and Morgenstern (1944) introduced decision matrices and "Expected Utility Theory" in economic studies. Similar to measurement of risk, the theory relies on the use of mathematical prediction and probability, yet is more practical and feasible for economic studies. Later, due to the unknown outcomes in gambling, subjective probability was introduced in the field. This created a trend in gambling and trust game study in the fields

of economy and psychology (Halt & Laury, 2002; Lavin, Snyder & Chapman, 1988; Schubert et al., 1999).

In contrast to Bernoulli, Kahneman and Tversky (1979) proposed that people are more risk averse when considering a possible gain, whereas more risk seeking while in a losing situation. Judgment also depends on the starting point of the decision maker. This behavioral economic theory significantly changed how people view risk, especially in gambling. One's risk preference in gambling tasks has been a useful way to study people's financial decisions. Due to the fact that most people are not living in a gambling-only world, one may seriously doubt how reliable these conclusions are if generalized to the general population. Therefore, a more relevant and comprehensive measure of one's financial decision making seems necessary.

Lönnqvist, Verkasalo, Walkowitz and Wichardt (2011) compared two popular methods of measuring individual risk attitudes in a laboratory setting. These two methods each represent how most economists and most psychologists now study human financial decisions. One is the lottery-choice task by Holt and Laury (2002) and the other is the multi-item questionnaire. Through a year-long test-retest experiment, these researchers doubted the ability of the lottery-choice task to measure risk or trust, whereas asking these types of questions directly through a questionnaire would be a better choice due to enhanced reliability and validity, including much higher test-retest reliability. Researchers also examined the relationship between the Big Five personality traits and risk-taking

behavior, and between Big Five personality measurement and the two methods of risk measurement being compared (Horvath & Zuckerman, 1993). Results showed that the questionnaire measure had higher predictive power (R^2 =.65 for questionnaire versus R^2 =.23 for lottery-choice task, both $p < .05$). Furthermore, an investigation of the test-retest reliability was conducted. Based on the test-retest comparison, the lottery-choice task was shown to have a low and not statistically significant reliability, $\rho = .26$, $p > .10$. On the other hand, the general risk factor from the questionnaire showed a high over-time stability, $\rho = .78$, $p < .001$.

In similar study on measuring risk tolerance, Lucarelli and Brighetti (2010) asserted that psychological or neurobiological thinking would not greatly affect an individual's thinking on financial decisions. Although, researchers believe that a self-report questionnaire would lead to an underestimation of risk tolerance, more studies on the two new approaches to risk measurement would contribute to a better understanding of one's decision making process. Lucarelli and Brighetti categorized the latest psycho-physiological measurement as "Unbiased Risk tolerance (UR)," the measurement scale as "Biased Risk tolerance (BR)," and actual financial decisions as "Real Life Risk (RLR)." These three categories each represent "how we are," "how we think," and "how we actually act" (Lucarelli & Brighetti, 2010, p. 25). For the UR measurement, the "Iowa Gambling Task" was used with the physiological measurement of skin conductance responses. Researchers used the Grable and Lytton Test to represent BR. Results between

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the three measures showed that unbiased risk is higher than the biased self-reported risk and much higher than the real life risk. Researchers called this incongruence between the unbiased risk measured and the real life risk measured a result of an "unconscious sleeping factor." This sleeping factor can be simply understood as daydreaming about profits, unconsciously changing people's behavior to be risk seeking. Although researchers indicated the effect was notable in certain demographic groups by analyzing the social demographic information, it is still unknown how and why the effect occurred in the study. These two important studies suggest more needs to be understood about the psychological aspects of financial decision making and risk measurement.

The psychometric measurement of financial decision making. Kahneman and Tversky (1979) brought a revolution from the traditional economic view of studying financial decisions to a new world by looking at the behavioral perspective of human behavior using the insights of psychology. In Kahneman's (2003) Nobel Prize lecture, Kahneman presented three major topics: heuristics and biases in judgment, risky choice, and framing effects. As most cognitive psychologists believe, our memory system has two stages in information processing: (1) Automatic processing (2) Controlled processing. Unlike controlled processing, automatic processing is fast, associative, and effortless. This idea provided the theoretical evidence for explaining why an "unconscious sleeping factor" could slip through and affect individual's financial decisions aside from controlled processing, which controls most human judgments. Later in the lecture, Kahneman

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explained how framing and reference may create an opposing effect on one's decision: First, stating a choice in a positive way or a negative way could significantly change one's preference; second, when choosing between a fixed gaining choice versus a flexible gaining choice with greater risk, people would typically choose the former option. On the other hand, the opposite pattern is formed for making a decision in a losing situation: people tend to take greater risk to avoid a fixed loss. Given these conclusions, it is interesting to see that human beings do not always make their decisions based on maximized utility theory and rational thinking. Another contribution from Kahneman and Tversky besides prospect theory was introducing the ideas of heuristics and biases into financial decision studies. Affect heuristics became one of the important attributes to study (Fitzsimons et al., 2002; Weber & Johnson, 2009). Imagine this situation: The amount we give in making a donation to charity when we are in a good mood could be different from the amount we give in a relatively bad mood. Prototype attribute was another powerful heuristic category in which people simply pick the option that is most accessible to them, such as stereotypes or favored objects (Raghubir, Das, Lichtenstein & Lyons, 1999). Raghubir et al. cited a previous study which showed that negative information in general is more easily retrieved in our memory than positive information. In other words, this could explain why people with previous bad experiences in financial decisions tended to be influenced more in a financial priming task. Inference, based on either distorted or correct limited available information becomes one of the determining factors in making a decision

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under the heuristic assumption (Bodenhausen, 2005; Fitzsimons et al., 2002; Raghubir et al, 1999; Weber & Johnson, 2009). These increasingly researched psychological concepts have dramatically changed decision making studies in the fields of both psychology and economics in the past decades. In order to understand how financial decisions were measured in psychology, some recent studies on risk measurement are summarized.

Xiao (2008) provided a general overview of existing risk measurement scales from the early 1980s when risk scale studies started to become prevalent. A wide range of dimensions of risk were deemed important when measuring risk tolerance. Questions related to several general dimensions such as general risk-taking characteristics, losses and gains, experience or knowledge about financial decisions, comfort level in making decisions related to risk, were recommended for inclusion in a scale. Not only could these dimensions provide a more comprehensive measurement of risk, but also researchers could improve the reliability and validity of a measure. The Grable and Lytton Risk Tolerance Scale designed in 1999 (Gilliam et al., 2010) and a domain specific risk behavior scale from Weber et al. (2002) were noted by Xiao. It was shown that both multiple choice scales and Likert scales were the leading methods for measuring risk behavior.

One of the early scale development studies was conducted by Horvath and Zuckerman (1993) on the relationship between sensation seeking and risk appraisal. Several other domains besides financial risk were included in the instrument "General Risk Appraisal Scale (GRAS)" such as sports, social violation, and crime etc. Sensation seeking, as a

construct closely connected to risk-taking behaviors, assesses how much an individual

cares about the reward of a certain risky activity. According to the researchers, higher

sensation seekers are generally more willing to take risks. Results indicated that the

sensation seeking measurement scale had strong relationships with all domains except the

financial and sports domains. Horvath and Zuckerman (1993) concluded that financial

risk-taking behavior might be a different or unique domain that is not strongly related to the

general sensation seeking trait among both males and females. This suggested that future

studies examine financial risking taking behavior as a domain-specific trait.

Although the number of the studies of financial decision making increased extensively

in the past decades in business and psychology, few studies have been conducted on the

development of measures until recently. Several reasons explain this change, but one of the

most convincing reasons is that many psychologists are still not sure if mind-sets toward

risk taking are systematically different. If there is no consistency of thought and behavior

from one to another then there is probably no need to develop a scale. Regardless,

Rohrmann (2005) developed four new risk attitude scales in his study. The outcomes,

consistent with Horavth and Zuckerman's (1993) results is that risk attitude is not a

unidimensional construct, and financial risky behavior was the most distinct variable that a

traditional risk attitude scale did not fully capture.

Keller and Siegrist (2006) examined people's willingness to invest in the stock market

by looking at their financial risk attitude, money attitude, stock market ethics, income, and

rated willingness to invest in the stock market. Researchers were attempting to identify the most predictive factors needed in a scale measuring behavior and willingness to invest in the stock market. A total of 20 items were used. Due to different previous experiences in the stock market, groups were divided based on gender and whether they had a market account. Two important predictors were: financial risk attitude (Cronbach's $\alpha = .76$) and negative ethics stance (Cronbach's $\alpha = .72$). Financial risk attitudes in all four groups were significant positive predictors of stock investment, whereas negative ethics was a significant negative predictor. There was a difference between people who previously had an investment account in the stock market and those who did not. For males who had an investment account in the stock market, income was a significant predictor. Overall, the study suggested that in order to measure one's financial decisions, a set of closely related factors could lead to better measurement than general predictors.

Dowling, Corney and Hoiles (2009) examined the multifactorial determinants of problematic financial management decisions among young Australian working male adults. By asking participants to answer five different surveys related to financial decisions, researchers were trying to find participants' financial satisfaction and ability to manage their personal finances. In Dowling et al.'s study, five measures were utilized: Financial Problems Scale with a Cronbach's $\alpha = .90$, Financial satisfaction, Financial Behavior Measure with a Cronbach's $= .82$ in the original scale study but a Cronbach's $\alpha = .62$ in the Dowling et al. study, the combination of Material Value Scale (MVS) and Attitude Toward

Money scale with a total Cronbach's $\alpha = .80$, and Financial Counseling Attitude Scale with a Cronbach's $\alpha = .63$. These scales improved researchers' understanding of how these young working adults feel and act when facing financial situations. Results indicated that money attitudes measured by MVS was a strong predictor of problematic and normal financial decisions, which also means that one's financial decisions are not only affected by one factor.

Compared to general financial decisions, people in academics and industry are more interested in knowing and predicting how individual make financial decisions involving risks. Financial risk tolerance is one of these frequently studied constructs that link to human risky financial decisions (Xiao, 2008). Grable and Joo (2004) examined a series of factors related to financial risk tolerance based on a previous study conducted by Irwin (1993). Although Grable and Joo only found self-esteem and environmental factors such as household income, financial knowledge, education etc. to be significantly associated with financial risk tolerance among lists of factors, researchers suggested future study examine other potentially important factors such as sensation seeking, aggressiveness, personality, locus of control, and social development. As suggested, these significant predictors as well as other suggested factors were considered in the following scale development process.

Gilliam et al. (2010) compared the reliability and validity of two financial risk tolerance scales: the SCF risk tolerance scale and the Grable and Lytton Risk Tolerance Scale (GL-RTS). Cronbach's alpha was generated for each scale, and the two scales were

correlated. The study indicated that both scales had acceptable Cronrach's α is, both $\alpha > .7$. The concurrent validity showed an $r = .6$ correlation between the two scales, $p < .01$. Although the two scales are similar, researchers suggested using the SCF only for measuring investment risk and GL-RTS for general financial risk tolerance measurement. GL-RTS, as a comprehensive and reliable measurement, was used as a reference measurement tool in this thesis.

Recent studies have supported the finding that financial risk measurement is domain specific; more studies have begun to focus on how "specific" a measurement tool needs to be in order to obtain the best result. Given that financial decision making is more domain specific than other decisions does not simplify the financial decisions that people make in daily life. These financial decisions can be about gambling, the stock market, insurance, salary and jobs, purchasing goods, and paying a mortgage. How to measure all these financial behaviors using a limited number of survey questions becomes a priority in measure design. More researchers now suggest including a variety of questions on the scale (Vlaev et al., 2010; Weber et al., 2002). By doing that, researchers would have a better understanding of the similarity and differences in attitudes about these financial behaviors.

Vlaev et al. (2010) included seven major daily financial situations: Gain, Investment, Mortgage, Salary, Pension, Loss, and Insurance. Researchers believed these seven financial contexts represented most financial decisions the general population needs to

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make. Unlike most other scales, participants in the study were given hypothetical choices between a sure thing and a certain probability, which was similar to traditional economic risk measurement. As Lönnqvist et al. (2011) pointed out, the traditional technique could lead to a lower test-retest reliability and thus smaller Cronbach's α than use of a scale. However, this does not mean the method is useless. Including more financial situations could improve the measurement tool to a much more comprehensive level, and this is the ideal case for future scale development. The seven scenarios were grouped into three main factors in a principal components analysis: "Positive Factor (Gains, Pensions, and Salaries)," "Positive Complex Factor (Investments and Mortgage)," and "Negative Factor (Losses and Insurances)." Due to the fact that the study primarily focused on one's decision on hypothetical choices related to one of the three factors, researchers focused more on the priming effect of these hypothetical choices. They found similar results as Kahneman and Tversky (1979) and Kahneman (2003); that people make decisions based their "sensitivity" or so-called "frequencies in memory/prototype" of the information, rather than on the choice itself. This study brought us to a difficult dilemma: the study suggests including more financial situations, yet knowing these situations might not be as important as knowing one's past behaviors. Therefore, one might wonder, is it really necessary to measure the risk tolerance of financial decisions in each situation if past experiences are the most predictive factor for one's future decision? As Kahneman (2003) and Weber and Johnson (2009) explained, not only past behaviors but also other psychological factors

such as emotion, psychological characteristics may influence one's risk tolerance, risk attitudes, and financial behaviors. In all, in order to measure individual's financial decisions, a scale that includes these important psychological factors is recommended.

Summary

The traditional normative method used in economic studies was shown to have limits in studying financial decisions, because the normative model fails to recognize the significant impact of psychological factors on financial decision making. Traditional hypothetical decisions in measuring one's decisions also showed a lack of test-retest consistency. Although the use of psycho-physiological measurement is more frequent in financial decision studies, the combination method was shown to need further development. Psycho-physiological measurement showed a higher risk level than the risk measured by the scale, which was higher than the actual perceived risk. Given the scale yielded values more closely related to actual perceived risk values, it was believed that the scale was the preferred method to study human financial decision. However, the major problem with a scale for financial decision study was clear: there is yet to be a comprehensive and domain-specific financial decision measurement tool that covers financial decisions besides gambling. It is obvious that gambling should not represent the only and all perspectives related to financial decisions. A need for the measuring one's daily financial decisions such as gambling, mortgage, investment, daily consumption, past financial behaviors (Vlaev et al., 2010; Xiao, 2008), and financial confidence (Glaser &

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Weber, 2007) etc. is necessary. Therefore, the goal of this study is to develop a more comprehensive and psychometrically sound measure in terms of reliability and validity.

In most of the previous studies mentioned, financial risk tolerance was one of the most important foci of measuring one's financial decisions (Byrnes et al., 1999; Lavin et al., 1988; Vlaev et al., 2010; Weber et al. 2002; Weber & Johnson, 2009). A summary of previously reviewed studies of measures is given in Table 1.

Table 1

A summary of studies examining instruments related to risks

Instrument Name	Date	Conductor(s)	Dimension(s)	Number of items	Sample Size	Reliability	Validity	Type
Grable and Lytton Risk Tolerance Scale (GL-RTS)	1999	Grable & Lytton; Followed by Gilliam, Chatterjee & Grable (2010)	Gambles, general risk, loss & gain, experience & knowledge, comfort, etc.	N=13	N=328	α= .75	Concurrent validity .6 with SCF Scale	Multiple Choice
Survey of Consumer Finances (SCF) Risk Tolerance Scale	N/A	Tested by Grable & Lytton; Grable & Schumm	Willingness to take financial risk regarding the amount of return	N=4	NA	α= .39 to .59 estimated	Concurrent validity .54 to .6	Multiple Choice
Doman Specific Risk Taking Scale (DOSPERT)	2002	Weber, Blais & Betz	Financial, health, recreational, ethics & social	N=101	N=560	Financial: α= .69 Test-retest = .44	NA	7-point Scale
General Risk Appraisal Scale (GRAS)	1993	Horavth & Zuckerman	Crime, financial, minorviolation, sports	N=101	N= 447	NA	NA	5-point Likert Scale
Risk Motivation Questionnaire (RMQ)	2005	Rohrmann	Personal risk (financial), occupational risk,physical	N=40	N=120	NA	NA	5-point Likert Scale
No name. *Stock (Market Risk Attitudes Measurement)*	2006	Keller & Siegrist	Financial risk attitude, money, gender, ethics	N=20	N=1569	Average α level around .69	NA	Likert Scale
Material Value Scale(MVS)	2004	Richins	Money attitude, materialism	N=6	N=400	α from .75 to .81	NA	5-point Likert Scale

CHAPTER II: METHOD

Research questions

In this chapter, the study design is presented. Based on the findings from the literature review, the researcher is particularly interested in the following questions:

(1) Does including questions from different dimensions related to financial risks such as confidence level and previous financial decision behaviors increase the predictive power of a scale, with support from a logical qualitative standpoint but also from a quantitative analysis?

(2) Are scores on the newly designed scale correlated with scores on the Grable and Lytton Risk Tolerance Scale (GL-RTS)?

(3) Do age, gender, income, and state residency affect risk tolerance level?

An original scale was developed and examined based on the recommended procedures in Benson and Clark (1982). There are four main phases in the scale development process.

Phase I: Planning

Currently, there is a limited number of scales to measure risky behaviors. There are even fewer scale options for measuring people's financial decision making. As shown in Table 1 (above), the Grable and Lytton Risk Tolerance Scale is currently the most

frequently used scale that is available to the general public for measuring one's financial risk tolerance. Although Weber, Blais and Betz (2002) as well as Keller and Siegrist (2006) each created a measure, the measures were either too general which covered more than financial risks or too specific which focused only on stocks. No existing measurement tool has been found using a Likert scale to measure domain-specific financial decisions related to risk. There was also a concern of extant measures lacking adequate dimensions for risk tolerance. For example, if a researcher is trying to study financial decisions by observing risk tolerance levels, a measure with questions that rely solely on financial gains or losses might be inadequate. Other factors such as one's past financial decisions or one's "reference point" could also have an impact on how a current decision is made (Kahneman, 2002; Vlaev et al., 2010).

In the current study, an instrument called "Risky Financial Behavior Scale" (RFBS) was introduced to measure the construct–financial risk tolerance. A Likert-like scale was selected over multiple choice, gambling decision tasks, or trust games due to better test-retest reliability as noted in the literature review above. The primary research goal was to develop and validate a scale that measures an individual's daily financial risk behaviors in four domains of financial risk tolerance: financial related decisions, financial related personality, attitudes toward risks and returns, and financial confidence level.

Phase II: Construction

A general literature review on past scale development studies related to financial decisions was included in Chapter 1. As previous studies suggested, questions regarding the four risk tolerance domains are considered. The construction of the scale focused on the processes of domain development, item format, item pool generation, instructions, content expert review, cognitive interview, further modification, a pilot test, and field administration. A content evaluation form was created during content expert review to measure the overall content-validity of the scale, and the importance of each domain in the instrument.

Domain development. The RFBS scale comprises four potential domains: financial confidence level (cl), attitudes toward risks and returns (rr), financial behaviors (beh), financial personality (per). Each domain represents a somewhat different perspective that explains one's financial decisions. The tight connection between confidence and trading volume has been studied in financial decision making research (Hastie, 2001; Kahneman & Riepe, 1998). By measuring whether one is overconfident about themselves based on their investment performances and skills, researchers found out how much and how often participants were willing to take greater financial risks (Glaser & Weber, 2007). The domain "Attitudes toward risks and returns" has long been studied and considered as a crucial indicator in the financial decision making process. Similar to attitudes, financial-related past behaviors are also logically valued as the most straightforward

predictor of future financial behavior. Surprisingly, it was not a main contributor in traditional economic studies until Kahneman and Tversky's (1979) introduction of psychological aspects of financial behaviors. Recent studies reemphasized the importance of the factor for measuring one's financial behavior, saying that past experiences or knowledge in dealing with financial risks affects the perception of risk (Weber & Johnson, 2009). Emotional stimulus or memory associations of these past behaviors of financial decisions were a potential factor for explaining a financial decision (Meller, Schwartz & Cook, 1998; Smith & Decoster, 2000; Kahneman & Riepe, 1998). Thus, including financial behavior-related questions might trigger people's irrational decisions by simulating the daily environments which are familiar to participants. Last but not least, traditional psychological studies have shown that one's personality such as "being impulsive/sensation seeking or not" could also be a predictor of financial decisions. Horvath and Zuckerman's (1993) study on sensation seeking and Rohrmann's (2005) intention of measuring one's personality traits regarding making choices showed that personality could also explain one's decision processes. These findings have been supported by recent studies on financial risk tolerance scale measurement (Gärling et al., 2010; Weber et al., 2002). In sum, all of these four domains were selected with theoretical support from past studies.

   Item format. Most recent studies have measured financial decisions by utilizing traditional Likert scales, multiple choice surveys, or trust games. In this study, a 5-point

Likert-like scale was used as the response format for the questions. The use of a Likert-like

scale response format was based on suggestions from previous studies that the Likert scale

results in better test-retest reliability for the measure (Lönnqvist et al., 2011). The choice

options were "Just like me" on the left to "Not like me at all" on the right with a "Neutral"

in the middle. All the questions were worded in same direction.

   Item pool generation. The original scale before content expert review contained a

total of 60 items from these four domains, with each domain containing same number of

questions. Some of these items were generated based on similar items from previous

studies. All items were created to be parsimonious, lack double-barreled wording, and

achieve clarity. For the process of content expert review, items were grouped by domain.

However, in the pilot test and later field administration, items were randomly placed. As

previously mentioned in the background section, installment payment and credit card

payment were the top two daily spending among American households. They might not be

the best options defining financial decisions involving risks, but they were the directly

related daily financial decisions that could be commonly seen in most U.S. households,

according to the U.S. Census Bureau. Jianakoplos and Bernasek (2008) also categorized

these financial payments as "risky assets." Although financial decisions related to credit

card spending or loan payment might not considered as risky as stocks, bonds, or other

investment plans, they might have a greater involvement in people's daily financial life

than other previously mentioned more risky investment plans. Sample questions are provided in Appendix A.

Instructions. Instructions for the survey included the introduction of the study and general rules for answering the questions. Participants were asked to click an arrow button representing "forward" to move on to the data collection page from the instruction page.

Instructions for the content expert review were also provided. Participants in the content expert review process were asked to evaluate questions based on the four criteria from Benson and Clark's (1984) scale development article: relevance, accuracy, clarity, and difficulty. Definitions of the construct being measured and the four criteria were given in the instruction page before participants were able to evaluate all the questions.

Content experts' review

Participants

Four content experts were recruited in the content expert review panel for evaluating the original scale questions based on the four criteria. All of the participants have Ph.D. degrees in different fields. All had at least two years of experience in both teaching and research in their field. Among the four experts, two have extensive knowledge and experience in social research design, especially in program evaluation and psychometric scale development. These two experts hold their Ph.D. degrees in Psychology and Education, and both are employed by the College of Education of a comprehensive

university in the United States. The third expert holds a Ph.D. degree in Marketing, with

years of experience studying and teaching consumer behavior in business school. The

fourth expert holds a Ph.D. degree in Economics, and has professional experiences in the

fields of econometrics and microeconomics. All these experts provided a variety of

opinions on the scale measurement and design. Table 2 provides a summary of the

demographic information of the members in this expert review panel.

Table 2.
Demographic Information of the Participants in Content Expert Review (N = 4)

	N	%
Gender		
Male	3	75
Female	1	25
Level of Education		
Completed Ph.D. degree	4	100
Ethnicity		
Caucasian	4	100

Instruments

1) **Risky Financial Behavior Scale (RFBS)** The original RFBS scale contained a

   total of 60 items, covering four domains related to one's financial risk tolerance

   and behaviors. The response scale was a 5-point Likert-like scale. Items are related

   to participants' financially related personality, financially related habits,

   confidence in making financial decisions, and attitudes toward risks and returns.

   The choice options were "Just like me" on the left to "Not like me at all" on the

right with a "Neutral" in the middle. A higher total score of the RFBS indicated a

lower risk tolerance level, also a lower possibility to seek for risky financial

decisions. (**See Appendix A.**)

2) **Informed Consent for Content Expert Review**: This was the informed consent

given at the content expert review. There was an informed consent sheet for all the

experts during the process of experts review on the designed scale. The participant

could only begin the survey after giving their consent to collect their data. (**See**

Appendix B.)

3) **Evaluation Form of Content Expert Review:** An electronic evaluation form

including all the survey questions was given during experts review on the scale

questions. The evaluation form for the content expert review included ratings

related to a scale's "relevance," "accuracy," "clarity," and "difficulty." Also,

questions and comments for each questions and the scale were asked to provide.

(**See Appendix C.**)

Procedure

Four content experts were invited at different points of time based on researcher's

personal request to evaluate the RFBS. An informed consent (Appendix B) along with the

content expert evaluation form (Appendix C) was given in the evaluation package.

Participants were told to evaluate the form only after giving their consent to participate in

the study. No results were discarded. Participants were encouraged to contact the

researcher via email during the process of evaluation with any questions and after their evaluation process was finished. Instructions and definitions of the construct and evaluation criteria were provided at the top of the evaluation form. Items were listed in order by domains, with ratings on relevance, accuracy, clarity, and difficulty of the item. On the very right side, space for questions and comments regarding each item was provided for the experts. At the bottom of the evaluation form, a general open-ended question on the scale was given to each expert. The expert reviews were conducted in order. A survey given to the following expert was revised beforehand based on the feedback from the previous experts. One of the experts was requested to conduct the expert review twice to ensure the content validity of all the items in the RFBS survey. After collecting the informed consent and evaluation forms from all participants, the expert review data collection process was terminated. The entire expert review process took an average of 40 to 60 minutes per person.

Results from Content Expert Review

Results from the first two experts indicated two problems with the survey: misplacement of questions and the overuse of absolute words such as "any," "never," and "always." Any poor (score = 1) ratings on Relevance, Accuracy, and Clarity criteria were reworded and modified for future content expert reviews. Based on the ratings from the first two expert reviews, a total of 34 items were revised. Two items from the last two domains asking about participants' preference of financial decision were relocated in the

financial personality domain based on their content meanings. Three items were dropped due to poor scores in all ratings, and three new items were generated for future reviews.

For the third content expert review, the expert suggested revisions of item difficulties, item external validity, logical wording, and questions regarding frequencies of some behaviors. A total of twenty eight changes were made. The expert pointed out that questions asking about financial investment plans and financial strategies might not apply to all populations. People who did not have any experiences in financial investments might face difficulties answering these questions. As a result, these questions were replaced by more relevant questions asking about daily decisions. Also, questions regarding frequencies were changed from asking "per day" to "per month" to rule out the possibility of irrelevance.

The fourth expert conducted the review two times: one in content expert review session, and the other on the first day of the cognitive interview data collection process. Old questions were further simplified after the two reviews, and new questions were generated based on the first cognitive interview feedback.

A revised version of the RFBS scale from all the content expert reviews is given in Appendix E.

Cognitive interviews

Cognitive interviews were conducted to provide initial feedback from potential participants. Questions regarding the wording and meaning of each item on the scale were

asked to each participant during the process of cognitive interviews. Timing and structure of the scale were also examined to achieve the best survey flow. Cognitive interviews served as a trial run for pilot data collection. Results from the cognitive interviews were used as an important criterion for scale improvement before the following pilot study.

Participants

A total of five participants were selected for cognitive interviews based on convenience sampling. These five participants each represented different sample populations: male with years of working experience, female with years of working experience, male student, female student, and non-Caucasian sample population. The age range of these participants fell in from 18 to 45 years old. A summary of the demographic information of these five participants is presented in Table 3.

Table 3.

Demographic Information of the Participants in Cognitive Interview (N = 5)

	N	%
Age		
20-40	3	60
40-60	2	40
Gender		
Male	2	40
Female	3	60
Working or Student		
Full-time job	3	60
Full-time Student	2	40
Ethnicity		
Caucasian	4	80
Asian	1	20

Instruments

1) **Risky Financial Behavior Scale (RFBS):** This was the revised version of the RFBS scale from expert content review which contained the revised items, covering four domains related to one's financial risk tolerance and behaviors. The response scale was a 5-point Likert-like scale. Items are related to participants' financially related personality, financially related habits, confidence in making financial decisions, and attitudes toward risks and returns. The choice options were "Just like me" on the left to "Not like me at all" on the right with a "Neutral" in the middle. A higher total score of the RFBS indicates a higher risk tolerance level, also a higher possibility to seek risky financial decisions. (**See Appendix E.**)

2) **Informed Consent for Cognitive Interviews**: This was the informed consent given during cognitive interviews. The participant began the survey after giving consent to collect data. (**See Appendix F.)**

Procedure

The entire data collection process of cognitive interviews was reviewed and approved by the University of Denver Institutional Review Board. Participants were invited based on their demographic characteristics and researcher's knowledge of each participant. Each participant was asked in person to participate in the study. Information and a meeting time and location was sent out or forwarded to each participant with their agreement to participate in the study via email. A formal inform consent was provided before the cognitive interview process (Appendix F). Participants were told to evaluate the item questions by using an evaluation form only after giving their consent to participate in the study. Instructions and definitions of the construct and evaluation criteria were explained before each interview. Participants were first asked to rate the survey as if they were going through the entire data collection process on the survey website. Questions and concerns were discussed between the researcher and the participants before each interview session was over. The entire data collection process took around 20 – 30 minutes for each participant. Before the final version of the survey was launched on the website server, modifications to the survey were made by the researcher based on the results from cognitive interview sessions.

Results from cognitive interviews

Overall, there were no major changes made in terms of item content but changes related to wording and expression issues. For the first participant, three item questions (#5, #16 and #30) were identified as not applicable to her. These items were directly related to house mortgage and car purchasing which she had little experience with. Since the purpose of the study was to measure participants' risk tolerance level rather than the actual financial decision, the researcher decided to retain these three items and added instructions on asking participants to imagine themselves making decisions in a hypothetical situation for items not applicable. The first participant also pointed out a possibility of having case exceptions in answering item #6 ("I am not interested in making fast money") and item #19 ("I think people can make a big fortune without having to take much risk"). She believed that other participants may answer the question differently under various conditions. Two out of five participants indicated a concern about the Likert-like scale, because they believed lower rating usually refers to "Strongly Disagree," and higher rating usually refers to "Strongly Agree" in American culture. Researcher explained the intuition of the scale format was for an easier understanding of the risk tolerance score. Since all the statements were presented in conservative wording, therefore it would make more sense to have a lower score indicating being financially more conservative, and a higher score indicating a higher risk tolerance level.

Field Administration

Participants

A sample of 421 adults in the United States participated in this pilot test. Among these participants, 112 cases were removed after screening for missing more than 5% of the total survey questions. Little's Missing Completely At Random (MCAR) test for missing values was conducted, results showed missing values were missing at random, χ^2 (1639, N= 349) = 1653.23, p = .40. A total of 40 cases with less than 5% missing values were then imputed with estimated maximum likelihood method. There were 14 multivariate outliers omitted in the Risky Financial Behavior Scale section using the probability for Mahalanobis distance at less than .001 level. A final list of 335 cases was used for further analysis. The final sample group consisted of a diverse population group with an age ranging from 18 to 80 years old. Among these participants, there were 147 males (43.9%) and 179 females (53.4%), with 9 cases missing a response for gender. The majority of the participants were Caucasian (77.9%), followed by Asian (10.4%) and African American (7.8%) groups. The top four states where participants reside were Colorado, California, Tennessee, and Texas. The sample also reflected diversity in report household income level, state, age, marital status and number of children in the family. A summary of the participant demographic information is provided in Table 4.

Table 4.

Demographic Information of the Participants in Field Administration (N = 335)

	N	%		N	%
Age (*Mean ± SD*)	37 ± 11.90		**Top 15 Resident States**		
Gender			Colorado	43	12.8
Male	147	43.9	California	26	7.8
Female	179	53.4	Tennessee	26	7.8
			Texas	21	6.3
Marital Status			Massachusetts	9	2.7
Single	93	27.8	New York	9	2.7
Living Together	18	5.4	Oregon	7	2.1
Married	191	57	Pennsylvania	7	2.1
Divorced or legally separated	18	5.4	Hawaii	6	1.8
Prefer not to answer	8	2.4	Louisiana	6	1.8
			Michigan	6	1.8
Household income			Virginia	6	1.8
Less than $10,000	115	34.3	North Carolina	5	1.5
$10,000 - $49,999	66	19.7	Minnesota	5	1.5
$50,000 - $99,999	80	23.9	Arizona	5	1.5
Over $100,000	53	15.8			
Prefer not to answer	12	3.6			
Ethnicity			**Working Status**		
Caucasian	261	77.9	Full time	258	77.0
African American	26	7.8	Part-time	26	7.8
Native Indian	0	0	Not-Working	35	10.7
Asian and Pacific Islander	35	10.4	Prefer not to answer	8	2.4
Hispanic	3	0.6			
Others	2	0.6			

Instruments

1) **Risky Financial Behavior Scale (RFBS):** This is the revised version of the RFBS scale which contained items revised from the cognitive interview, covering four domains related to one's financial risk tolerance and behaviors. The response scale is a 5-point Likert-like scale. Items are related to participants' financially related personality, financially related habits, confidence in making financial decisions,

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and attitudes toward risks and returns. The choice options were "Just like me" on the left to "Not like me at all" on the right with a "Neutral" in the middle. A higher total score of the RFBS is indicating a higher risk tolerance level, also a higher possibility to seek for risky financial decisions. (**See Appendix G for the measure.**)

2) **Informed Consent for the field administration**: This is the informed consent given on the first page of the survey. Only can the participant begin the survey after given their consents to collect their data. (**See Appendix H.**)

3) **The Grable and Lytton Risk Tolerance Scale (GL-RTS):** This is one of the most frequently used scales to assess risk in financial decision making. This is a 13-item financial *risk-tolerance scale* developed by Grable and Lytton in 1999. The multidimensional scale has been tested and shown to offer acceptable validity and reliability, with a Cronbach's α at 0.75 (Gilliam et al., 2010). The scale comprises three subscales. Questions 4, 5, 8, 11, and 12 address investment risk; questions 1, 3, 6, 7, and 13 evaluate financial risks; and questions 2, 9, and 10 address speculative risk. Total risk-tolerance scores are obtained by summing the individual scores from the 13 questions. Possible range for the total score is between 13 points and 43 points. Items 1 is reverse-coded. In item 9 and item 10, answer 2 worth 3 points. Higher scores reflect greater risk tolerance. (**See Appendix D.**)

4) **Demographic Survey:** Questions about gender, age, marital status, working status, number of children in the family, a category of household income before tax, and ethnicity were included in the survey. (**See Appendix I.**)

Procedure

The entire data collection process was reviewed and permission granted by the University of Denver Institutional Review Board. Participants were recruited through emails and invitations on academic and social forum websites. All of these participants were recruited through snowball sampling and random online sampling. Information and a secured survey link was sent to each participant with their agreement to participate in the study via email. By clicking the link in the email, participants were led to a secured online survey page. On the first page of the online survey, a formal informed consent was provided (Appendix H). Results from any participant without consent were discarded. Greetings and instructions were provided along with the item questions at the beginning of each page. Participants were reminded to follow the instructions and time requirement for each instrument. A total of three instruments were administrated on the survey website. The first was the RFBS scale revised from cognitive interviews and informed consent (Appendix H), followed by the GL-RTS survey (Appendix D), and then the demographic survey (Appendix I).In the first scale, participants were told to rate each item based on their feeling on a 5-point Likert-like scale, whereas in the second survey, participants were asked to pick the best choice among four options. A total of 13 items were administered for

the GL-RTS survey. Items in RDBS and GL-RTS were required. In the final instrument, seven questions related to one's demographic information were asked. Participants could choose not to answer some of the questions in the third survey. Timers were set for each instrument to prevent bias from major inconsistency of the amount of time being used for each survey. However, participants were encouraged to contact the researcher via email during the process with any questions. After collecting the informed consent and ratings from all participants, the pilot study data collection process was terminated. The entire data collection process was expected to take up to seven days to finish. Late response or no response were not included in the data analysis process. The entire data collection process was conducted anonymously online, with a total collection time of $20 - 30$ minutes for each participant. Final data were downloaded from the Qualtrics survey website database to the researcher's personal computer. All the data are protected with a passcode.

CHAPTER III: RESULTS

Phase III: Quantitative Evaluation

The first quantitative analysis of the field study was used to examine the

dimensionality of RFBS scale. Furthermore, the researcher was also interested in

shortening the RFBS survey by reducing the number of items in each domain that are not

reflecting the latent factors based on statistical results.

Factorability.

Prior to exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of

sampling adequacy and Bartlett's test of sphericity were checked to assess the factorability

of the correlation matrix. A test of KMO is used to measure whether the partial correlations

among variables are small. Bartlett's test of sphericity is used to examine if the correlation

matrix among variables is an identity matrix. Generally speaking, a KMO measure greater

than .6 usually suggests strong partial correlations among variables (Tabachnick & Fidell,

2007), and a probability level less than .05 indicates that a correlation matrix is not identity

matrix. Results from KMO showed the RFBS scale had a KMO level of .82, and the

associated probability value for Bartlett's test of sphericity was significant, χ^2 (1770, $N =$

335)=8474.07, $p< .001$. Both results suggested that a factor analysis was appropriate for

the data.

Assumption checks for conducting an exploratory factor analysis were followed. Since missing values were imputed and multivariate outliers were removed at the data screening stage, the researcher began by examining normality for all 60 items. Results of skewness between -1 to +1 and kurtosis divided by its standard error smaller than 3.29 for each item variable was examined (Tabachnick & Fidell, 2007), indicating normality assumption was met. The linearity assumption was examined using a matrix of scatterplots. However, it is impractical to analyze linearity for all items with pairwise scatterplots, so a spot check strategy for checking linearity among these scatterplots was adopted. The linearity assumption for the RFBS scale was generally met. Sample size was also an assumption for the researcher to assess before factor analysis. According to Comrey and Lee (1992) as well as Tabachnick and Fidell (1996), a sample size over 300 is a relatively good sample size for conducting factor analysis effectively.

Exploratory factor analysis.

An exploratory factor analysis (EFA) was conducted on field administration data using principal components analysis (PCA) for a final list of 335 cases. Initially, data were explored in SPSS using PCA with varimax rotation on the 60 items from the RFBS scale. To determine the number of components indicated by the items, the researcher examined the scree plots of the eigenvalues, as well as the extracted eigenvalue larger than 1 (Kaiser, 1960). From the scree plot, the researcher interpreted six main components to be extracted based on the elbow of the scree plot, as shown in Figure 1 (Cattell, 1966). However, the

total variance explained table suggested 16 components could be extracted based on

Kaiser's rule of eigenvalue larger than 1.
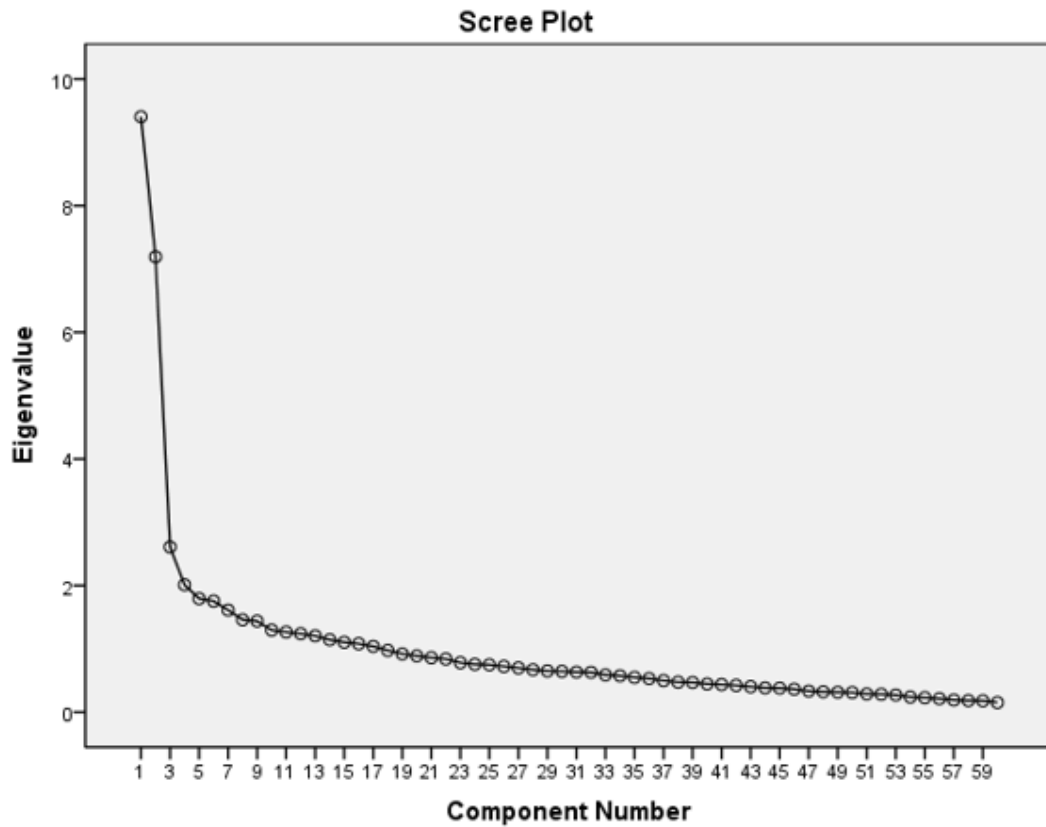
Figure 1. Scree plot. Number of eigenvalue generated from exploratory factor analysis using principal component method with promax rotation.

In order to determine the number of components to be generated in the EFA, the

researcher conducted Horn's parallel analysis. The parallel analysis generates an

equivalent random number matrix for EFA, which allows researcher to compare the

eigenvalues extracted from the real data correlation matrix and the eigenvalues extracted

from the simulated data matrix (Horn, 1965). The researcher believed parallel analysis

would serve as an accurate way to determine the number of components to interpret. A

parallel analysis was performed using principal component analysis and the same rotation

methods as previous exploratory factor analysis, and the number of random correlation

matrices and percentile of eigenvalues were set at 100 and 95% respectively for the

comparisons between eigenvalues generated from the two analyses (Turner, 1998). Results

suggested six or fewer components be retained for further analysis, as the seventh

eigenvalue from the previous factor analysis ($\lambda = 1.61$) had a smaller value compared to the

seventh eigenvalue ($\lambda = 1.63$) generated from the random number matrix in parallel

analysis at $p = .05$ level, as shown in Table 5.

Table 5

Factor Analysis versus Parallel Analysis

RFBS Scale	Exploratory Factor Analysis	Parallel Analysis
	Eigenvalues	
Root 1	9.41	2.01
Root 2	7.19	1.90
Root 3	2.61	1.83
Root 4	2.01	1.77
Root 5	1.79	1.72
Root 6	1.75	1.67
Root 7	1.61	1.63

Note: Principal component analysis with varimax rotation was used in both factor analysis and parallel analysis. Eigenvalues from exploratory factor analysis were compared against eigenvalue for the 95th percentile of the simulated matrices in parallel analysis using Raw Data Permutation.

A six-component solution was adopted. After determining the number of components

to be extracted, the researcher decided to conduct the factor analysis with promax oblique

rotation instead of varimax orthogonal rotation. It was believed by the researcher that the

factors might be related, so the use of oblique rotation would be the best form of rotation to produce a theoretically more fitted analysis. Principal axis factoring extraction method via promax rotation was also explored for the RFBS scale. Instead of taking all variances into consideration, shared variance was examined in principal axis factoring. The investigator was curious whether the extraction method using share variance would lead to a better loading on each

A comparison of each factor loading was conducted between principal component extraction and principal axis extraction, with a better result found using principal component factoring in terms of number of items retained in each factor and the internal consistency of each factor based on Cronbach's α. A comparison of total variance in each of the extraction methods for this six-component solution is presented in Table 6. A comparison of each item loading and Cronbach's α level is presented in Table 7. As we can see from Table 6, the principal axis extraction method had a smaller percentage of total variance explained due to its extraction method of using only shared variance for analysis, which was different from principal component analysis in which total variance was analyzed. Therefore, one would expect the total variance being explained by the principal axis factoring to be smaller than that from the principal component analysis. As we can see from Table 7, the number of item loadings via the principal axis method also resulted in a smaller number of items on the fifth and sixth factors, and lower Cronbach's α for most

factors. Overall, the principal component factoring method gave a slightly better solution

in fitting the data than the principal axis method.

Table 6

Total Variance Explained Comparisons (Promax Rotation)

RFBS Scale	Principal Component	Principal Axis
	Cumulative	Cumulative
	% of Total Variance	% of Total Variance
Factor 1	16.31	15.37
Factor 2	28.55	26.53
Factor 3	32.92	29.79
Factor 4	36.15	31.94
Factor 5	39.19	33.91
Factor 6	42.01	35.63

Table 7

Principal Component Analysis versus Principal Axis Factoring

RFBS Scale	Principal Component		Principal Axis	
	Over .4 Factor Loading		Over .4 Factor Loading	
	N	Cronbach's α	N	Cronbach's α
Factor 1	21	.91	20	.92
Factor 2	5	.62	4	.61
Factor 3	4	.64	4	.62
Factor 4	5	.64	4	.63
Factor 5	5	.71	4	.71
Factor 6	4	.62	1	

Note. A promax rotation was used in both extraction methods.

However, as the results in principal axis showed that only one item loading on factor 6 had a factor loading over .40, the researcher also examined the possibility of extracting only four and five components in the factor analysis using principal component analysis. There were two reasons behind forcing the items to load on fewer factors: First, the researcher was trying to generate the most parsimonious factor solution while maintaining as much variance explained as possible. Second, forcing items to load on fewer factors might prevent the possibility of having too few items on any factors resulting from future item reduction processes in phrase IV. After exploring the number of factors to be extracted, a five components exploratory factor analysis result was believed to be a better solution in terms of more adequate loadings, higher internal consistencies, and factor interpretation. The comparison between the six-component soluation and the five component solution is presented in Table 8.

Table 8

Six component solution versus five component solution.

| RFBS Scale | Six Component | | Five Component | |
| | Over .4 Factor Loading | | Over .4 Factor Loading | |
	N	Cronbach's α	N	Cronbach's α
Factor 1	21	.91	21	.92
Factor 2	5	.62	9	.73
Factor 3	4	.64	6	.68
Factor 4	5	.64	7	.74
Factor 5	5	.71	5	.68
Factor 6	4	.62		

Note. Principal component analysis with promax rotation was used in both extraction methods.

Based on these criteria, a final solution with five factors was decided upon. A summary of exploratory factor analysis item results for RFBS scale using pricinple component analysis with promax rotation is presented in Table 9. Item-factor loadings less than .4 were not considered for further analysis under the review. As a result, eleven items were removed from the scale. There was no cross-loading from the factor analysis. All items on each factor component were sorted by factor loading size. The component correlation matrix indicated an overall positive correlation between component 2, component 3, component 4 and component 5. Positive correlations were found between component 2 and component 3 ($r = .18$), 4 ($r = .29$), and 5 ($r = .21$). For component 3, positive correlations were found between component 3 and component 4 ($r = .27$)as well as component 3 and component 5 ($r = .20$). Lastly, a positive correlation between component 4 and 5 was also found ($r = .15$). These results supported the use of promax rotation in the study.

Table 9

A summary of exploratory factor analysis item loading results for RFBS scale.

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
#37	.77				
#44	.72				
#52	.71				
$40	.70				
#28	.70				
#56	.69				
#31	.63				
#16	.60				
#30	.60				
#20	.59				
#36	.57				
#05	.57				
#08	.57				
#32	.56				
#04	.55				
#35	.55				
#55	.51				
#24	.50				
#39	.47				
#27	.43				
#12	.42				
#17		.66			
#13		.61			
#10		.56			
#57		.47			
#29		.43			
#06		.43			
#14		.43			
#21		.41			
#54		.41			
#26			.65		
#41			.64		
#23			.60		
#25			.44		
#43			.43		
#50			.40		
#07				.69	
#02				.60	
#18				.51	
#48				.50	
#59				.50	
#15				.47	
#51				.40	
#46					.56
#49					.50
#33					.47
#53					.45
#58					.42

Note. Principal component analysis with promax rotation was used in both extraction methods. Item-factor loadings <.40 were removed. There was no cross-loading. ($N = 335$)

Rasch model.

The Rasch model was used to provide a different understanding of the instrument

based on item response theory against traditional classical test theory methods such as item

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analysis and factor analysis.The Rasch model was adopted in this study to measure the relationship between items and survey takers due to its ability to provide separation from the distribution of the attribute in persons (Bond & Fox, 2007). In other words, the Rasch model is used to construct a relatively invariant measurement that takes person's trait variation into account. In the current study, a "personal trait" could be considered as one's knowledge, characteristics, or believes in handling financial risks. The researcher was trying to find out if any of the items in the previously reduced scale fail to provide a fit when considering each individual's trait. Due to the complexity of Rasch analysis results, only dimensionality, overall fit and item fit, item-person position, and category frequencies were interpreted for this study in order to help construct an instrument. The unidimensionality assumption served as a criterion for examining the dimension of each factor in the five-component solution derived from exploratory factor analysis. Overall fit and item fit could provide further justification to reduce the number of misfitting items that were remained from the previous factor analysis. The results from Rasch model analysis would further improve the measure of RFBS scale in terms of construct validity (Bond & Fox, 2007).

The Rasch model analsis was conducted using Winsteps software (Linacre & Wright, 2013).Based on the assumption of unidimensionality, each of the factors in RFBS scale was analyzed individually. A total sample size of 335 participants was used for each analysis. In the first factor, twenty one items were analyzed with Winsteps, output

including dimensionality, summary statistics, and item fit order were reviewed. Results

from the dimensionality output indicated a possible of multidimensionality of factor 1,

given 40.1% of raw variance explained by measure, but an eigenvalue of 2.3 and a 6.4% of

variance for the first contrast. This interpretation was informed by the criteria of

unidimensionality that over 40% of the variance should be attributable to the first

dimension with an eigenvalue less than 2.0 and variance for the first contrast less than 5%

of the total unexplained variance (Linacre, 2010). To investigate problems resulting in

multidimensionality, the researcher first conducted a check on item fit order and found that

item 5 and item 12 were misfitting according to one of the suggestions of keeping mean

square infit or outfit between less than 1.3 for sample size less than 500 (Smith,

Schumacker & Bush, 1998). These two items were underfitting, meaning participants'

results for this item had too much noise (underfit) in the model. The misfitting items were

removed from the data set and the remaining items were subjected to a new round of

analysis. The result of dimensionality for factor 1 after removing the item showed

unidimensionality for the data set: percentage of total variance explained by the first

dimension was 43%, with an eigenvalue of 2.0 which accounted for 6.4% of the variance in

the first contrast. The overall fit of the first factor after dropping item 5 and item 12 had

mean squares of 1.02 and 1.01, and standard deviation under 1 for both infit and outfit. This

suggested the data fit the model well. All the other items were retained based on the infit

and outfit mean squares in item fit order output. Figure 2 illustrates items were spread out

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between -1.0 and 1.0 logits with the majority of the persons positioned between -1.0 and

2.0 logits, and a person mean of 0.10 logits. This illustrated that most of the 325 students

were adequately targeted by items along the scale, across all 19 items in factor 1.

Figure 2. Item-Person Map – Factor 1 Subscale

The response scale was also examined for each factor to determine if the scale was properly used to fit participants' characteristics. There were 5 categories in the RFBS scale: 1 ("Just like me"), 2 ("Somewhat like me"), 3 ("Neutral"), 4 ("Somewhat not like me"), and 5 ("Not like me at all"). The results showed that the response category for the confidence subscale spread out nicely. The probability of each category from 1 to 5 were 8%, 27%, 21%, 30%, and 14% respectively, with all fit indexes satisfied under the cutoff of 1.3. A category probabilities plot (Figure 3) is presented as follows. The category results suggested a good use of the response scale for the factor 1 subscale.

```
       CATEGORY PROBABILITIES: MODES - Structure measures at intersections
 P      -+-------+-------+-------+-------+-------+-------+-------+-
 R  1.0 +                                                         +
 O      |                                                         |
 B      |11                                                       |
 A      | 111                                                     |
 B   .8 +    111                                               5+ |
 I      |     11                                             55 |
 L      |      1                                            55   |
 I      |      11                                          5     |
 T   .6 +       11                                        55     +
 Y      |        1      22222                            5       |
     .5 +          11222      22           44444    5            +
 O      |          221        22        44       4**             |
 F   .4 +         22   1         2     44       5  44            +
        |        22      11        22 4        5      44         |
 R      |       22         1        **        55        44       |
 E      |      22          11   333*  *333  5            444 |
 S   .2 +    222              *33 44    22 **3              4+   |
 P      |  222              333 114      5*    33                |
 O      |22               333    444111   55 222  333            |
 N      |            333333  4444      5***1      2222 333333     |
 S   .0 +*******************555555555    1111111111***********+
 E      -+-------+-------+-------+-------+-------+-------+-------+-
           -4      -3      -2      -1       0       1       2       3
        PERSON [MINUS] ITEM MEASURE
```
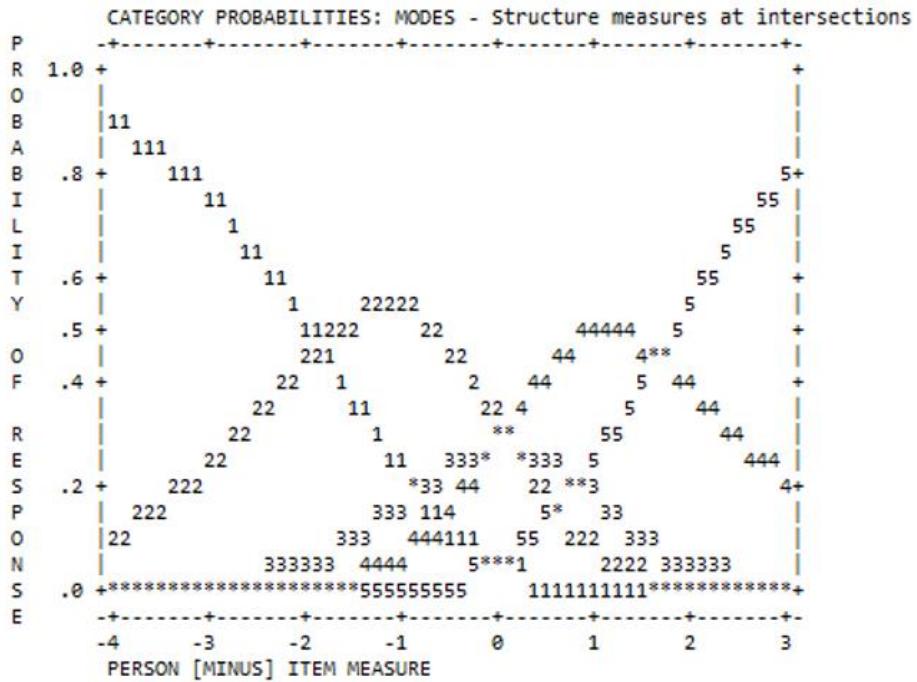
Figure 3. Category probability plot for factor 1

Similar procedures were conducted in Winsteps for the other four factors. A summary of dimensionality, percentage of variance explained is reported in Table 10. Although most

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results suggested unidimensionality in each factor, concerns of possible

multidimensionality and a wide spread of items and persons on measures were raised by

the researcher.

Table 10

A summary of dimensionality and variance explained

RFBS Scale	Item N	Total Variance Explained	Eigenvalue for the 1st contrast	% of Variance Explained by the 1st contrast
RFBS Total	60	31%	9.2	10.6%
Factor 1	19	42.5%	2.0	7.4%
Factor 2	9	34.0%	1.9	14.2%
Factor 3	6	40.6%	1.9	18.3%
Factor 4	7	44.8%	1.5	12.1%
Factor 5	5	42.0%	1.6	18.1%

Note: Conducting using Principal Components Analysis of Residuals in Rasch model in Winsteps.

All other factors also indicated good overall fit to the data. Following the criterion of

mean squares below 1.3 for less than 500 participants, no item was removed from factors 2,

3, 4 or 5. A summary of the item separation, infit, and outfit MNSQ statistics for each item

of the RFBS scale and frequency response categories is presented in Table 11.

As to the use of scale examinations for the rest of the four subscales, the results of all

other four factors suggested a misfit of category 5 ("Not like me at all"), meaning that

category 5 was not fitting the sample characteristics well enough according to the dataset.

A possible explanation of this misfitting category in terms of item scale responses could be

that most participants were not disagreeing with the items and perceived themselves less

risk seeking. Also, extreme categories are more likely to misfit.

Table 11.
Item separation, infit and outfit MNSQ statistics for each item of the RFBS scale and frequency response categories

RFBS Scale	Real Person Separation	Infit	Outfit	Mean Category Frequency (%)				
				1	2	3	4	5
Factor 1	2.97	1.02	1.01	8	27	21	30	14
Item 30		1.23	1.27	7	21	19	37	16
Item 40		1.19	1.22	12	27	16	20	25
Item 27		1.18	1.17	13	33	24	25	6
Item 39		1.06	1.12	16	44	25	12	4
Item 52		1.10	1.10	8	19	19	31	23
Item 44		1.09	1.05	13	30	14	24	19
Item 32		1.09	1.07	11	39	16	24	10
Item 04		1.08	1.05	5	26	17	32	21
Item 16		1.04	1.07	11	32	16	27	14
Item 24		1.07	1.06	8	34	28	21	8
Item 36		0.97	0.99	5	20	14	41	19
Item 08		0.88	0.96	2	18	20	40	20
Item 55		0.94	0.95	6	29	26	32	8
Item 56		0.92	0.94	4	26	24	34	13
Item 31		0.90	0.90	7	22	34	28	9
Item 28		0.85	0.87	5	24	13	35	22
Item 35		0.85	0.82	4	30	33	26	7
Item 20		0.81	0.80	6	24	19	41	10
Item 37		0.78	0.77	7	29	18	29	17
Factor 2	1.47	1.03	1.01	31	33	19	14	4
Item 17		1.29	1.24	36	14	19	21	10
Item 10		1.14	1.18	32	30	19	14	5
Item 06		1.03	1.08	19	42	20	16	4
Item 29		0.99	1.07	21	37	25	15	3
Item 57		1.03	1.05	26	21	28	20	5
Item 21		1.00	0.93	38	37	16	8	1
Item 14		0.94	0.92	36	36	15	11	2
Item 54		0.83	0.83	38	38	17	7	1
Item 13		0.74	0.78	32	42	13	11	1

Factor 3	1.16	0.97	0.99	40	34	15	10	2
Item 25		1.25	1.13	48	23	15	12	2
Item 41		1.09	1.04	48	28	16	5	3
Item 26		1.07	1.02	55	29	10	5	1
Item 23		1.00	1.00	50	34	11	6	0
Item 43		0.95	0.94	16	46	22	15	1
Item 50		0.80	0.78	22	42	19	15	2
Factor 4	1.57	1.02	1.00	14	41	23	19	4
Item 02		1.19	1.19	17	39	21	18	4
Item 59		1.13	1.16	5	22	28	33	12
Item 51		1.05	1.09	13	45	29	11	1
Item 48		1.04	1.03	13	37	26	21	3
Item 18		0.94	0.91	19	51	15	13	1
Item 07		0.85	0.81	22	49	16	12	1
Item 15		0.80	0.80	8	41	24	22	4
Factor 5	1.30	0.99	0.99	24	46	17	11	1
Item 33		1.07	1.08	27	41	16	15	1
Item 53		1.05	1.08	27	38	21	12	2
Item 46		0.99	0.98	24	49	19	7	1
Item 58		0.94	0.90	22	55	13	10	0
Item 49		0.91	0.89	21	48	17	12	2

Final reduction.

A further reduction of the items in the RFBS scale was a combined decision regarding item-factor meaning interpretation and item-factor loadings.

Based on the researcher's initial expectation of the factors and the understanding of each items in the scale, five factors were defined as follows: (1) Factor 1: Financial confidence; (2) Factor 2: Comfort level with gambling; (3) Factor 3: Financial responsibility; (4) Factor 4: Financial risks attitude; (5) Factor 5: Financial decision personality. A summary of remaining items in each factor is included in Figure 4.

Factor 1 - Financial Confidence

Item 44: I believe I am less skilled in managing my money than other people.

Item 52: I am not confident in planning my financial budget for the coming year.

Item 28: I do not feel confident making financial decisions, even when I have the knowledge to do so.

Item 56: Regardless of my experiences in financial management, I get easily influenced by others' opinion.

Factor 2 - Comfort Level With Gambling

Item 17: I've never spent my income on buying Mega Million lottery tickets.

Item 13: I do not like taking high interest loans mainly because they would create stress.

Item 10: Because I don't believe in luck, I never buy lottery tickets or gamble.

Item 6: I am not interested in making fast money (that involves high risks at the same time).

Factor 3 - Financial Responsibility

Item 26: I am very responsible for the financial loans I took.

Item 41: I always pay off all my credit card debts rather than just the minimum payment.

Item 23: I believe there is no such thing as a free lunch.

Item 25: I never overspend with my credit card.

Factor 4 - Financial Risks Attitude

Item 7: When it comes to making a financial investment, I prefer safety to risks.

Item 2: Most of the time, I do not feel like handling any investment involving risks.

Item 18: I am more comfortable with living a life that does not involve high financial risk.

Item 59: I believe most wealthy and successful people don't like to take great risks.

Factor 5 - Financial Decision Personality

Item 46: When it comes to my daily spending, I always try to save as much as I can.

Item 49: Before I make a financial decision, I would consider my options multiple times.

Item 53: I keep my monthly credit card spending below my budget.

Item 58: When making big financial decisions, I am a very cautious person.

Figure 4. A summary of remaining items in each factor after exploratory factor analysis, item reliability analysis, Rasch model analysis, and final reduction. Item order sorted by factor loading sizes.

The first factor was identified as financial confidence, since all four questions remaining after analysis were from the originally defined "financial related confidence"

domain when the scale was first created in phase II. These items were related to measuring the idependent level of people making financial decisions.

Factor 2 was overall the hardest factor to define for the researcher. Ostensibly, each item under this factor addressed the topic of gambling: the first question was about experiences with gambling; the second item was about taking high interest loans which could be taken as a problematic behavior;the third item was also about gambling which was very similar to the first item in this factor; the fourth item was about making fast money but involving high risk. The researcher realized that the first item (item 17) and the third item (item 10) were similar, which might confuse future survey takers. However, a round of item reliability analyses of all possible combinations of the remaining items suggested that these four items had a better Cronbach's α than other combinations. Although reluctant, the researcher decided to keep both item 17 and item 10, thinking future survey participants might be able to distinguish item 17 which was asking about gambling behavior from item 10 which was asking about gambling beliefs.

Factor 3 was intended to measure one's financial responsbility, because keywords such as "responsible," "always pay off…debt," "no…free lunch," and "never overspend" all indicated a sense of financial resonsibility and control of outcome. Factor 4 was realted to the opinions on financial risks. Three out of four items were from the original "attitude toward risks" domain. Lastly, items in factor 5 all indicated a type of personal habitual

practice about financial saving and decision making. All the verbs in these items revealed personality related beliefs that could influence one's financial behavior as a result.

As the researcher decided to keep these 20 items, an item reliability analysis was conducted to investigate the final internal consistencies of each factor item loadings. The total 20 items RFBS scale had an internal consistency Cronbach's α of .69 based on the field administration data. Factor 1 had an internal consistency of .79; factor 2 had an internal consistency of .62; factor 3 had an internal consistency of .63; factor 4 had an internal consistency .65; factor 5 had an internal consistency of .63. Overall, the results from each subscalewere adequate but not strong.

Phase IV: Validation

Besides the goal of using field administration data to develop a financial risk tolerance scale, the researcher was also interested in examining the convergent validity between newly developed RFBS scale and the commonly used Grable Lytton Risk Tolerance Scale (GL-RTS) scale. Convergent validity is generally considered as a parameter for estimating the relationship of the two measurements that measure similar constructs. Both scales were worded in the same direction, indicating more tolerance for risk with higher scores. A bivariate correlation was computed between each factor total score in the RFBS scale and the GL-RTS total scores for 334 participants. Results showed that there were no particularly strong correlations between two scales, however, four out of five factors had statistically significant correlation coefficients at α = .05 level. Factor 1 (Financial

confidence level) had a negative correlation with the GL-RTS total scores, r (334) = -.19, p

< .01. Factor 2 (Comfort level with gambling) had a positive correlation with the GL-RTS

total scores, r (334) = .15, p < .01. Factor 3 (Financial responsibility) had a positive

correlation with the GL-RTS total scores, r (334) = .26, p < .01. Factor 4 (Financial risk

attitude) did not have a significant correlation with the GL-RTS scale. Factor 5 (Financial

decision personality) had a positive correlation with the GL-RTS total scores, r (334) = .18,

p < .01. Overall, these correlation suggested a moderate convergent validity between the

two measures (Murphy & Myors, 1998).

Other demographic data of the field administration results were also examined at the

end of phase IV validation. Besides what has already been mentioned in Table 4, the

researcher compared the mean differences in score results of the two measurement scales

with regards to demographic information. This final step provided some supports for

looking at the validity of the scale to prevent any major sample selection bias. As

hypothesized in chapter 2, the effect of age, gender, and state were examined in the study.

Although state effects in the survey might possibly exist, the researcher was not

expecting any state differences to be significant from the field data due to lack of previous

theoretical supports. However, hypotheses of age, gender, or family household income

effects in risk tolerance level were supported by previous studies (Byrnes et al., 1999;

Daruvala, 2007; Jianakoplos & Bernasek, 2008). In the current study, due to the majority of

participants were Caucasian and working as a full time, the comparisons between different

ethnicity groups and working statuses were not examined due to major differences between each group in sample size. Potential gender differences and state differences were examined as follows.

Age data were categorized into five groups based on a decade separation. Participants who had age ranging from 18 to 30 years old were categorized into group 1. A total of 117 participants were in the first group. There was a total of 96 participants ranging between 31 and 40 years old. The same classification method was conducted for the age group between 41 and 50, 51 and 60, 61 and above. A total of 327 valid age cases were used for the comparison.

A total of 41 states were represented in the current study among 335 participants. In order to compare group differences while maintaining enough statistical power, the researcher picked only the most populated four states (California, Colorado, Tennessee and Texas) among all the states. All these four states had at least 20 or more participants participated in the survey study, thus could be compared at a similar sample size level.

Since assumptions of normality, linearity, and outliers were checked in the previous phase, the researcher assumed these assumptions were met given the fact that no data point was modified or added. Tests of homogeneity of variances were conducted for one-way ANOVA analysis on age and the four states, and the Levene's test for quality of variances was conducted for the later t-test analyses on gender.

Results from the tests of homogeneity of variances suggested that there were no significant differences of variances for five factor total scores and GL-RTS survey total scores in the dataset, given all p-values not significant at α =.05 level. Nonsignificant p-values were found for the Levene's test for quality of variances for gender data at α =.05 level. All assumptions were met for the three analyses.

One-way analysis of variance tests were conducted across all five age categories. Except for the first factor in RFBS scale which measures financial confidence, results of the ANOVA tests showed nonsignificant differences across all age groups at α=.05 level. A significant group difference was found between the means of age groups for confidence subscale, F (4, 322) = 2.67, p< .05. Post-hoc tests using Fisher's Least Significant Difference (LSD) and Tukey HSD approaches were conducted. Results from the Tukey HSD post hoc test suggested that there was not a significant difference in financial confidence subscale between the means of each individual groups, but the results from Fisher's LSD post hoc test indicated significant mean differences between group 1 and group 2, group 1 and group 3, as well as group 1 and group 4. A summary of the average scores of age groups in each factor domain is included in Table 12.

Table 12.

A summary of the average score by age groups

	Group #1	Group #2	Group #3	Group #4	Group #5
Factor 1	12.18	13.61*	13.73*	13.68*	13.70
Factor 2	9.89	9.44	8.94	8.60	9.00
Factor 3	8.46	7.76	8.23	7.62	9.50
Factor 4	10.84	10.15	10.15	10.24	10.30
Factor 5	9.27	8.84	9.08	8.98	9.08

Note: All comparisons were examined at α = .05 level.
* = mean difference with group 1 in LSD post hoc test was significant at α = .05 level.

One-way analysis of variance tests were conducted across four states. Results of the ANOVA test showed RFBS total score, five RFBS subscale total scores and GL-RTS total scores were not significantly different across the four states at α =.05 level, $F(3, 112)$ = 1.695, p =.17.

Independent *t*-tests were conducted to examine the differences between males and females on RFBS total score, all five RFBS subscale total score and GL-RTS total score. There were significant gender differences between males and females on factor 2 and factor 3 total scores. Male participants (M = 9.88, SD = 3.23) had a significantly higher score in the "comfort level with gambling" factor total scores than female participants (M = 9.01, SD = 3.06), t (324) = 2.50, $p < .05$. In the third factor total score indicating "financial responsibility," male participants (M = 8.56, SD = 3.11) also had a significantly higher score than female participants (M = 7.79, SD = 2.64), t (324) = 2.41, $p < .05$. However, there was not an overall difference between males and females on the total score of RFBS scale, p = .06. A summary of the other *t*-test results is included in the following Table 13.

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Table 13.

A summary of the total score comparisons by gender

	Gender $M_M - M_F$	SE_{diff}	$t(324)$	p (two tailed)
GL-RTS Total	-.35	.61	-.57	.57
RFBS Total	1.69	.88	1.92	.06
Factor 1	-.34	.44	-.77	.44
Factor 2	.87	.35	2.50	.01*
Factor 3	.77	.31	2.41	.02*
Factor 4	-.06	.32	-.20	.85
Factor 5	.46	.28	1.64	.10

Note: All comparisons were examined at α = .05 level. * = <.05.

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CHAPTER IV: DISCUSSION

General Review

Without a doubt, the human financial decision making process is complicated. Traditional methods of measuring one's risk tolerance in economic and finance were built on the idea of the "rational mind," which assumes that people make consistent and rational financial decisions based on the rule of maximizing possible return. The effects of psychosocial factors and differences in human cognitive perception were not focused in the field until Kahneman and Tversky's prospect theory was introduced in 1979. Since then the study of human decisions started to include more measures related to human perceptions, personality, emotion, and other psychosocial factors. Brachinger (2002) mentioned that how well a decision or a value preference can be understood depends on the amount of risk one can handle. Although previous researchers have developed many psychometric scales to measure one's risk preference level from different perspectives such as gambling, attitudes, risk compulsiveness and personality, the researcher started to wonder if there was a comprehensive way of measuring one's understanding and tolerance about their risks (Horvath & Zuckerman, 1993; Rohrmann, 2005; Vlaev et al., 2010; Weber et al., 2002). In other words, the research questions were: could risk tolerance level really be measured? Is it possible to have a consistent measure of one's risk tolerance level, given

the fact that there are so many economic and psychological factors that possibility affect

human financial decisions? In this study, the researcher attempted to design a

comprehensive domain-specific measurement scale that can reflect one's financial risk

tolerance level regarding their daily money decisions. It is believed by the researcher that a

developed measurement scale that reflects more than one component could be a potential

tool for studying and predicting human risk seeking behaviors in the future.

A measure was thus created based on previous theoretical supports and the

researcher's understanding of risk tolerance. A total of 60 questions were developed in the

item pool generation process in phase I. Item content examination from content expert

review as well as cognitive interview helped to increase the face validity and content

validity of the scale before being administrated to a participant sample. After the data

collection was over, item reduction processes were conducted using exploratory factor

analysis (EFA), item reliability analysis, and Rasch analysis. Items were finally selected

based on the combined decision of item-factor loading and item meaning. Redundant items

and weak items were removed from the scale. A five-component solution of 4 items in each

of the five factors were used by the researcher.

Major Findings and Implications

The goal of developing the RFBS scale was to explore the possibility of examining

different aspects of the financial risk tolerance in one comprehensive scale. Although the

final results from the factor analysis and item reliability analysis did not show a

particularly strong reliability level as expected, the researcher still obtained a Cronbach's α

level of .69, comparing to the GL-RTS of .75 from previous studies (Gilliam et al., 2010).

This result showed the possibility of designing a comprehensive scale which measures

people's financial risk tolerance at a relatively consistent level. The use of having several

different but somewhat theoretically related factors to represent a latent construct was

shown in this study.

Although the original idea of having four-component solution (Financial related

behavior, financial related personality, attitudes toward risk and return, and financial

confidence) to reflect one's financial risk tolerance was not fully supported by the

statistical results, this was expected by the researcher given the fact that financial risk

tolerance is a difficult construct to define. The trade-offs between being content highly

consistent and less comprehensive, between quantitative/number oriented and

psychological oriented, between survey length and measurement tiredness were concerned

by the researcher throughout the statistical analyses in phase III. More will be discussed in

the limitation section.

The comparison between using traditional exploratory factor analysis and the trait

focused Rasch analysis was revisited in the study. The researcher is not trying to discuss

which method would lead to a better measurement accuracy or a better result, but the

obvious theoretical differences in using these two methods could lead to some serious

thinking about the best way of analyzing the data based on the characteristics of the sample

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set. Although the researcher only dropped two items from factor 1 in the Rasch analysis, it is worth mentioning that there were several other items that were close to the 1.3 cutoff of item fit index by Smith et al. (2013). According to Green (1996), Rasch model and exploratory factor analysis using principal component method could result in similar definitions of a scale if the items were closely related. It was suggested by Green that the Rasch analysis could provide further support to the results obtained from principal component analysis, because it examines the item calibration independently to prevent the item residuals from creating different results. Besides the suggestion, the researcher also believed that EFA could provide a better understanding of the correlation between items from a purely statistical practice standpoint, and Rasch could bring insights to understand the data from a broader scope based on sample latent traits and item difficulties standpoint. Therefore, the combination of these two methods were adopted and were found to be helpful for researcher to identify the strongest possible items while also considering how well these items could fit the characteristics of the sample population.

In the validation phase, the overall results from RFBS scale suggested a moderate convergent validity with the commonly used GL-RTS scale. There were four subscales correlated with the GL-RTS scale at statistically significant but low correlation levels (smaller than $r = .30$). However, given a large number of sample in this study, a low correlation can still be considered as a relative moderate effect size for convergent validity,

according to Murphy and Myors (1998). Among these four significant correlations, the financial responsibility subscale had the highest correlation with GL-RTS scale.

In order to further interpret the results of the comparison, the researcher took a closer look at the design and items of each measure again and believed these two surveys are still very different. Although both surveys were intended to measure the same construct which was financial risk tolerance level, these two scales approached the goal in quite different ways. First of all, these two scales had different formats and different scoring systems. The GL-RTS scale was created in a multiple-choice format with a possible number of two, three or four choices to choose from, whereas the RFBS scale was created using a 5-point Likert-like scale ranging from 1 to 5. The scoring system in the GL-RTS involves reverse scoring, inconsistent score for each rating answer (answer choice number 2 could be scored as 2 points or 3 points, depending on different items). The RFBS scale had consistent scoring with no reverse scored items. Furthermore, most of the items in the GL-RTS scale involved specific hypothetical money decisions, but the RFBS scale measured people's daily financial risk decisions using a less hypothetical approach. A concern of external validity in GL-RTS scale occurred naturally when the researcher considered the possibility of people having no experience with choosing financial assets or portfolio in their real life. During the cognitive interview in phase II, three out of five participants provided background information lacking experience in making real world financial asset decisions, which brought more awareness to the researcher in carefully reconstructing items in the

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RFBS scale. Although running the risks of not being specific and problem focused in the RFBS scale, the researcher reduced the risk of having non-applicable items to a minimum for all participants with different level of experiences in financial management. A further examination of the convergent validity of RFBS scale should be explored with other similar measures.

There were some interesting findings from the inferential statistical analyses. Based on the descriptive statistics and correlation analyses of RFBS scale, we can see that there was a statistically significant negative correlation between factor 1(financial confidence) with other factors in the scale, r (334) = -.20, p <.01. The average total score of the financial confidence subscale was higher than other subscale total scores. This indicated that even relatively financial conservative participants would rate higher in the financial confidence subscale (meaning high confidence). Although detailed comparisons were not conducted since the main focus was not on examining the relationship between financial confidence and risk tolerance level, the results did suggest some interesting ideas about previous studies on financial overconfidence. It was believed that overconfidence would lead to a more risk seeking behavior in terms of trading volume, the researcher was curious whether this behavior was mainly due to being confident (Glaser & Weber, 2007). Without a doubt, there might be a significant difference in definition between "being overconfident" and "being generally confident," more needs to be studied to distinguish the effect of

overconfidence on financial behaviors from the effect of confidence on financial behaviors.

In the current study, the results from other demographic comparisons suggested that there was not a state effect (from 4 most populated states comparisons) in both RFBS scale ratings and GL-RTS scale ratings, and there were gender differences in the rating of comfort level of gambling subscale and financial responsibility subscale. The comparisons between age groups did not suggest a significant difference based on the Tukey's HSD post hoc test but significant differences between age groups based on Fisher's LSD post hoc test. Given the fact that not enough samples were collected from other states, the researcher was not yet confident to say that there was not a state effect on financial risk tolerance. Although the gender rating differences in two of the subscales were significant in the study (a .9 and .8 difference respectively), the researcher was also not sure how different was an average of one point difference for the results. The comparisons between age groups showed that there was an overall significant difference in financial confidence subscale, the followed-up Fisher's LSD suggested significant group difference between group 1 and group2, group 3, and group 4. However, Tukey's HSD post hoc test did not suggest a significant mean difference between the groups in confidence subscale. Future comparisons need to be conducted in order to examine the effect of these demographic variables.

Limitations and Future Research

The main focus of this study was to develop a comprehensive risk tolerance scale that might have the potential to be a future measurement tool through psychometric testing and reduction. Although the researcher made efforts to prevent major drawbacks at every stage of the study, limitations still existed in the study.

The biggest concern of this scale development study was the difficulty of generating and testing comprehensive item questions. As the researcher mentioned in the previous section, the worries of having too many item questions asking about the different aspects of one's risk tolerance level could lead to a feeling of being not content specific. Traditional factor analyses was conducted based on item correlations. Although the results provided a good start to developing a comprehensive measurement for risk tolerance, the measure of risk tolerance is a cross-discipline work which requires further development. Another round of item generation process with stronger theoretical support is recommended. The researcher also believes that the use of Rasch analysis could be potentially a better method for studying risk tolerance.

The tradeoff between total item numbers and test fatigue in field administration was also a concern of the researcher, since having a total of over 80 items in this study was definitely a little bit too long for the survey taker. There were originally over 430 participants who started the online study, but only around 300 participants answered all the survey questions. Among those over 130 missing cases, a total of 80 incomplete cases had

many missing values. In order to reduce this possible confounding factor from the future, a suggestion of having several rounds of retesting with fewer items is recommended.

There was also a concern of including more demographic questions for the study. Other important demographic questions such as asking about education status and levels of experiences in handling their financial budget would be extremely helpful for analyzing future results. A large and more representative sample is also encouraged for future research.

In order to study group differences with more confidence and statistical power, a second round of data collection would be necessary. Although group comparisons were not the main focus of this study, the researcher was hoping to see more interesting results from the demographic information. Another round of data collection using the simplified and better constructed risk tolerance measurement scale with more strong loading items added in the future would increase the accuracy of group comparisons.

Lastly, it is still unclear whether one's confidence level is really affecting a person's preference of being risk seeking or risk avoiding. Yet, this was another big concern from the researcher when designing and analyzing the survey items. Interestingly, the financial confidence subscale had the highest internal consistency in measuring risk tolerance in the current study, but the subscale scores were negatively correlated with other subscales. The result generated a research question concerning the effect of financial confidence. Furthermore, it seems even more necessary to conduct a comparison between the

definitions of being overconfident and being confident for the future study as these two concepts might lead to total different results in future studies.

Conclusion

The researcher developed the RFBS scale to address the lack of a comprehensive risk tolerance scale in existing measures. The results of the factor and item analyses have showed that the RFBS scale has a potential for being developed to be a useful instrument in measuring people's daily financial risk tolerance. Although the initial results of reliability and validity from the field administration data was not as strong as expected, the researcher identified several areas for future improvement. The study showed the possibility of designing a comprehensive yet relatively reliable measurement for measuring risk tolerance level. The use of Rasch analysis is shown to be helpful for studying a construct that has a strong connection with individual traits.

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Risky Financial Behavior Scale (RFBS)

for Content Expert Review

Once again, thank you for participating in this study. This instrument measures people's financial decision behaviors. A true reflection of your opinion on each question is extremely important.

On a scale from 1 to 5 (with 5 being best), please respond to the following questions by choosing the number that best describes you or your experience. Your results will be recorded anonymously. No identifying information will be collected. Thank you!

Financial Related Behaviors (15 Qs):

1. I usually have tight control over my budget for the major spending in the coming year.

5. I do not change my loan interest plan once I've made a major purchase, like a house.

9. I usually do not accept any types of loans (car or college tuition) for personal and family purposes.

13. I do not like taking high interest loans simply because they would create stress.

17. I've never thought about spending my income on buying Mega Million lottery tickets.

21. Regardless of my financial situation, I would pay attention to how many times I've used my credit card.

25. I've never overspent with my credit card.

29. I would rather live in a smaller apartment than a bigger apartment with higher rent.

33. Before taking any financial loans, I do a lot of financial research.

37. I have no plan for how to handle financial risk compared to other people.

41. I always pay off all my credit card debts rather than just the minimum payment.

45. Even if I had to take loans, I am paying off my mortgage, loan, or credit card bill as fast as I can.

49. Before I make a financial decision, I would consider my options multiple times.

53. I keep my monthly credit card spending below my budget.

57. I always keep track of how much I spent with my credit card every week.

Financial Related Personality (15 Qs):

2. Most of the time, I avoid any investment involving risks.

6. I am not interested in making fast money.

10. Because I don't believe in luck, I never buy lottery tickets or gamble.

14. When it comes to credit card spending, I am financially more conservative.

18. I am comfortable with living a life that does not involve high financial risk

22. If it involves money, I never bet with friends on any event.

26. I am very responsible for the financial loans I took.

30. I would rather wait for another year to get a better deal for a car.

34. When it comes to the best opportunities of making money, I can be very patient.

38. I avoid financial decisions with high interest loans.

42. When it comes to daily spending, my friends say that I am financially conservative.

46. When it comes to my daily spending, I always try to save as much as I can.

50. By nature, I am not a risk-seeking person.

54. I feel rewarded to be able to control my spending.

58. When making big financial decisions, I am a very cautious person.

Financial Attitude toward Risks and Returns (15Qs):

3. Taking loans for any level of further education will lead to a better return financially.

7. When it comes to making a financial investment, I prefer safety to risks.

11. I think the biggest mistake one can make is to take risks beyond what one can handle.

15. I understand risk may be good, but I like to associate it with negative feeling.

19. I think people can make a big fortune without having to take much risk.

23. I believe there is no such thing as a free lunch.

27. I do not agree with the idea that greater risk leads to higher rate of returns.

31. The amount of return has nothing to do with my willingness to take risks.

35. In my world, risks and return go in opposite direction.

39. I am happy with any financial investments as long as the risk is minimal.

43. High return investment plan sounds risky to me.

47. I would rather give up the money I spent than spending more on a bad investment and hoping it will turn around.

51. Minimizing my financial risk level is a strategy of making money.

55. Regardless of if I am in a losing or winning situation, I do not take risk at all.

59. I believe most wealthy and successful people don't like to take great risks.

Financial Confidence Level (15 Qs):

4. I do not believe I have the talent to manage my money investment(s).

8. I am not optimistic about my financial investment(s).

12. I am constantly second guessing the long term impact of my financial choices.

16. I wish someone else could help me choose the best financial mortgage.

20. If my investments start to go bad, I do not know what to do.

24. I prefer consulting experts in managing my financial loans than doing it by myself.

28. I do not feel confident making financial decisions, even when I have the knowledge to do so.

32. If I make any financial investments, I won't sleep well at night.

36. I am afraid of making financial decisions no matter how good I think my decisions are.

40 I have never tried to make a financial investment.

44. I believe I am less skilled in managing my money than other people.

48. I am not interested in how my credit score is calculated by the credit bureau.

52. I am not confident in planning my financial budget for the coming year.

56. I constantly worry about where I spent my money in the past month.

60. I am not optimistic about making big money.

Informed Consent for Content Experts Review

Dear Participant,

You are invited to participate in a study about your financial investment behaviors, more specifically your opinion on financial risks and how you handle financial risks. In addition, this study is being conducted to fulfill the requirements of a master independent study. The study is conducted by Yilong Zheng. Results will be used to finish the master independent study and to receive a master degree. Yilong Zheng can be reached at Yilong.zheng@du.edu. This project is supervised by the independent study chairs, Dr. Kathy Green and Dr. Pablo Antonio Olmos-Gallo. Dr. Kathy Green can be contacted through College of Education, University of Denver, Denver, CO 80208 (303-871-2490, kgreen@du.edu). Dr. P. Antonio Olmos-Gallo can be contacted through College of Education, University of Denver, Denver, CO 80208 (303-871-6681, polmos@du.edu).

Participation in this study should take about 40 to 50 minutes of your time. You will involve rating and commenting on 60 questions about financial decision behaviors related to risks. Participation in this project is strictly voluntary. The risks associated with this project are minimal. If, however, you experience discomfort you may discontinue the interview at any time. We respect your right to choose not to answer any questions that may make you feel uncomfortable. Refusal to participate or withdrawal from participation will involve no penalty or loss of benefits to which you are otherwise entitled.

If you have any concerns or complaints about how you were treated during the survey, please contact Paul Olk, Chair, Institutional Review Board for the Protection of Human Subjects, at 303-871-4531, or you may email du-irb@du.edu, Office of Research and Sponsored Programs or call 303-871-4050 or write to either at the University of Denver,

Office of Research and Sponsored Programs, 2199 S. University Blvd., Denver, CO 80208-2121.

You may keep this page for your records. Thank you for your time and participation!

Evaluation Form for Content Expert Review

Risky Financial Behavior Scale (RFBS)

Purpose: The purpose of this study is to develop and pilot a scale that measures financial risk taking behaviors by asking participants questions related to risk related personality, risk related financial habits, confidence level in making financial investment, and actual past financial decisions. There needs to be 15 to 20 good self-response questions created on a 5-point Likert-like scale (1 = Just like me to 5 = Not like me at all). Please rate the potential questions on the criterion of relevance with the construct, accuracy of measuring and clarity of the wording and meaning of the questions. Thank you very much!

Relevance: Whether the questions are related to each domain and risk tolerance (Expert Ratings - 1 = poor, 2 = fair, 3 = good, 4 = extremely good)
Accuracy: Whether the questions are asking as it intended to measure. Representative (Expert Ratings - 1 = poor, 2 = fair, 3 = good, 4 = extremely good)
Clarity: Whether the questions are stated in an understandable way, w/ no confusion. (Expert Ratings - 1 = poor, 2 = fair, 3 = good, 4 = extremely good)
Difficulty: Whether the question can be answered correctly by the participants. (For Difficulty level: 1 = Easy to agree with+A4 or 2 = Medium or 3 = Hard to agree with)

Definition for Financial Related Behavior domain: Including a sets of item statements distinguishing participants as risk seeking or avioding type based on the past & future decisions they made/ are going to make. These financial related behaviors can be related to small things like setting a financial budget plan or daily purchasing behaviors to bigger financial decisions like insurance, banking, loans, and market investment options such as stocks, bond, or mutual funds etc. (Related Finance concepts: familiarity heuristic, memory and behaviors)

Definition for Financial Related Personality domain: Including a sets of item statements distinguishing participants as risk seeking or avioding type based on their similar social personality regarding money. The personality can be impulsive or not, their preferences on the money decisions, responsibilities for their financial gain or losses, obsessions about making money or not, amount of time they are willing to spend to wait for a best deal or not, etc. (Related concepts: financial personality trait: five factor theory, risk-seeking type, positive and negative emotion, financial stereotypes)

Definition for Attitude Toward Risk & Return domain: Including a sets of item statements distinguishing participants as risk seeking or avioding type based on their opinions regarding taking a risk or not. The attitude can be related to the ratio and relationship of financial risk and future financial return, how much level of financial risks they are willing to take, how much level of financial returns they are willing to take, their views on the coexistence of risk and gaining money/ losing money, their views on how risks or no risks can actually affect their decisions at all, etc. (Related finance concepts: The risk/return tradeoff, higher risk higher return, valuation of risks.)

Definition for Financial Confidence level domain: Including a sets of item statements distinguishing participants as risk seeking or avoiding type based on their confidence level of making a financial decision involving money and risks. The confidence level is focusing more on the willingness to learn and practice good financial management skills, their anticipation of their future decision results, their independence level of making a financial decision, their reluctant of facing a failure, etc. (Related Psychology concept: self-efficacy level, self-esteem, over-confidence, financial stereotypes)

Item	Item Description	Expert Ratings - 1 = poor, 2 = fair, 3 = good, 4 = extremely good For Difficulty level: 1 = Easy or 2 = Medium or 3 = Hard					
		Relevance	Accuracy	Clarity	Difficulty	Content	Comments):
I1	I usually have tight control over my budget for major spending.						
I2	I rarely change my investments once I make a financial decision.						
I3	I usually seek the best results regardless of how long I have to wait.						
I4	I do not like buying stocks simply because of the risks involved.						
I5	I never even think about buying a lottery ticket.						
I6	Even if I really like something, I still consider the price.						
I7	I prefer buying insurance for my investment, and that makes me feel a lot secured.					Financial Related Behavior	
I8	I never ever thought about taking a loan.						
I9	I am very afraid to bet with my friends on the occurrence of some events for money.						
I10	I have more financial knowledge than I need to make good financial decisions.						
I11	I have fewer strategies to handle financial risk than other people.						
I12	Putting money in the bank is the first option when I get my salary check.						
I13	I am paying off my mortgage, loan, or credit cad bill earlier than I need to.						
I1	I always manage to keep my monthly spending below original						

							Financial Related Personality	
4	budget plan.							
I15	I am not against risks in investments, but I do not seek out high risk investments.							
I16	I prefer investments that do not involve risks.							
I17	I always have a backup plan for my major investment in case of losing.							
I18	I can tolerate one thing for a long time even though it is not pleasant.							
I19	I am conservative when it comes to spending money.							
I20	I am comfortable not taking financial risks.							
I21	I always consider my options multiple times before I eventually make a financial decision.							
I22	I am very responsible for the financial decisions I made.							
I23	I would rather wait for another year to get a better deal for a car than buying it now.							
I24	I am very patient when I am waiting for a best investment returns.							
I25	I am obsessed with avoiding financial decisions with high risks.							
I26	My friends said that I am financially conservative when it comes to spending.							
I27	Actually, I am not interested in making a lot of money.							
I28	I am not a risk-seeking type of person.							
I2	Regardless of money, I prefer having tight control over my budget.							

9							
I3 0	Overall, I am a very cautious person, especially in making big financial choices.						
I3 1	I always view risks as losing money.						
I3 2	I prefer safety to risk in financial investment.						
I3 3	I think taking financial risks is the biggest mistake people usually make in daily life.						
I3 4	I understand risk may be good, but I consider it as negative.						
I3 5	I think people can make a fortune without taking risks.					Attitude toward Risk & Return	
I3 6	Return is ideal to me if there is no risk to worry about.						
I3 7	I do not agree with the idea that greater risk leads to higher rates of return.						
I3 8	I do not think the amount of return has a lot to do with my willingness to take risks.						
I3 9	Risk and return cannot coexist in my world.						
I4 0	As long as the risk is minimal, I am happy with whatever the financial investment is.						
I4 1	Risks always come second when it comes to personal finance.						
I4 2	I tend to avoid risk if there is a satisfactory return on my investment.						
I4 3	Minimizing my financial risk level is a strategy of making money.						
I4	Regardless of whether I would win or lose, I do not take financial						

							Financial Confidence Level	
4	risks at all.							
I4 5	I believe most wealthy people don't like to take great risks.							
I4 6	I do not believe I have the talent to manage my investments.							
I4 7	I do not think everyone can be good at making daily financial decisions.							
I4 8	I am constantly worrying about my financial choices.							
I4 9	I wish someone else could help me with choosing my investment plan.							
I5 0	I prefer avoiding risky options in general because risks give me a sense of lacking control.							
I5 1	I prefer hiring experts in financial investing rather than doing it by myself.							
I5 2	I am not confident in making financial decisions involving high risks.							
I5 3	I am usually quite stressed about making a big daily financial investment decision.							
I5 4	I am afraid of making financial decisions no matter how good my past decisions were.							
I5 5	I have to say doing financial investment in general is very stressful to me.							
I5 6	I believe I am less skilled in handling my financial investment than other people around me.							
I5 7	I am not hopeful for my future financial investment at all.							
I5 8	I am not confident in seeking new financial knowledge to help me make decisions.							
I5	I constantly worry about where my money is going to in my daily							

9	spending.						
I6 0	I do not think I have the ability to handle risks related to daily financial decisions.						

The Grable and Lytton Risk Tolerance Scale (GL-RTS)

1. In general, how would your best friend describe you as a risk taker?

   ○ A real gambler

   ○ Willing to take risks after completing adequate research

   ○ Cautious

   ○ A real risk avoider

2. You are on a TV game show and can choose one of the following. Which would you take?

   ○ $1,000 in cash

   ○ A 50% chance at winning $5,000

   ○ A 25% chance at winning $10,000

   ○ 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:

   ○ Cancel the vacation

   ○ Take a much more modest vacation

   ○ Go as scheduled, reasoning that you need the time to prepare for a job search

   ○ 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?

○   Deposit it in a bank account, money market account, or an insured CD

○   Invest it in safe high quality bonds or bond mutual funds

○   Invest it in stocks or stock mutual funds

5. In terms of experience, how comfortable are you investing in stocks or stock mutual funds?

○   Not at all comfortable

○   Somewhat comfortable

○   Very comfortable

6. When you think of the word "risk" which of the following words comes to mind first?

○   Loss

○   Uncertainty

○   Opportunity

○   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?

○   Hold the bonds

○ Sell the bonds, put half the proceeds into money market accounts, and the other half into hard assets

○ Sell the bonds and put the total proceeds into hard assets

○ 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?

○ $200 gain best case; $0 gain/loss worst case

○ $800 gain best case; $200 loss worst case

○ $2,600 gain best case; $800 loss worst case

○ $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 sure gain of $500

○ 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 sure loss of $500

○ 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 savings account or money market mutual fund

○ A mutual fund that owns stocks and bonds

○ A portfolio of 15 common stocks

○ 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?

○ 60% in low-risk investments 30% in medium-risk investments 10% in high-risk investments

○ 30% in low-risk investments 40% in medium-risk investments 30% in high-risk investments

○ 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?

○ Nothing

○ One month's salary

○ Three month's salary

◉ Six month's salary

Risky Financial Behavior Scale (RFBS)
for Cognitive Interviews

Once again, thank you for participating in this study. This instrument measures people's financial decision behaviors. A true reflection of your opinion on each question is extremely important.

On a scale from 1 to 5 (with 1 = "Just like me" and 5 = "Not like me at all"), please respond to the following questions by choosing the number that best describes you or your experience. Your results will be recorded anonymously. No identifying information will be collected. Thank you!

Financial Related Behaviors (15 Qs):
1. I usually have tight control over my budget for the major spending in the coming year.
5. I do not change my loan interest plan once I've made a major purchase, like a house.
9. I usually do not accept any types of loans (car or college tuition) for personal and family purposes.
13. I do not like taking high interest loans mainly because they would create stress.
17. I've never spent my income on buying Mega Million lottery tickets.
21. Regardless of my financial situation, I would pay attention to how much I've spent with my credit card.
25. I never overspend with my credit card.
29. I would rather live in a smaller apartment than a bigger apartment with higher rent.
33. Before taking any financial loans, I do a lot of financial research.
37. I have no plan for how to handle financial risk compared to other people.
41. I always pay off all my credit card debts rather than just the minimum payment.
45. Even if I had to take loans, I am paying off my mortgage, loan, or credit card bill as fast as I can.
49. Before I make a financial decision, I would consider my options multiple times.
53. I keep my monthly credit card spending below my budget.
57. I always keep track of how many times I spent with my credit card every month.

Financial Related Personality (15 Qs):
2. Most of the time, I do not feel like handling any investment involving risks.
6. I am not interested in making fast money (usually involves high risks at the same time).
10. Because I don't believe in luck, I never buy lottery tickets or gamble.
14. When it comes to credit card spending, I am financially more conservative.
18. I am more comfortable with living a life that does not involve high financial risk
22. If it involves money, I prefer not to bet with friends on any event.

26. I am very responsible for the financial loans I took.
30. I constantly worry about where I spent my money in the past month.
34. When it comes to the best opportunities of making money, I can be very patient.
38. My gut feeling tells me to avoid financial decisions with high interest loans.
42. When it comes to daily spending, my friends say that I am financially conservative.
46. When it comes to my daily spending, I always try to save as much as I can.
50. By nature, I am not a risk-seeking person.
54. I feel rewarded by being able to control my spending.
58. When making big financial decisions, I am a very cautious person.

Financial Attitude toward Risks and Returns (15Qs):
3. I do not agree with the idea of taking loans for further education.
7. When it comes to making a financial investment, I prefer safety to risks.
11. I think the biggest mistake one can make is taking risks beyond what one can handle.
15. I understand risk may be good, but I like to associate it with negative feelings.
19. I think people can make a big fortune without having to take much risk.
23. I believe there is no such thing as a free lunch.
27. I do not agree with the idea that greater risk leads to a higher rate of return.
31. The amount of return has nothing to do with my willingness to take risks.
35. In my world, risks and return can never be balanced.
39. I am happy with any financial investments as long as the risk is minimal.
43. A high return investment plan sounds risky to me.
47. I would rather give up the money I already spent on a bad investment than putting in more money and hoping it can eventually help me make benefit.
51. Minimizing my financial risk level is a strategy of making money.
55. Regardless of if I am in a losing or winning situation, I do not take risk at all.
59. I believe most wealthy and successful people don't like to take great risks.

Financial Confidence Level (15 Qs):
4. I do not believe I have the talent to manage my money investment(s).
8. I am not optimistic about my financial investment(s).
12. I am constantly second guessing the long-term impact of my financial choices.
16. I wish someone else could help me choose the best mortgage.
20. If my investments start to go bad, I do not know what to do.
24. I prefer consulting experts in managing my financial loans than doing it by myself.
28. I do not feel confident making financial decisions, even when I have the knowledge to do so.
32. When I need to make a tough decision about a financial investment, I cannot sleep well at night.
36. I am afraid of making financial decisions no matter how good I think my decisions are.
40 I have never tried to make a financial investment.

44. I believe I am less skilled in managing my money than other people.

48. When making decisions involving money: If I am not 100% sure about my decisions, I do not make any move.

52. I am not confident in planning my financial budget for the coming year.

56. Regardless of my experiences in financial management, I get easily influenced by others' opinions.

60. I am not optimistic about making big money.

Informed Consent for Cognitive Interviews

Financial Decision Making Scale Development
Yilong Zheng, M.A Candidate
Morgridge College of Education
University of Denver

Dear Participant,

You are invited to participate in a study that will measure your financial investment behaviors, more specifically your opinion on financial risks and how you handle financial risks. In addition, this study is being conducted to fulfill the requirements of a master independent study. The study is conducted by Yilong Zheng. Results will be used to finish the master independent study and to receive a master degree. Yilong Zheng can be reached at yilong.zheng@du.edu. This project is supervised by the independent study chairs, Dr. Kathy Green and Dr. P. Antonio Olmos-Gallo. Dr. Kathy Green can be contacted through College of Education, University of Denver, Denver, CO 80208 (303-871-2490, kgreen@du.edu). Dr. Pablo Antonio Olmos-Gallo can be contacted through College of Education, University of Denver, Denver, CO 80208 (303-871-6681, polmos@du.edu).

Participation in this study should take about 30 minutes of your time. You will involve evaluating questions about a financial decision scale related to risks. Participation in this project is strictly voluntary. The risks associated with this project are minimal. If, however, you experience discomfort you may discontinue the interview at any time. We respect your right to choose not to answer any questions that may make you feel uncomfortable. Refusal to participate or withdrawal from participation will involve no penalty or loss of benefits to which you are otherwise entitled.

Your responses will be anonymous. That means that no one will be able to connect your identity with the information you give. Please do not indicate your name during data collection.

If you have any concerns or complaints about how you were treated during the survey, please contact Paul Olk, Chair, Institutional Review Board for the Protection of Human Subjects, at 303-871-4531, or you may email du-irb@du.edu, Office of Research and Sponsored Programs or call 303-871-4050 or write to either at the University of Denver, Office of Research and Sponsored Programs, 2199 S. University Blvd., Denver, CO 80208-2121.

You may keep this page for your records. Thank you for your time and participation!

By clicking "AGREE," you are given the consent to participate in this study.

Risky Financial Behavior Scale (RFBS)
for Field Administration

Once again, thank you for participating in this study. This instrument measures people's financial decision behaviors. A true reflection of your opinion on each question is extremely important.

There are 60 questions for the first part of this survey. On the scale from "Strongly Disagree" to "Strongly Agree", please respond to the following questions by choosing the number that best describes you or your experience. Your results will be recorded anonymously. No identifying information will be collected. Thank you!

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Informed Consent for Field Administration

Financial Decision Making Scale Development
Yilong Zheng, M.A Candidate
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Participation in this study should take about 20-30 minutes of your time. You will involve responding to 60 questions about your financial decision behaviors related to risks. Participation in this project is strictly voluntary. The risks associated with this project are minimal. If, however, you experience discomfort you may discontinue the interview at any time. We respect your right to choose not to answer any questions that may make you feel uncomfortable. Refusal to participate or withdrawal from participation will involve no penalty or loss of benefits to which you are otherwise entitled.

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By clicking "AGREE," you are given the consent to participate in this study.

Demographic Survey

The purpose of having this basic information questionnaire is for the researcher to analyze the differences among participants. A true reflection of your opinion on each question is extremely important. Your results will be recorded anonymously. No identifying information will be collected. The result will be presented at population level, rather than individual basis. Thank you!

1. Gender: Male   Female

2. Year of Birth:

3. Marital status(Please choose a category):

    Single
    Living Together
    Married
    Divorced or legally separated
    Prefer not to answer

4. Working status:
    No employment
    Part time
    Full time

5. Household income level (Please choose a category):
    Less than $10,000
    Between $10,000 and $49,999
    Between $ 50,000 and $99,999
    Over $100,000
    Prefer not to answer

6. Ethnicity:
    Caucasian   African American
    Native Indian   Asian and Pacific Islander
    Hispanic   Others
    Prefer not to answer

7. Which state are you currently in?