PERSONALITY, MOTIVATION, AND FINANCIAL RISK TOLERANCE

by

LANE ELIZABETH SIEDOR

(Under the Direction of W. Keith Campbell)

ABSTRACT

Over 200 million Americans are hoping to increase their wealth beyond their own daily labor by investing in a marketplace. Almost all financial investments involve risk. Thus, understanding risk is essential to describing how people manage their money. Therefore, the goal of this dissertation is to better understand individual differences in financial risk tolerance in terms of basic psychological traits and motivations, especially the five factor personality model and approach/avoidance traits- concepts that have largely been left out of the financial risk tolerance literature. The findings from this study suggest that the inclusion of the personality and basic motivation enhance our understanding of financial risk tolerance and financial risk taking. Specifically, the personality trait Neuroticism and the motivation dimension Reward Responsiveness provide unique information about these core concepts and therefore advocate for their inclusion in theories of financial risk tolerance.

INDEX WORDS: Personality, Big Five, Motivation, BIS BAS, BISBAS, Risk Tolerance, Financial Risk Tolerance, Financial Risk.

PERSONALITY, MOTIVATION, AND FINANCIAL RISK TOLERANCE

By

LANE ELIZABETH SIEDOR

B.S., The University of Georgia, 2014

M.S., The University of Georgia, 2017

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment

of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2018

PERSONALITY, MOTIVATION, AND FINANCIAL RISK TOLERANCE

by

LANE ELIZABETH SIEDOR

Major Professor:	W. Keith Campbell
Committee:	Gary Lautenschlager John Grable

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
December 2018

DEDICATION

This dissertation is dedicated to my sister, Katherine. My sister is a titan and a saint. She battled cancer when she was 20 years old – a Junior at the University of Georgia. The semester she was diagnosed, she was taking organic chemistry in fulfillment of her B.S. in biology. That semester, and all of the semesters she was undergoing treatment, she remained a full-time student because the school had no real solutions for long-term medical leave. So she commuted back and forth from Atlanta to Athens for class and chemo; chemo and then class. Kate *enjoyed* Ochem and got an A in the course…. Despite all of that. She got an A in one of the hardest courses at UGA – and across all college campuses in the country…maybe even the world – while commuting, while losing all her hair (my dad liked to fondly reflect on her changed appearance and call her an alien – a strange, unworldly-*beautiful* alien. It was a compliment. And she had the strength to take it as such), while losing what seemed like half her body weight, while giving herself weekly, painful injections in the gut, while only being able to tolerate a diet of microwave-baked potatoes, while being a good friend and sister, while laughing at the jokes, the pain, and what at the time seemed to me the insurmountable road ahead.

My sister taught me that struggle and pain are entirely relative – and we are always entitled to how we feel (Mo' money, mo' problems). Since I was little – and we had matching twin beds and shared a room and pretended we were Destiny's Child – she has been subtly illuminating the strength and power within me… and striking the impossible balance between unconditional love and demanding progress.

Kate, you are the standard. Thank you for your strength, your patience (even when I assuredly don't deserve it), and your prodigious love. You mean everything to me.

ACKNOWLEDGEMENTS

"As I stood outside in Cow Lane, it occurred to me that Heaven must be a place where the library is open twenty-four hours a day, seven days a week.

No ... eight days a week."

Thank you to the UGA Library and also the exceedingly kind staff. Thank you to my advisor, W. Keith Campbell. Keith has always been an advocate of his students. He always wants what's best for us – even if that requires a lot more work and a lot less reward for him. So, thank you, Keith. I look forward to maintaining our relationship and learning from you in the years to come. You made such an effort to ensure I got the most out of my time at UGA and I will be forever grateful. Thank you to all my graduate school friends and classmates- it's always comforting to remember that we're all in this together. You all answered my calls when google had failed me… and even when it hadn't. Kate Conley, this has been such a wild ride. There have been so many moments of self-doubt, of exhaustion, of illness, of desperation… I know exactly where I would be without you and it is not here. I promise you that. Thank you to my undergraduate advisor, Michelle vanDellen, who continues to mentor me long after the projects we collaborated on have ended. Michelle, your students – myself included – are truly fortunate. The amount of time and energy you put into your students, with few tangible benefits for yourself, is commendable. I am forever grateful. And lastly thank you to my friends and family- you are the motivation and support I am so lucky to have pushing me along.

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION AND BACKGROUND

Nearly all Americans are trying to make money while they sleep (Kennon, 2018). They are hoping to increase their wealth beyond their own daily labor by investing in a marketplace – stocks, bonds, real estate, government securities, currencies, cryptocurrencies, commodities, and other assets. The numbers are impressive. Well over half the population—nearly 200 million people—have invested in the stock market (McCarthy, 2016), amounting to over 40 trillion dollars in 2017 (Reid, Collins, Holden & Steenstra, 2017); almost 50 million people have invested in real estate, beyond owning the home they live in (Claffey, 2017); further, Americans have invested over 25 trillion dollars in retirement funds; and nearly 8% of Americans have invested in cryptocurrencies (Finder, 2018). Many billions of dollars are being spent annually on investments, which makes it clear why the financial advising and investment business is growing.

Almost all financial investments involve risk, meaning there is a level of uncertainty relative to various outcomes associated with a decision. Financial risk varies. No single investment guarantees an after tax, real rate of return or gain; all can lead to losses, although there are commonly accepted assumptions about risk: Treasury notes, for example, are thought to be very safe; real estate is assumed to be safe *most* years; bonds are safer than stocks, with bonds having a fixed payout and term as well as advantages over stocks in bankruptcy; it is also assumed that currencies and commodities require considerable knowledge and sophistication in order to make the risks reasonable; and the

current state of cryptocurrencies seems little more than a guess. The other generalization is this: the greater reward, the greater the risk … and the opposite. In other words, risk is a measure of both upside and downside variability in asset prices.

Because understanding risk is so essential to describing how people manage their money, the goal of this dissertation is to describe individual differences in financial risk tolerance in terms of basic psychological traits and motivations, especially the five factor personality model and approach/avoidance traits. However, before describing the specific research in detail, I will (a) define what financial risk is, including the general theory of risk, the basic financial terms, and how the different literature conceptualizes risk; (b) describe why understanding risk is so important and why the addition of these fundamental psychological concepts to financial-risk theory is so necessary; and (c) review the background of risk—including individual differences in risk tolerance—across the relevant academic literature (i.e., judgment and decision making, finance, and psychology). The fundamental goal of this dissertation is to bring theoretical concepts about risk across multiple literatures into the financial risk literature. In this case, I am particularly interested in incorporating what is known about risk in the psychological literature to the financial literature, something that has not yet been done comprehensively but could add great value in financial planning and counseling practice.

Defining Risk

Before diving into the numerous studies and vast literature of risk, I will first define risk and review the basic terms associated with the construct. The Oxford English Dictionary defines risk as, “A situation involving exposure to danger,” or, “A person or thing regarded as likely to turn out well or badly in a particular context or respect” (Oxford English Dictionary Online). Common to the semantic definition of risk is the

inherent negative connotation—the *exposure to a negative outcome*. Within the academic literature regarding finance, economics, psychology, and judgment and decision-making, risk is not always so inherently negative. In some cases, in fact, risk is not only necessary but advised because, with most financial products, the acceptance of risk also means the possibility of a higher reward.

In the risk-taking literature, risk is generally defined as a selection of an option, usually among a number of other options—but at least one other option (i.e., not forced)—where the option selected enhances possible gains while accepting the plausible associated consequences (Brockhaus, 1980). When an individual chooses an option of greater uncertain (i.e., not known or certain) risk it is because the *value of the outcome* (i.e., how good the gain is) and the *probability of the desired outcome* (i.e., likelihood the outcome is realized vs any other possible outcomes) are so favorable that, when combined, they outweigh the fear of the consequences of *not* attaining the desired outcome. This function—value of outcome multiplied by the probability of the outcome—is called the *expected value*.

While the formula for expected value may be consistent across people, what is not consistent across people is the evaluation of the value of the outcome—the subjective probability of the outcome (i.e., when the probability is not certain)—and a person's general appetite for engaging in risk. The various literature relating to risk taking, mentioned above, handle these individual nuances differently.

For centuries, economists, psychologists, and financial experts have tried to understand, quantify, and predict an individuals' engagement in risky behavior. As such, there have been numerous attempt in the literature to examine risk, each with idiosyncrasies that make it hard to compare the theories across methodological traditions.

Below, I will define the common terms across the literature, compare them, and discuss how risk is discussed more generally in each academic discipline.

Risk Tolerance

Risk tolerance is defined as a willingness and comfortability with risk-taking. In the financial literature, risk tolerance refers to the extent to which someone is willing to risk losing money for higher possible gains (Grable & Joo, 2004). Risk tolerance is similar to other terms (e.g., risk propensity), however, it is usually specific to financial domains.

Risk Propensity

Risk propensity is defined as one's average willingness to take risks, or, "the tendency of a decision maker either to take or to avoid risks," (Pablo & Sitkin, 1992, p. 12). Risk propensity is most commonly referred to in the psychological domain but has been used across other literature as well (Brockhaus, 1980). In psychology, risk propensity—at the trait level, which it is most often referred—is usually understood by examining its strongest personality correlates: Impulsivity, Sensation Seeking, Extraversion, and Openness (i.e., Openness to Experience in the Five Factor Model or FFM; Zuckerman 1994; Soane & Chmiel, 2005; Dahlen, Martin, Ragan, Kuhlman, 2005).

Risk Preference

Some researchers refer to risk preference as the operationalization of risk propensity, because risk propensity is assessed based on an individuals' preference for various risky or non-risky choices (Soane & Chmiel, 2005; Sitkin & Pablo, 1992). However, Pablo and Sitkin (1992) took great pains in differentiating risk preference from risk tolerance. In fact, in their model, risk propensity mediates the relationship between risk preference and risk behavior, where risk preference is the specific appeal to the challenge of engaging in

risky decisions and risk propensity is the likelihood—based on past experiences—that an individual will *actually* engage in risk behaviors. Pablo and Sitkin (1992) posited that there are other trait-level road blocks that could potentially inhibit an individual from making risky decisions despite being relatively high on risk preference. Thus, an individual who scores high on risk preference could still have low risk propensity, due to other factors like inertia. However, despite this distinction, other researchers have found little benefit in measuring risk preference as distinct from risk propensity because, for practical purposes, the act of engaging in a risk behavior of more interest than one's conceptual attraction to it (Soane & Chmiel, 2005).

Risk Perceptions

Each individual's subjective interpretation of the riskiness of a choice—holding the parameters of the choice and its objective riskiness constant—is a phenomenon referred to as risk perception (Brockhaus, 1980). Perceptions are influenced by a number of variables including an individual's estimates of the likelihood the desired outcome will occur and her or his confidence in those estimates (Sitkin & Pablo, 1992). Risk perception is a trait level individual difference (i.e., over-confidence); however, contextual idiosyncrasies—such as familiarity with the risk decision and choices—may also contribute to risk decisions.

Risk Dimensions

There are several dimensions that contribute to the perceptions of risk level associated with each available choice in any given scenario (Sitkin & Pablo, 1992). These dimensions contribute to the evaluation of the choices and, subsequently, the downstream outcomes of those choices. Sitkin and Pablo (1992) have determined *outcome*

uncertainty, outcome expectations, and *outcome potential* are the three critical dimensions of risk.

Outcome Uncertainty

The risk dimension of outcome uncertainty refers to the extent to which the actor has control over the outcome (Libby & Fishburn, 1977; Kahneman & Tversky, 1979; Sitkin & Pablo, 1992). Control over the outcome is predicated on three factors, according to Sitkin and Pablo (1992): variability of outcomes, lack of knowledge of the distribution of potential outcomes, and uncontrollability of outcome attainment. Outcomes that are less controllable are inherently riskier. Outcomes are seen as more controllable when they are perceived as related to skill (versus chance), because skill implies that the relationship between skill level and outcome attainment is linear (Kogan & Wallach, 1964).

Outcome Expectations

Outcome expectations refer to the perceived benefit or consequence associated with each outcome. There are both subjective and objective outcome expectations (Kahneman & Tversky, 1979; Tversky & Kahneman, 1986). The objective assessment of an outcome expectation is called the expected value. The expected value is calculated as the reward value associated with choice A multiplied by the probability of choice A occurring (Tversky & Kahneman, 1986). On the other hand, subjective expectations are far less quantifiable. Expected Utility Theory (Bernoulli, 1954;1738) demonstrates the usefulness for explanations of human choices when they contradict objective reason (i.e., subjective choices do not reflect the expected value). In such cases, “moral” (i.e., subjective) expectations of the value of the risk choice are affected by such things as problem framing (i.e., gain vs loss framing, relative vs absolute value of loss or gain, etc.) (Kahneman & Tversky, 1984).

Outcome Potentials

Outcome potential refers to the extent to which a choice outcome is attractive or unattractive. Individuals might choose low probability options because the attractiveness of the potential outcome is so great. Pablo and Sitkin (1992) used this term to explain why so many individuals purchase lottery tickets despite having such a low probability of winning—because the payout of the reward is so great and, for some, because the cost of the choice (i.e., cost of purchasing the ticket) is so low. Additionally, Pablo and Sitkin pointed out that outcome potentials are important because they affect the nature of the relationship between the individual's decision and the parameters of the choice(s). Specifically, Pablo and Sitkin suggested there may be a threshold at which one considers taking the risky choice because the potential outcome becomes appealing enough. Thus, the relationship between decisions and parameters of the choices would resemble a step-function, rather than being truly linear.

The Importance of Understanding Risk as a Psychological Construct

Because all investments involve some risk, typically individuals rely on expert consultation—financial advisors working alone or within investment companies of various sizes—when deciding how to invest and what risks to take within their portfolio (Kitces, 2016). In the United States, building investment portfolios is currently a 20 trillion dollar business (Reid et al., 2017). Investment advisors in companies such as Vanguard, Charles Schwab, Fidelity, Raymond James, most large banks, and brokerage firms are required to gauge how much risk their clients are willing to endure as an element of the investment planning process. This includes designing a portfolio that maximizes gains in accordance with a clients' level of risk tolerance. For example, take the hypothetical example of Kelly who is willing to take serious financial risks (i.e., high

risk tolerance), compared to Dan who prefers to play it safe with his investments (i.e., low risk tolerance). Kelly and Dan are both planning to open investment portfolios with Vanguard. Vanguard has the ability to customize Kelly's and Dan's portfolios, ranging from extremely low risk to extremely high risk. Thus, Vanguard must have the ability to understand Kelly's and Dan's unique needs to build investment portfolios that are suitable based on each person's unique risk tolerance. Herein lies the problem: to assess a client's risk tolerance requires one or more measuring tools, and the troubling question is, how accurate, how precise, and how long-lasting is any such measurement?

Historically, investment companies have taken non-standardized approaches to assessing their client's risk tolerance (Kitces, 2016). More recently, however, some companies have attempted to standardize their approach to capturing their clients' risk tolerance by asking them to complete an investing questionnaire; or a *risk tolerance questionnaire* (RTQ) (Kitces, 2016). These questionnaires usually consists of a few questions about demographics, previous investment experience, retirement and other goals, and some hypothetical risk scenarios. While the attempt to standardize this approach, as well as incorporate analytics to support the results, is arguably a step in the right direction, the questionnaires, in general, are still rudimentary (Guillemette, Finke, & Gilliam, 2012).

In fact, "rudimentary" may be benign. Roughly 62% of all American households reported a willingness to take on more risk with their investments (Reid et al., 2017), indicating that their current investment approach is not adequately matching their level of risk tolerance. Further, creating a customized investment approach to match their clients risk tolerance is *more* than just helpful for financial advisers, it is currently the law. The Financial Industry Regulatory Authority (FIRA) imposes a "Suitability Standard," which

requires that financial advisors make recommendations that are appropriate for their client's situation and needs (FINRA Manual; Lazaroff, 2016). This specific standard inherently calls for financial advisors to understand their client's risk tolerance so that the advisor can act accordingly when making recommendations on his or her clients' behalf. Further, the United States Department of Labor requires financial advisors to act in the best interest of clients when making retirement planning recommendations (US Department of Labor, 2018). And, while this rule is currently being disputed in the appellate courts, most experts agree that the basic tenants of the rule will remain, even if the rule is modified (Benjamin, 2018).

The need for financial advisors to understand their client's risk tolerance is clear: when they don't adequately address their clients risk tolerance, they are breaking the law, thus vulnerable to fines and lawsuits. Not to mention, when financial advisors fail to accurately assess financial risk tolerance they are poorly serving their clients (Cohen, 1971). Thus, the client who receives unsuitable advice is likely to leave the financial advisor who performed the invalid risk tolerance assessment, which can be costly to both the financial advisor and her or his client. Finally, assessing one's own risk tolerance can be a helpful exercise for an individual so that she or he can better understand and articulate her or his investment attitudes to their financial advisor.

As such, recent lines of research have attempted to capture individuals' financial risk tolerance more accurately (Grable & Lytton, 1999). This dissertation attempts to extend these more advanced lines of research by examining the basic personality and motivational factors that contribute to financial risk tolerance—factors that have been largely absent both in the risk assessments of most financial advisors as well as from the existing literature. The addition of these factors will enable researchers, psychologists,

and financial planners to better estimate a person's financial risk tolerance and adapt subsequent decisions (e.g., investment portfolios) accordingly. And, theoretically, this work will ground financial risk tolerance into broader models of personality and motivation. If successful, this will open up some avenues to understand financial risk tolerance as part of broader models of personality and behavior. In a sense, building a theoretical bridge between the finance and personality literature.

risk tolerance in Judgment and Decision Making

Across the literature, when attempting to describe risk tolerance and risk-taking, a variety of approaches are typically taken. Some experts choose to focus on the elements of the problem and/or choice when predicting outcomes (e.g., economics), while others focus on attributes of the individual involved in the risk (e.g., psychology and financial planning). The approach largely depends on the literature and the academic background of the researchers or test designers (e.g., economists take a judgment and decision making approach, financial planning scholars take a biographical approach, psychologists take an attitudinal approach or trait) (Roszkowski & Grable, 2005). For the purposes of this dissertation, the study will focus on attributes of the individual, especially as described within the psychology literature. However, all three assessment traditions will be described in more detail below.

In the judgment and decision making literature, when predicating risk, scholars take on a mostly problem centered approach (i.e., risk taking). The canonical theory surrounding human decision making is called Decision Theory, first officially described by Erich Lehmann (Lehmann, 1950), but credit is attributed to several scholars, including von Neumann and Morgenstern (Leonard, 2010). However, the ideas at the foundation of Decision Theory, in reality, date back to the 17th century (Peterson, 2009). Decision

Theory suggests that there are a set of conditions that, when met, predict when a rational person will make certain decisions versus others. However, as Kahneman and Tversky's (1979) Prospect Theory points out, the human mind is not always rational. Kahneman and Tversky's renowned and Nobel Prize-winning findings suggest that features of the decision or problem affect how a person responds and makes subsequent choices. Usually, such features are the problem frame (Kahneman & Tversky, 1979). Problems that are framed in terms of losses have been found to elicit riskier decisions, whereas problems that are framed in terms of gains elicit risk avoidant decisions (see Kahneman & Tversky for a full review).

While the large focus of the judgment and decision making literature surrounds features of the problem, some decision making scholars acknowledge the effects of other variables—primarily variables that pertain to individual differences. For example, authors Kogan and Wallach (1964) examined the effects of basic personality (i.e., defensiveness and test anxiety, meaning failure avoidance), motivation (i.e., Atkinson's achievement vs failure approach) (see Atkinson, 1957, for a full review), and gender (Kogan & Wallach, 1964). However, these investigations of personality and motivation were brief and preliminary. Further, because the purpose of this dissertation is to understand an individuals' risk propensity at a trait level, the idiosyncrasies of the problem are held constant and are of no concern. Thus, the remainder of this dissertation will focus exclusively on risk within the finance and psychology literature.

Risk tolerance in Finance Planning

Despite a long history of empirical research, there is little theoretical foundation to the concept of risk taking in the financial planning literature (Grable & Joo, 2004). In lieu of a foundational theory, past empirical research in the financial planning literature

has focused on basic indicators of risk. This focus has led to an assortment of "proxy measures" (Roszkowski, 1992), including basic demographic information, investment goals and investment expectations, as well as autobiographical investment history (Roszkowski & Grable, 2005). There are some key findings regarding demographic information and risk tolerance:

Age. General risk-taking was previously thought to linearly decline with age (Botwinick, 1966); however, more resent research has shown that the relationship between risk and age may be curvilinear, such that the relationship between risk and age is positive until about the age of 33 and then declines after that (Rolison, Hanoch, Wood, & Liu, 2013). Relatedly, there is a negative relationship between years away from retirement and financial risk tolerance (Sung & Hanna, 1996).

Gender. In general, women are less risk tolerant than men, across all ages and in most scenarios (Sung & Hanna, 1996). Additionally, women tend to underestimate their financial risk tolerance whereas men overestimate their financial risk tolerance (Grable & Roszkowski, 2007). And, on average, women earn lower returns on investments (Grable & Roszkowski, 2007). Grable and Roszkowski (2007) speculated that this is because women are less willing to take financial risk and higher risk investments are more financially profitable in the long term (Pålsson, 1996).

Socio-economic Status. In general, wealth (e.g., net worth and net financial assets) is positively related to financial risk tolerance (Finke & Houston, 2003). Further, people with investing history are more likely to take financial risks (Sung & Hanna, 1996). Additionally, education is positively related to risk tolerance (Sung & Hanna, 1996). Finally, individuals who are self-employed are more willing to take risks than individuals who are not (Sung & Hanna, 1996).

Marital Status. In general it is believed that married people are more willing to take risks, especially married males (Sung & Hanna, 1996). One reason is that married couples have the ability to combine financial and human capital resources, which essentially increases risk capacity.

General risk tolerance. People who are generally risk tolerant are more likely to be financially risk tolerant (Kumar & Singh, 2015). Also, higher risk tolerance generally leads to greater financial reward over the long term (Pålsson, 1996).

Beyond basic demographics, a select few researchers have ventured to build more robust theories in describing financial risk tolerance. In a few, more recent cases, financial planning scholars have included attitudes and emotions in the assessment of risk (i.e., risk-as-feelings theory) (Loewenstein, Weber, Hsee & Welch, 2001). However, the strongest theory relating to risk in the finance literature is the bi-factor approach that considers both *Biopsychosocial* and *Environmental* factors when attempting to describe risk tolerance (Grable & Joo, 2004). In this approach, Grable and Joo (2004) included the following variables in the Environmental factors group: income, net worth, financial knowledge, home ownership, education, and marital status. On the other hand, Grable and Joo included in the Biopsychosocial factors are: age, gender, race, birth order, self-esteem, personality (specifically, so-called "Type A" personality), sensation seeking, and financial satisfaction. Combined, the Biopsychosocial and Environmental factors partially describe the determinants of an individual's financial risk tolerance. This framework was among the first models to combine demographic variables with more traditional psychological variables (e.g., self-esteem and personality).

Despite the relative strength of this framework, crucial and more robust concepts core to psychology—personality and basic motivation (i.e., approach vs. avoidance)—are

notably missing from the financial planning literature. One notable exception exists, however. Mayfield, Perdue, and Wooten (2008) studied financial risk aversion (i.e., the inverse of risk tolerance) with respect to the Big Five personality traits. These authors found that, of the Big Five traits, Openness to Experience was negatively related to financial risk aversion, whereas with Neuroticism the relationship was positive. Beyond these preliminary findings, though, the literature surrounding personality—specifically the Big Five—and financial risk tolerance is nascent and would benefit from a more robust investigation.

Risk tolerance in Psychology

Within the psychological literature, risk-taking and risk tolerance have been examined in three domains: at a broad level (e.g., general trait mappings, nomological networks, etc.), with regard to risky behaviors (e.g., drug or alcohol abuse, risky sexual behaviors, etc.), and within business contexts (e.g., entrepreneurial endeavors, mergers and acquisitions, and other risk-related organizational concerns). Across these domains, the critical questions remain constant: *what predicts risk-taking* and *what can be done to change risk attitudes* (i.e., the likelihood that an individual engages in risky behavior). Because this dissertation is solely concerned with assessing risk tolerance—and is uninterested in changing behavior—the latter question is not of immediate consequence and thus is not addressed in this study. To answer the first question, psychologists have often turned to two underlying factors: personality (i.e., Big Five and non-Big Five), and motivation (i.e., behavioral inhibition vs behavioral activation or BIS/BAS). Below I will review the findings within the psychological literature related to risk and personality and motivation.

Risk and Personality. While personality has somewhat been left out of the risk assessment conversation, some scholars have begun to broach the topic. For example, Lauriola and Levin (2001) found that among the Big-Five personality traits, risk-taking was positively related to Openness to Experience and negatively related to Neuroticism. Other authors have expanded these Big-Five findings: Nicholson, Fenton-O'Creevy, Soane, and Willman (2005) found that risk-taking, across six domains (recreation, health, career, finance, safety, and social), was predicted by a combination of high levels of Extraversion and Openness with low levels of Neuroticism, Agreeableness, and Conscientiousness.

Going beyond the Big-Five, Kumar and Singh (2015) measured personality using the Zuckerman-Kuhlman Personality Questionnaire, (Zuckerman & Kuhlman, 1993) that serves as an alternative to the Five-Factor Model of Personality. Kumar and Singh (2015) found that in general (across various domains of risk-taking), the personality traits Activity, Impulsivity-Sensation Seeking, and Sociability were positively related to risk-taking, whereas Neuroticism-Anxiety and Aggression-Hostility were negatively related to risk-taking. What's more, despite the debate surrounding the benefit of measuring risk tolerance/aversion within a specific domain (i.e., the Domain Specific Risk-Taking Scale or DOSPERT) (Weber, Blais & Bletz, 2002), the general pattern of associations for each personality trait across all risk domains appears to be consistent. This indicates that measuring the broad relationship of general risk tolerance/aversion with various personality traits is sufficient. (It is important to note, however, that some scholars may be interested in the nuanced differences of domain-specific risk.) In addition to personality, scholars have looked at other *similar* trait-level variables and risk. For example, Isen and Geva (1987) found Positive Affect (PA) positively predicts risk

propensity and risk-taking. However, most of the trait-level findings reported in the literature are specific to personality.

Risk and Basic Motivation. According to the revised Reinforcement Sensitivity Theory (RST) (Gray 1975; Gray & McNaughton, 2000), the Behavioral Activation System (BAS), the Behavioral Inhibition System (BIS), and the Fight-Flight-Freeze System (FFFS), are three interdependent systems that dictate how people respond to the basic cues in their environment.

The BAS is the part of the brain that is sensitive to rewards, or all "appetitive stimuli" (Corr, 2008; Gray & McNaughton, 2000), The BAS is strongly related to the personality trait Extraversion (Corr, 2008). The BAS is considered akin to approach motivation. In other words, people seek out activities that bring them closer to a desired state or goal, thus giving pleasure and satisfaction. Because RST is rooted in behaviorism, the pleasure received from achieving a goal is theorized to be the "final biological reinforcer" that motivates continual goal pursuit (Corr, 2008). In order to achieve goals, people must create sub-goals and also inhibit impulsive behavior that may be desirable in the short-term but prevent acquisition of a long-term goal (Corr, 2008). As such, Corr (2008) noted, "Sub-goal scaffolding, which is necessary for planning effective BAS approach to appetitive stimuli, will often entail the *inhibition* of impulsive behaviors, and for this reason we might suspect that BAS behaviors are hierarchically organized such that lower-level reactions (e.g., impulsiveness) are inhibited by high-level (control) modules, which involve the cognitive processing underlying sub-goal scaffolding" (p. 22). However, that is not to say impulsivity serves no useful purpose. Corr (2008), pointed out that, "rash impulsivity is appropriate when cognitive planning can be replaced, at short temporo-spatial distance, by fast 'getting,' or physical grabbing,

action" (p. 22). Thus, both behavioral restraint and impulsivity are required: behavioral restraint is necessary for long-term goal planning and inappropriate impulsive behavior inhibition, whereas impulsivity is necessary in the final stretch of goal attainment (i.e., "the get/capture of the final biological reinforcer at near-zero temporo-spatial distance" (Corr, 2008, p. 22).

Because the concepts within the BAS are complex, researchers have argued that the BAS is, at least psychometrically, multidimensional (the distinct underlying biological processes have yet to be determined beyond factor analysis). It is posited that the BAS is comprised of three facets: Reward Responsiveness, Drive, and Fun-seeking (Carver, 2005; Carver & White, 1994). Carver (2005), stated, "The three aspects of the BAS sensitivity that are reflected in the three BAS scales derive from theoretical statements about the ways in which BAS functioning should be reflected experientially. That is, high BAS sensitivity should cause people to seek new incentives [Reward Responsiveness], to be persistent in pursuing incentives [Drive], and to respond with positive feelings when incentives are attained [Fun-seeking]" (p. 20). Within this conceptualization, Drive is most akin to goal pursuit, Reward Responsiveness is akin to the satisfaction associated from winning and achieving the goal, and Fun-seeking is akin to more purely impulsive tendencies (Corr, 2008).

On the other hand, the FFFS is sensitive to punishment and is responsive to all "aversive stimuli" (Gray & McNaughton, 2000). The FFFS is responsible for mediating reactions of fear and pain. Opposite the BAS, the FFFS relays avoidance cues to the brain. For example, in the face of a predator, often the prey will flee (i.e., active avoidance) to avoid being eaten (Corr, 2008). In the original conceptualization of RST, Gray (1975) believed the FFFS to be responsible for only *unconditioned* aversive

stimuli—or inherently painful stimuli (e.g., burns/fire). The BIS was previously thought to be responsible for all *conditioned* aversive stimuli—or stimuli that became aversive after basic learning (e.g., spiders and snakes). However, in the new conceptualization of RST, the BIS is instead thought to be responsible for goal conflict resolution and the FFFS is thought to be responsible for reactions to *all* aversive stimuli (i.e., conditioned or unconditioned) (Corr, 2008; Gray & McNaughton, 2000). Thus, in the revised theory, the BIS is activated when goal expectations are not met and behavior changes are required or when the possibility that goal expectations *might not* be met (Corr, 2008). Specifically, Corr (2008) stated, "The BIS generates the 'watch out for danger' emotion of anxiety, which entails the inhibition of prepotent conflicting behaviors, the engagement of risk assessment processes, and the scanning of memory and the environment to help resolve concurrent goal conflict … The BIS resolves conflict by increasing, by recursive loops, the negative valence of stimuli (these are adequate inputs into the FFFS), until behavioral resolution occurs in favor of approach or avoidance. Subjectively, this state is experienced as worry and rumination" (p. 11). As noted above, the BIS is associated with feelings of worry and anxiety—feelings that are neurologically and pharmacologically distinct from fear (i.e., the FFFS)—and is strongly related to the personality trait Neuroticism (Corr, 2008).

Because this underlying motivation system is fundamental to everything humans do, researchers have examined how the BIS/BAS systems relate to risk. Risk-taking and BAS have long been studied in parallel. This is due to a number of factors. First, as mentioned above, the BAS is directly related to the inhibition, *or not*, of impulsive behaviors. And, in certain contexts, impulsivity can be strongly associated with risk taking (Zuckerman 1994). Second, because the BAS is especially sensitive to positive

rewards, the BAS is theoretically linked to risk taking because of the positive reward associated with engaging in risky behaviors. Individuals with an overactive BAS are particularly sensitive to contextual signals of potential rewards (O'Connor, Stewart, & Watt, 2009). Thus, people with an overactive BAS are more likely to engage in risky behaviors because they are especially sensitive to the rewards associated with doing the risky behavior (e.g., drug-induced high, pleasure from sex, etc.). Furthermore, individuals with an overly active BAS may be more likely to engage in risk simply because taking risks can cause an adrenaline "rush," which is pleasing in itself (O'Connor, Stewart, & Watt, 2009).

As such, researchers have found that elevated BAS activity—especially elevated levels of the Fun-seeking dimension of BAS (O'Connor, Stewart, & Watt, 2009)—is associated with a number of risky behaviors such as alcohol and drug use (Franken, Muris, & Georgieva, 2006), gambling (O'Connor, Stewart, & Watt, 2009), smoking (O'Connor, Stewart, & Watt, 2009), over-eating and obesity (Davis, Patte, Levitan, Reid, Tweed, & Curtis, 2007), and general addiction (Gray, 1993). In fact, risk-taking and elevated BAS may be more than just associated—these constructs may be interconnected. For example, one study found that risk and the BAS system *jointly* play a large part in the occurrence of Bipolarity (Black et al., 2014). Clearly, risk-taking and the BAS system are strongly related.

The relationship between the BIS and risk-taking is less clear, however. Historically, the BIS was assumed to inhibit certain behaviors based on an over sensitivity to punishments. However, the thinking has somewhat changed in the revised version of the Reinforcement Sensitivity Theory. O'Connor et al., (2009) described the new way of thinking as follows: "…the revised theory views the BIS as a conflict

resolution system; one that moves an individual towards a decision of behavioral approach or avoidance by drawing attention to the potential dangers of a behavior. Thus, a high BIS individual will over attend to the warning signs of a behavior, leading to avoidance" (p. 515). Following this logic, one would expect individuals with over active BIS to be *less* likely to engage in risky behaviors because they are more sensitive to the potential punishments rather than the rewards. Consequently, when facing a choice that is not a sure bet—which, by definition risks are not—the high BIS individual will opt out of the risky choice, in favor of a non-risk or low-risk choice. And in fact, researchers have found such a link. Specifically, elevated BIS has been associated with lower levels of both *functional* impulsivity (i.e., useful impulsivity, thinking quickly, etc.), and *dysfunctional* impulsivity (i.e., rash impulsivity, acting without thinking, etc.) (Franken & Muris, 2005; Smillie & Jackson, 2006)

The Present Study

Despite the clear relationship between core psychological concepts—*basic motivation* and *personality*—and risk tolerance and risk-taking, the psychological theories of risk-taking have yet to systematically be applied to financial risk tolerance. As noted above, within the financial risk-taking literature, theories of financial risk tolerance are largely rudimentary, examining only basic concepts (e.g., basic demographics), making it quite difficult to accurately assess financial risk tolerance—a crucial step for financial advisors and investors. A stronger theory of financial risk tolerance has emerged (e.g., Biopsychosocial and Environmental theory of financial risk tolerance) (Grable & Joo, 2004). However, given what is known about risk-taking in the psychological literature, the Biopsychosocial and Environmental theory could be expanded to include additional psychological constructs (i.e., motivation and personality).

Thus, the aim of this dissertation is to (a) expand upon the Biopsychosocial and Environmental theory of financial risk tolerance by including basic psychological traits (i.e., personality and motivation) that contribute to shaping a person's financial risk tolerance, and (b) evaluate how well those traits capture financial risk tolerance compared to currently used measures of risk-tolerance in the finance literature (Research Question 1).

Based on the findings and literature reviewed above, it is reasonable to expect the basic relationship between risk tolerance and personality to be largely driven by Extraversion (positive correlation; *Hypothesis 1*) and Neuroticism (negative correlation; *Hypothesis 2*). Additionally, it is expected that a moderate positive correlation between Openness and risk tolerance (*Hypothesis 3*) will exist. It is difficult to claim specific hypotheses for the personality traits Agreeableness and Conscientiousness and risk tolerance, as there are no clear relationship patterns across the literature. Figure 1 summarizes a review of the hypotheses between personality and risk tolerance.

Further, with regard to motivation, I expect the basic relationship between risk tolerance and BIS/BAS to be as follows: BAS Reward Responsiveness will be positively associated with risk tolerance (*Hypothesis 4*), BAS Drive will be positively associated with risk tolerance (*Hypothesis 5*), and BIS will be negatively associated with risk tolerance (*Hypothesis 6*). I do not hypothesize an associated between BAS Fun-seeking and risk tolerance. *See Figure 2 for a review of the hypotheses between personality and risk tolerance.*

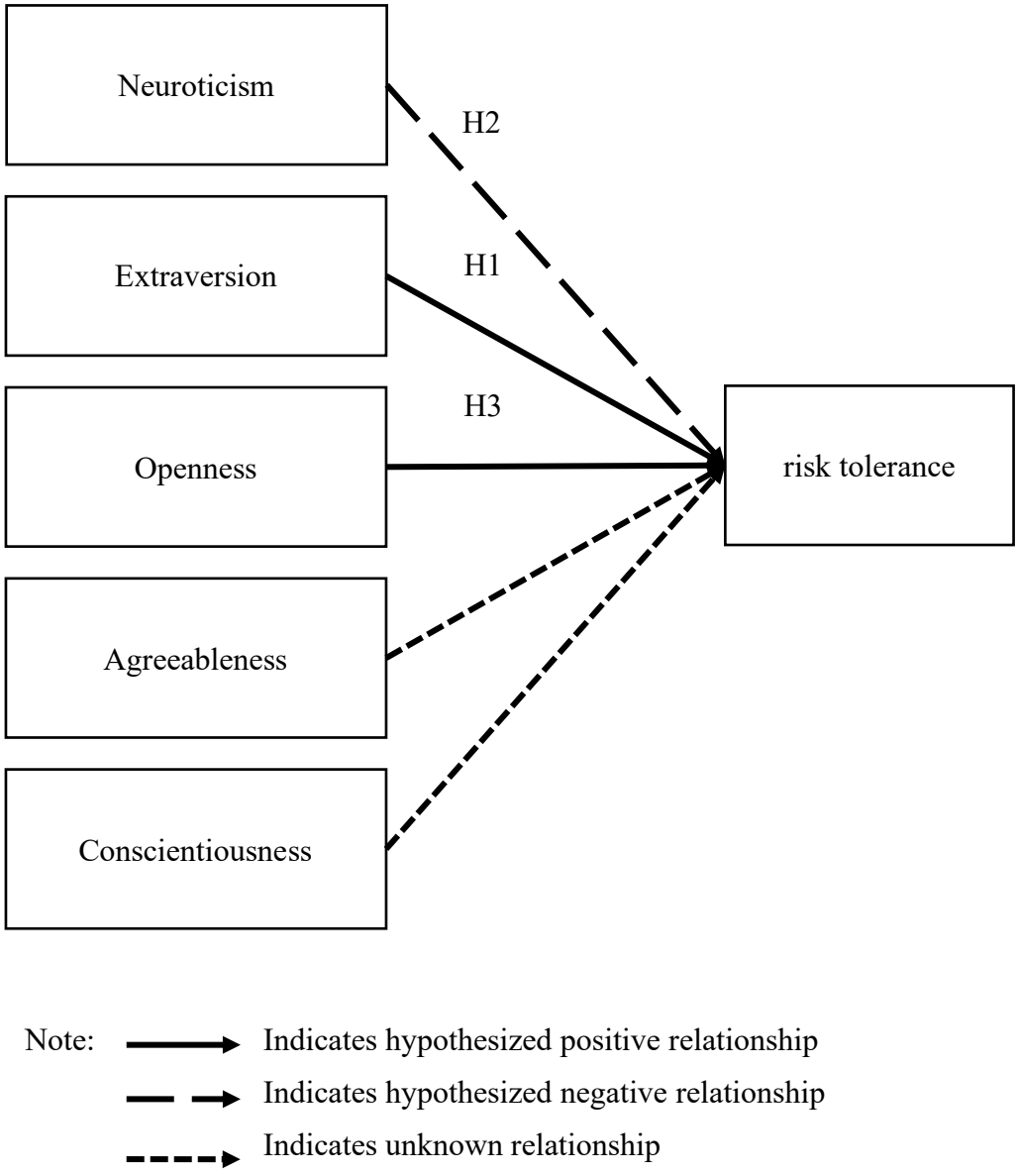


Figure 1.

Personality and risk tolerance Hypotheses.

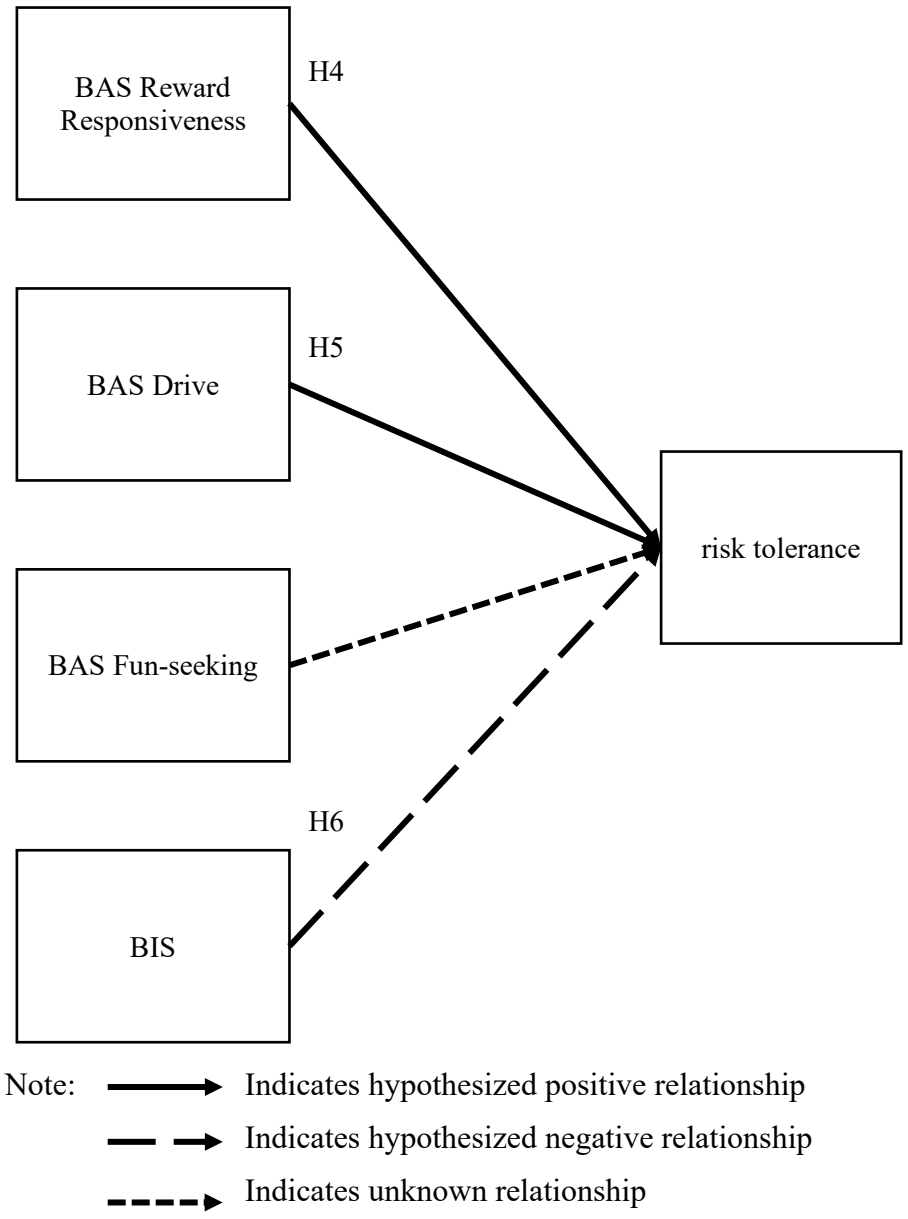


Figure 2.

Motivation and risk tolerance Hypotheses

CHAPTER 2

METHODS

Sample and Procedures

The sample for this study consisted of N = 303 Mechanical Turk (MTurk) participants. MTurk is an online research pool consisting of individuals interested in completing research for monetary compensation. MTurk is a valid data collection resource, as past publications have proven MTurk respondents are representative of the general population (Goodman, Cryder & Cheema, 2013; Paolacci & Chandler, 2014). For the study, participants were screened prior to completing the full survey. Based on the screening, participants were required to be at least 26 years old, make at least $25,000 a year, and make their own investing decisions (i.e., they could not rely on a financial advisor). This delimitation was imposed so it would be likely that participants would have at least a year of investing experience, be managing their own money, and doing so independently of a broker's influence such that their data truly represented themselves and could be tied to their personality and motivation. Additionally, the research protocol qualified that participants be located in the United States. The sample was 70.6% female, 83.2% White, 4.0% African American/Black, 4.3% Hispanic, and 6.6% Asian. The average age of participants was approximately 39 years (M = 38.73, SD = 12.42).

Financial demographics. Approximately 81% of the sample owned an IRA (45.0%) or a SEP (35.0%). Nearly 52% of the sample were married, 7.6% were divorced, 25.1% had never been married, and 14.5% were not yet married but living with a significant other. Approximately 75% of the sample were employed full-time, 11.9% were employed part-time, and 4.6% were retired. With regards to individual income, 45%

of the sample made between $40,000 and $100,000 a year, with a majority of the sample making between $40,000 and $60,000 a year. With regards to household income, 36% of the sample reported their household income as greater than $100,000 per year. Across the sample, with regards to portfolio composition, on average individuals held mostly cash (M = 52.98, SD = 35.01), followed second by equities (M = 28.50, SD = 29.67). The average individual in this sample had roughly 10% (M = 9.46, SD = 13.93) of their portfolio in fixed income (e.g., bond mutual funds, government bonds), 2% in business ownership (M = 2.15, SD = 8.01), and almost 4% in real estate (not including a principal residence) (M = 3.79, SD = 10.66).

Measures

Personality. Personality was measured using the adapted version of the International Personality Item Pool (Maples, Guan, Carter, & Miller, 2014) Big-Five personality measure. The adapted IPIP (Maples et al., 2014) is a 120-item personality measure that assesses the five dimensions of personality: Agreeableness, Extraversion, Conscientiousness, Neuroticism, and Openness. Coefficient alpha for the IPIP-120 has been shown to be strong at the domain level, ranging from .87 to .90, with a median of .88. At the facet level, the IPIP-120 fairs similarly to other commonly used measures of personality (i.e., the NEO PI-R and the 300-item IPIP-NEO), ranging from .62 to .88, with a median of .78 (Maples et al., 2014). Coefficient alpha for the aforementioned dimensions were .83, .90, .90, .93, and .87, respectively. Each dimension can be broken down further into six facets. The reliabilities for each facet can be seen in Tables 2 through 6. Participants were asked to indicate how accurately a statement represented them on a Likert-type scale ranging from 1 (very inaccurate) to 5 (very accurate). Sample

statements included, “Often feel blue,” “Have a vivid imagination,” “Am not interested in abstract ideas,” and, “Get chores done right away.”

Motivation. Theories in psychology suggest there are two motivational systems that underlie behavior: the motivational approach system and the motivational avoidance (or inhibition) systems. Basic motivation (i.e., BIS/BAS) was measured using the Carver and White (2004) conceptualization of the BIS/BAS system. This 24-item measure assesses both the behavioral approach (BAS) and avoidance/inhibition systems (BIS). Respondents were asked to rate how much they agreed or disagreed that an item represented them, ranging from 1 (very true for me) to 5 (very false for me). An example item from the BIS dimension is, “Criticism or scolding hurts me quite a bit.” Carver and White’s (1994) conceptualization of the BAS includes three-dimensions: Reward Responsiveness, Drive, and Fun-seeking. BAS Reward Responsiveness is related to continuing behavior based on perceived attainment of a desired outcome such as a victory, recognition, praise, and positive affect. For example, a question in the Reward Responsiveness facet is, “When I’m doing well at something I love to keep at it.” BAS Drive is related to aggressively pursuing and driving to achieve desired goals or outcomes. An example item for BAS Drive is, “When I want something I usually go all-out to get it.” BAS Fun-seeking is related to regulating one’s behavior to have fun and to seek thrill and excitement. Example items for BAS Fun-seeking are, “I often act on the spur of the moment,” and, “I will often do things for no other reason than that they might be fun.” Coefficient alpha was found to be .86 for BIS, and .69, .80, .74 for BAS Reward Responsiveness, BAS Drive, and BAS Fun-seeking, respectively.

Financial risk tolerance. Financial risk tolerance was measured using two scales commonly used to assess financial risk tolerance within the financial planning literature.

First, the widely respected and validated Grable & Lytton (1999) scale was used. The Grable-Lytton scale is a 13-item self-report risk assessment. The Grable-Lytton scale is comprised of three dimensions: (1) Investment Risk, (2) risk comfort and Experience, and (3) Speculative Risk. However, the authors noted that the scale should be used as a summative scale and not analyzed at the facet level (Grable & Lytton, 2003). The Grable-Lytton scale has been found to be more reliable and valid as a predictor of financial risk tolerance than other available scales (Grable & Lytton, 2003). Past research has shown the Grable-Lytton scale demonstrates acceptable reliability with coefficient alphas estimated to be about .75 (Grable & Lytton, 1999). In the present study, coefficient alpha for the Grable-Lytton scale was found to be .76.

Second, in addition to the Grable-Lytton scale, the single item risk tolerance/aversion measure from the Survey of Consumer Finances (SCF) was included in the study. This item is a stand-alone (i.e., single item) in the SCF, thus there is no alpha reliability to report. However, the SCF item has long been used to measure financial risk tolerance in empirical research and is considered a valid measure (Grable & Lytton, 2001).

Financial Risk Behavior: portfolio risk. In addition to subjective risk tolerance (as measured primarily by the Grable-Lytton scale), information on participants' actual risk within their financial portfolio was evaluated. The amount of each participant's portfolio allocated to equities (e.g., stocks and stock mutual funds) was used to represent individual objective portfolio risk.

In addition to equities, participants were asked what percent of their portfolios were in the following categories: Fixed income (e.g., government bonds, bond mutual funds), Cash (e.g., money markets, bank & checking accounts), Business Ownership

(e.g., ownership in your own business), Real Estate—not including your principal residence, and Other.

Other Risk Indicators: In addition to portfolio allocation, participants were asked how often they gambled, using a 1 to 4 Likert scale, where 1 = frequently, 2 = sometimes, 3 = rarely, 4 = never. For analysis purposes, answers were reverse coded. Additionally, participants were asked whether they owned a Roth, SEP, or other IRA retirement plan and whether they were primarily interested in seeking variable or fixed returns.

Data Analysis Methods

Three methods were used to address the research hypotheses. First, a correlation analysis was conducted to determine the strength of associations between and among the variables of interest in this study. Second, a mediation test was conducted to estimate the direct and indirect effects of psychological constructs in describing risk taking behavior. Third, a series of hierarchical regressions were used to determine the effects the psychological constructs evaluated in this study had in adding to descriptions, above and beyond risk tolerance, of financial risk taking behavior. The results for the tests are described in Chapter 3.

CHAPTER 3

RESULTS

Basic Correlations

Personality. As hypothesized, the personality traits of Neuroticism (r = -.15, p <.05), Extraversion (r = .32, p <.01), and Openness (r = .17, p <.01), were significantly associated with financial risk tolerance measured by the Grable-Lytton scale. As such, *hypotheses 1-3 were supported* (Figure 3). The SCF, an alternative yet less widely used measure of financial risk tolerance, behaved similar to the Grable-Lytton scale (see Table 1). Neither personality trait Agreeableness nor Conscientiousness were significantly related to financial risk tolerance as measured by the Grable-Lytton scale (r = -.09, p >.05; r = .01, p >.05, respectively). Interestingly, the SCF did demonstrate a significant relationship with Agreeableness (r = -.14, p <.05), indicating a potential difference between the two measures of financial risk tolerance. That being said, the two scales behaved similarly. As such, and because the Grable-Lytton scale is a more widely accepted, established scale, henceforth, risk tolerance will refer to the Grable-Lytton scale.

While hypotheses between the psychological variables and objective portfolio risk were not specified, attempts were taken to examine these relationships. With regards to objective portfolio risk, the only significant relationship found was with Neuroticism (r = -.17, p <.01). Extraversion was not found to be significantly related to portfolio risk, though the relationship was approaching significance (r = .11, p =.064).

Similar to portfolio risk, specific relationships related to risk comfort were not hypothesized; however, these relationship were examined in an exploratory sense. Interestingly, Neuroticism was significantly related to risk comfort, such that high Neuroticism suggested lower risk comfort (r = -.24, p <.01). While this specific relationship was not hypothesized, the results are in the logical direction. Extraversion demonstrated the opposite relationship—high Extraversion suggested higher risk comfort (r = .19 p <.01). The remaining three personality traits (i.e., Openness, Agreeableness, and Conscientiousness) did not demonstrate significant relationships with risk comfort. Again, while these relationships between personality and risk comfort were not specified as hypotheses, the findings (i.e., low Neuroticism; high Extraversion) are in the logical direction. Beyond these analyses, attempts were made to examine facet level relationships for personality to provide a foundation for future theory building.

Across personality traits, at the facet level, there were several facets that were significantly correlated with portfolio risk. Of the Neuroticism facets, Anxiety (r = -.16, p <.01), Depression (r = -.15, p <.01), Vulnerability (r = -.18, p <.01), and Self-consciousness (r = -.15, p <.01) were significantly related to portfolio risk. Of the Extraversion facets, only Assertiveness (r = .15, p <.01) was significantly related to portfolio risk. Of the Openness facets, Emotionality (r = -.15, p <.01) and Adventurousness (r = .23, p <.01) were significantly related to portfolio risk. Of the Agreeableness facets, Trust (r = .18, p <.01) and Modesty (r = -.13, p <.05) were significantly related to portfolio risk. Notably, none of the Conscientiousness facets were significantly related to portfolio risk. Specific facet level correlation can be seen in Tables 2 through 6.

Motivation. The motivation variables behaved somewhat as expected. Specifically, BAS Drive was significantly related to financial risk tolerance as measured by the Grable-Lytton scale, (r = .18, p <.01). BAS Reward Responsiveness was surprisingly not significantly related to financial risk tolerance (r = .04, p >.05). However, BAS Fun-seeking was significantly related to risk tolerance, which was not hypothesized (r = .24, p <.01). The BIS was significantly related to risk tolerance, as expected (r = -.20, p <.01). As such, *hypothesis 4* was *not supported*, however, *hypotheses 5 and 6 were supported* (Figure 4).

Again, although specific hypotheses surrounding risk comfort, objective portfolio risk, and motivation were not made, the relationships were tested in an exploratory manner. Of the motivation variables, BAS Drive and BIS were the only variables found to demonstrate significant relationships with risk comfort (r = .13, p <.05; r = -.13, p <.05), respectively. Surprisingly, none of the motivation variables were significantly related to objective portfolio risk.

Mediation

In addition to basic correlations, two mediation models were tested. Mediation was not formally hypothesized *a priori*. However, after reviewing the differences in the pattern of correlations between the psychological variables with risk tolerance as compared to portfolio risk, there was evidence to suggest that some of these dynamic relationships may be best described through mediation analyses. First, a test was made to determine if there was a significant indirect effect of personality through subjective risk tolerance on objective portfolio risk. Next, the same model was tested with motivation instead of personality. All mediation models were tested using the Hayes bootstrapping mediation SPSS Macro (Hayes, 2012). This method of mediation analysis has proven

superior (i.e., over the commonly used Sobel test) with regards to power and Type 1 error (Hayes, 2009). Further, this method is preferred because it does not assume the sampling distribution of the indirect effect be normal, which it is commonly not, whereas the Sobel test assumes normality (Hayes, 2009). Findings from each mediation test are described below.

Personality. With regards to personality, it appears that the Grable-Lytton scale measure of risk tolerance captures all of the variance explained by Extraversion in relation to portfolio risk. The main effect of Extraversion on portfolio risk was non-significant, however, the indirect effect of Extraversion on Portfolio risk through risk tolerance was significant (Figure 5; $\beta = 5.96$, $p < .01$). Evidence for mediation of Extraversion on portfolio risk through subjective risk tolerance was obtained. On the other hand, in the same mediation model, the main effect of Neuroticism on Portfolio risk was significant ($\beta = -6.65$, $p < .01$), and the indirect was non-significant. Openness demonstrated both a non-significant main effect ($\beta = 1.45$, $SE = 2.69$) and indirect effect through risk tolerance ($\beta = 1.58$, $SE = 1.16$).

Motivation. With regards to motivation, the main effect of BAS Drive on portfolio risk was non-significant, however, the indirect of BAS Drive on Portfolio risk through risk tolerance was significant (Figure 5; $\beta = 3.34$, $SE = 1.63$). Similarly, the main effect of BIS on portfolio risk was non-significant, however, the indirect of BIS on portfolio risk through risk tolerance was significant (Figure 5; $\beta = 3.65$, $SE = 1.38$). Therefore, evidence for mediation of BAS Drive and BIS on portfolio risk through subjective risk tolerance was found. BAS Reward Responsiveness demonstrated both a non-significant main effect ($\beta = .45$, $p = .87$) and indirect effect ($\beta = -.43$, $SE = 2.39$).

Hierarchical Regression

An additional goal of this study was to see how well the psychological variables predict objective portfolio risk above and beyond subjective risk tolerance. As such, three hierarchical regression models were tested: personality, motivation, and combined personality-motivation model (Tables 8 through 10). For each model, the following were examined: first, whether or not the inclusion of the psychological variables better explained portfolio risk over and above the Grable-Lytton scale (i.e., the measure of risk tolerance), and second, whether adding control variables affected the significance of the psychological predictor variables. Findings from the tests are described below.

Personality. The basic model (i.e., without controls) that included personality (i.e., Neuroticism, Extraversion, and Openness) did, in fact, increase the variance explained of portfolio risk over and above the Grable-Lytton scale (Table 8; $\Delta F = 2.66$, $p < .05$). The strongest—and only significant—personality predictor was Neuroticism ($\beta = -.17$, $p < .01$). Unfortunately, however, when the control variables (i.e., age and gender) were included in the hierarchical regression, the addition of personality (i.e., Neuroticism, Extraversion, and Openness) was non-significant ($\Delta F = .85$, $p > .05$).

Motivation. The basic model (i.e., without controls) that included motivation (i.e., BAS Drive, BAS Reward Responsiveness, and BIS) did not increase the variance explained of portfolio risk over and above the Grable-Lytton scale (Table 9; $\Delta F = 1.98$, $p > .05$). Despite the additional variance explained of Model 1b in Table 9 being non-significant, there was one significant motivation predictor of portfolio risk, which was BAS Reward Responsiveness ($\beta = -.13$, $p < .05$). Additionally, when the control variables (i.e., age and gender) were included in the hierarchical regression, the addition of

motivation (i.e., BAS Drive, BAS Reward Responsiveness, and BIS) was non-significant ($\Delta F = 2.15$, $p > .05$).

Exploratory. In addition to the *a priori* hierarchical regression models tested, a model that included the significant variables of both personality and motivation (i.e., Neuroticism and BAS Reward Responsiveness) was tested to see if they significantly contributed to the variance of portfolio risk explained by the model. The addition of Neuroticism and BAS Reward Responsiveness both with and without the control variables resulted in a significant change in the F value ($\Delta F = 3.18$, $p < .05$; $\Delta F = 5.52$, $p < .01$, respectively), indicating that these two variables significantly predicted portfolio risk, over and above risk tolerance. In the model without the controls, both Neuroticism and BAS Reward Responsiveness significantly predicted portfolio risk ($\beta = -.12$, $p < .05$; $\beta = -.13$, $p < .05$, respectively). In the model with controls, only BAS Reward Responsiveness remained a significant predictor of portfolio risk ($\beta = -.12$, $p < .05$). This suggests that the addition of specific psychological variables—most notably the personality trait Neuroticism and BAS Reward Responsiveness—significantly improves the ability to explain portfolio risk taking.

Table 1.

Basic Correlations

	N	E	O	A	C	BAS Drive	BAS Fun	BAS Reward Respon.	BIS	Grable-Lytton Scale	SCF	risk comfort
Alpha	.90	.90	.87	.83	.90	.80	.73	.70	.85	.76	-	-
Mean	2.61	3.35	3.40	3.82	4.01	2.74	2.66	3.41	3.30	24.81	2.23	2.25
SD	.74	.62	.62	.47	.55	.59	.60	.39	.60	5.06	.72	1.02
E	-.46**											
O	.03	.31**										
A	-.21**	.13*	.13*									
C	-.58**	.34**	-.04	.35**								
BAS Drive	-.21**	.47**	.16**	-.04	.30**							
BAS Fun	-.01	.50**	.32**	-.10	-.20**	.32**						
BAS Reward Respon.	-.03	.36**	.16**	.15**	.20**	.48**	.29**					
BIS	.66**	-.24**	-.02	.17**	-.23**	-.18**	-.06	.141*				
Grable-Lytton	-.15*	.32**	.17**	-.09	.01	.18**	.24**	.04	-.20**			
SCF	-.16**	.24**	.07	-.14*	.05	.20**	.21**	.06	-.20**	.63**		
risk comfort	-.24**	.19**	-.01	-.02	.09	.13*	.10	-.01	-.13*	.31**	.28**	
portfolio risk	-.17**	.11	.06	.05	.09	.02	.05	-.11	-.10	.42**	.46**	.31**

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

Table 2.

Neuroticism Facet Correlations

	Anxiety	Anger	Depression	Immoderation	Vulnerable	Self-conscious
Alpha	.86	.88	.90	.76	.81	.72
Mean	3.06	2.65	2.25	2.82	2.23	2.66
SD	1.10	1.01	1.13	.94	.89	.87
BAS Drive	-.15**	-.02	-.21**	-.04	-.24**	-.30**
BAS Fun	-.10	.07	-.04	.26**	-.09	-.17**
BAS Reward Respon.	.06	.00	-.10	.09	-.08	-.09
BIS	.79**	.33**	.48**	.24**	.57**	.54**
N	.84**	.67**	.84**	.56**	.82**	.73**
E	-.34**	-.22**	-.47**	.02	-.46**	-.61**
O	.06	-.01	.09	.10	-.04	-.12*
A	-.03	-.42**	-.14*	-.19**	-.14*	-.01
C	-.34**	-.32**	-.54**	-.46**	-.51**	-.43**
Grable-Lytton	-.23**	-.05	-.12*	.09	-.20**	-.14*
SCF	-.20**	-.05	-.13*	.03	-.25**	-.14*
risk comfort	.24**	.11	.21**	.04	.19**	.25**
portfolio risk	-.16**	-.07	-.15**	-.04	-.18**	-.15**
Age	-.26**	-.16**	-.20**	-.23**	-.21**	-.18**
Gender	.23**	.05	.03	.11*	.15**	.15**
Individual Income	-.06	-.01	-.12*	.13*	-.09	-.17**
House-hold income	.00	.07	-.12*	.11	.00	-.06

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

Table 3.

Extraversion Facet Correlations

	Friendly	Gregarious	Assertive	Activity Level	Excitement Seeking	Cheerful
Alpha	.86	.83	.89	.68	.77	.73
Mean	3.49	2.49	3.52	3.70	3.08	3.81
SD	.97	1.04	.98	.77	.82	.73
N	-.50**	-.25**	-.39**	-.25**	-.10	-.42**
E	.81**	.71**	.72**	.59**	.58**	.75**
O	.17**	.27**	.21**	.17**	.29**	.15**
A	.24**	.00	.00	.20**	-.14*	.28**
C	.34**	.04	.39**	.46**	-.10	.31**
BAS Drive	.33**	.18**	.43**	.40**	.30**	.35**
BAS Fun	.26**	.36**	.27**	.20**	.70**	.33**
BAS Reward Respon.	.26**	.19**	.23**	.27**	.22**	.37**
BIS	-.21**	-.15**	-.27**	-.09	-.14*	-.10
Grable-Lytton	.18**	.22**	.27**	.16**	.30**	.19**
SCF	.14*	.13*	.20**	.13*	.27**	.13*
risk	-.17**	-.11*	-.13*	-.09	-.11	-.19**
comfort						
portfolio risk	.05	.00	.15**	.08	.09	.08
Age	.06	-.13*	.03	-.08	-.31**	-.01
Gender	.07	-.01	-.05	.06	-.06	.22**
Individual Income	.17**	.14*	.31**	.22**	.22**	.17**
House-hold income	.15**	.09	.14*	.10	.13*	.18**

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

Table 4.

Openness Facet Correlations

	Imagination	Artistic Interests	Emotionality	Adventurous	Intellect	Liberalism
Alpha	.81	.80	.76	.78	.86	.80
Mean	3.35	3.76	3.51	2.78	3.76	3.21
SD	.99	.93	.91	.90	1.01	1.16
N	.13*	-.06	.51**	-.40**	-.20**	.11
E	.25**	.25**	.06	.42**	.26**	-.03
O	.72**	.77**	.38**	.53**	.75**	.60**
A	-.02	.25**	.14*	.08	.10	-.01
C	-.14*	.12*	-.19**	.11	.12*	-.16**
BAS Drive	.16**	.10	.10	.19**	.16**	-.07
BAS Fun	.33**	.09	.16**	.37**	.15**	.14*
BAS Reward Respon.	.21**	.15**	.23**	.01	.11	-.09
BIS	.04	-.03	.53**	-.46**	-.17**	.02
Grable-Lytton	.11	.11*	-.07	.26**	.13*	.06
SCF	.12*	.03	-.16**	.22**	.10	-.02
risk comfort	.03	.05	.08	-.13*	-.02	.02
portfolio risk	-.05	.02	-.15**	.23**	.07	.10
Age	-.14*	.00	-.12*	.05	.01	-.24**
Gender	-.05	.05	.23**	-.04	-.08	-.04
Individual Income	.00	-.07	-.01	.16**	.03	.11
House-hold income	-.10	-.21**	.02	.01	-.12*	-.03

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

Table 5.

Agreeableness Facet Correlations

	Trust	Morality	Altruism	Cooperation	Modesty	Sympathy
Alpha	.92	.64	.76	.67	.78	.73
Mean	3.42	3.99	4.21	4.09	3.38	3.85
SD	.99	.66	.64	.76	.91	.80
N	-.36**	-.19**	-.20**	-.34**	.27**	.04
E	.44**	-.20**	.48**	.02	-.53**	.26**
O	.08	-.10	.27**	.04	-.13*	.35**
A	.52**	.64**	.67**	.71**	.40**	.64**
C	.15**	.36**	.41**	.31**	-.06	.18**
BAS Drive	.14*	-.21**	.21**	-.07	-.34**	.13*
BAS Fun	.14*	-.29**	.11	-.13*	-.29**	.08
BAS Reward Respon.	.17**	-.04	.32**	.04	-.10	.18**
BIS	-.07	.05	.16**	.01	.20**	.27**
Grable-Lytton	.23**	-.22**	.04	-.11	-.27**	-.05
SCF	.16**	-.18**	-.06	-.06	-.24**	-.14*
risk comfort	-.19**	.12*	-.02	-.06	.23**	.03
portfolio risk	.18**	.05	.02	.09	-.13*	-.05
Age	.13*	.24**	.12*	.15*	.13*	.07
Gender	.05	.17**	.20**	.10	.13*	.27**
Individual Income	.12*	-.17**	.12*	-.03	-.24**	.06
House-hold income	.13*	-.10	.11	-.07	-.19**	.08

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

Table 6.

Conscientiousness Facet Correlations

	Self Efficacy	Order.	Dutiful.	Achievement.	Self Discipline	Cautiousness
Alpha	.82	.81	.75	.77	.88	.87
Mean	16.75	15.17	4.32	4.20	3.61	3.93
St. Dev	2.35	3.71	.58	.70	1.03	.83
N	-.51**	-.28**	-.43**	-.30**	-.55**	-.36**
E	.53**	.11*	.21**	.46**	.30**	-.10
O	.05	-.08	.01	.14*	-.11	-.11
A	.14*	.15*	.45**	.27**	.23**	.27**
C	.73**	.68**	.69**	.67**	.82**	.61**
BAS Drive	.45**	.13*	.15**	.42**	.28**	-.09
BAS Fun	.07	-.15*	-.12*	.08	-.14*	-.49**
BAS Reward Respon.	.26**	.11*	.12*	.33**	.13*	-.06
BIS	-.24**	-.08	-.17**	-.05	-.32**	-.09
Grable-Lytton	.17**	-.10	-.03	.11*	.03	-.09
SCF	.18**	-.06	-.05	.13*	.08	-.02
risk comfort	-.17**	-.02	.00	-.06	-.09	-.06
portfolio risk	.10	.02	.02	.07	.07	.10
Age	.05	.16**	.27**	.04	.26**	.24**
Gender	.04	-.01	-.02	.09	-.01	.06
Individual Income	.16**	-.05	-.01	.21**	.00	-.03
House-hold income	.09	-.02	-.08	.14*	-.07	-.03

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

Table 7.

Portfolio Composition, Other Risk Outcomes, Personality, and Motivation Correlations

	BAS Drive	BAS Fun	BAS Reward Respon.	BIS	N	E	O	A	C
Cash	-.04	-.04	.12*	.15*	.20**	-.11	-.04	.00	-.09
Fixed Income	.04	.09	-.02	-.09	-.16**	.11	.00	.02	.12*
Equities	.02	.05	-.11	-.10	-.17**	.11	.06	.05	.09
Business Ownership	.00	.07	.04	-.05	.00	.06	.13*	.05	-.06
Real Estate	.08	-.03	-.04	.00	.02	-.02	-.06	-.16**	-.05
Gamble	.09	.08	.01	-.19**	-.04	.00	-.12*	-.17**	-.02
Return Risk	.05	.13*	.11	-.09	-.09	.16**	.10	.04	.03
risk comfort	.13*	.10	-.01	-.13*	-.24**	.19**	-.01	-.02	.09

Note, ** Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). BAS Fun = BAS Fun Seeking facet, BAS Reward Respon. = BAS Reward Responsiveness facet, N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness, Grable-Lytton scale = The Grable-Lytton scale measuring risk tolerance, SCF = the Survey of Consumer Finance single item risk tolerance question.

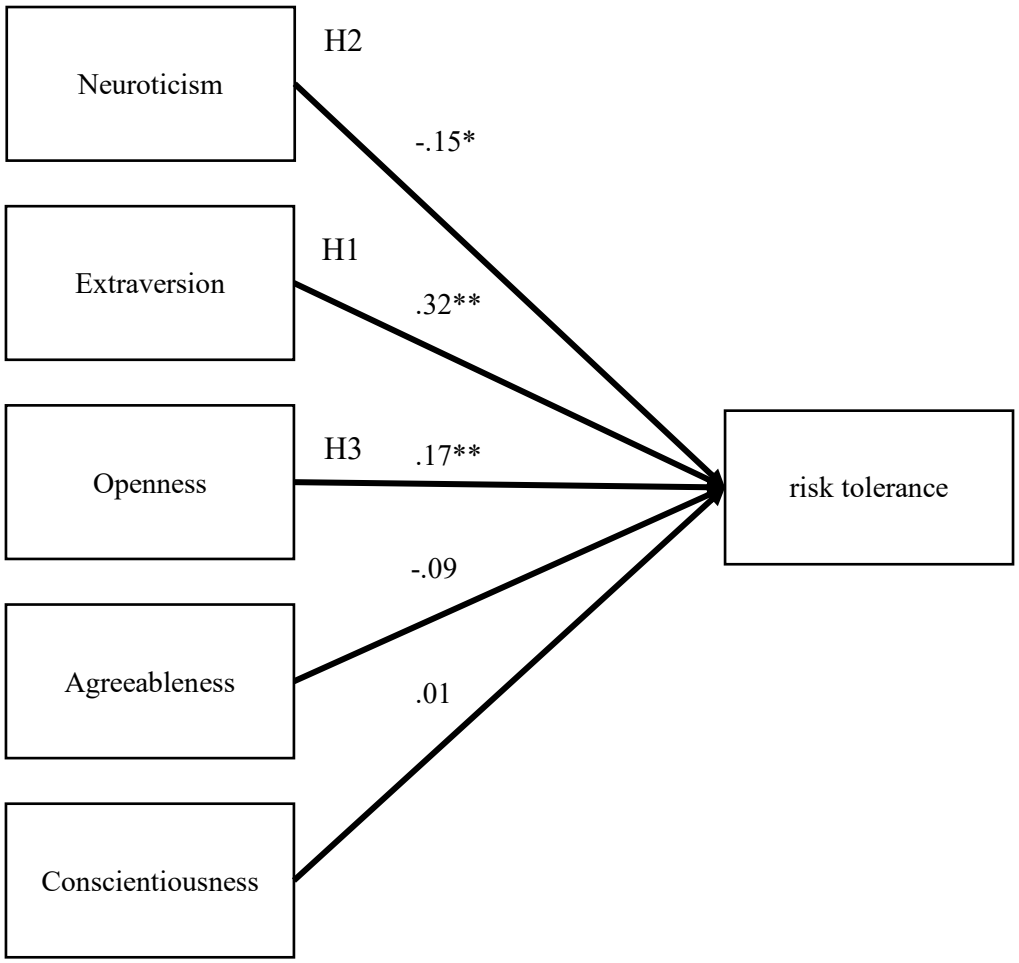


Figure 3.

Hypothesis Testing: Basic Personality Correlations

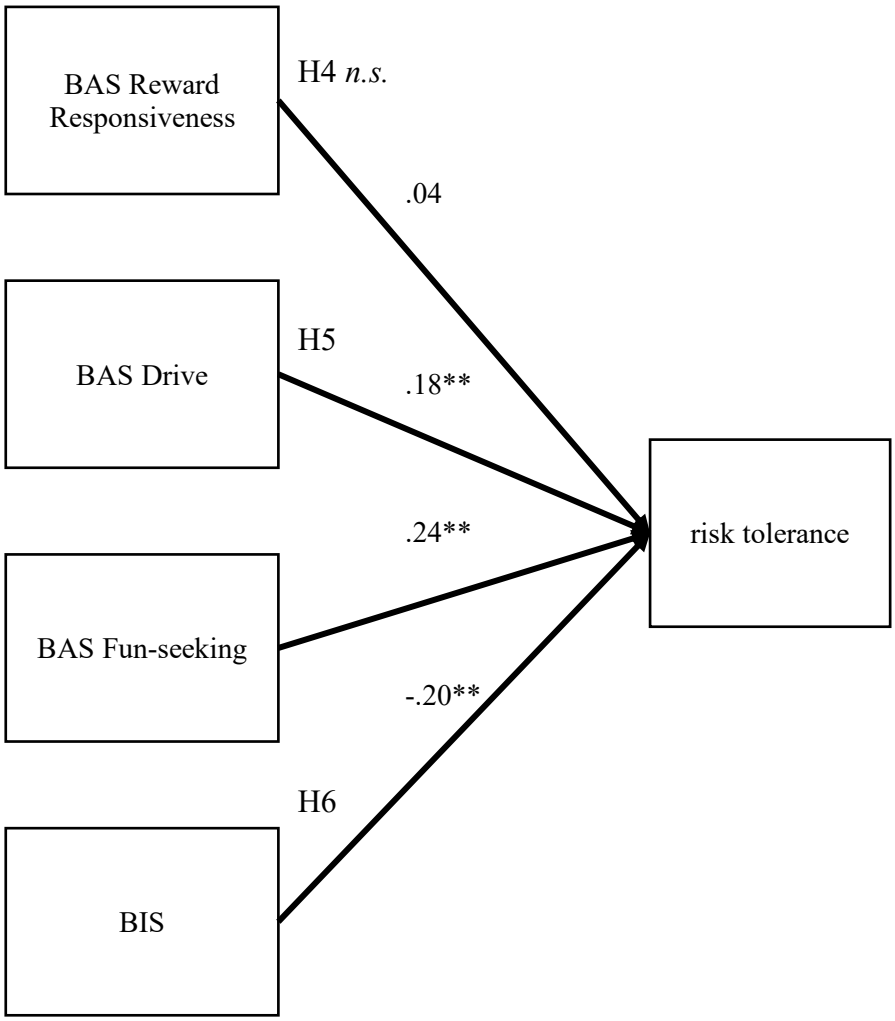
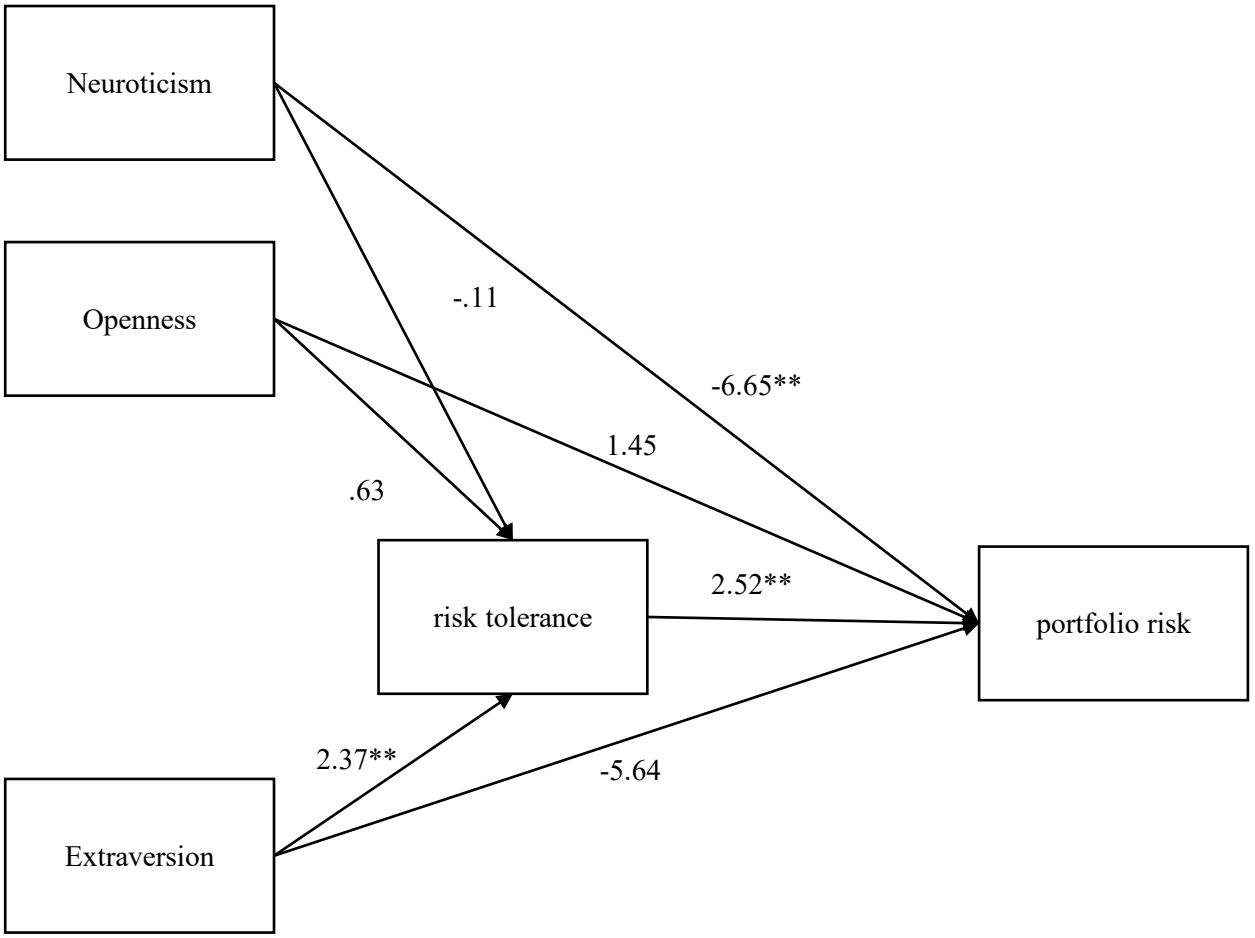


Figure 4.

Hypothesis Testing: Basic Motivation Correlations



Note, n.s. = Hypothesis 5 was not supported.

Figure 5.

Mediation Model: Personality, risk tolerance, and portfolio risk

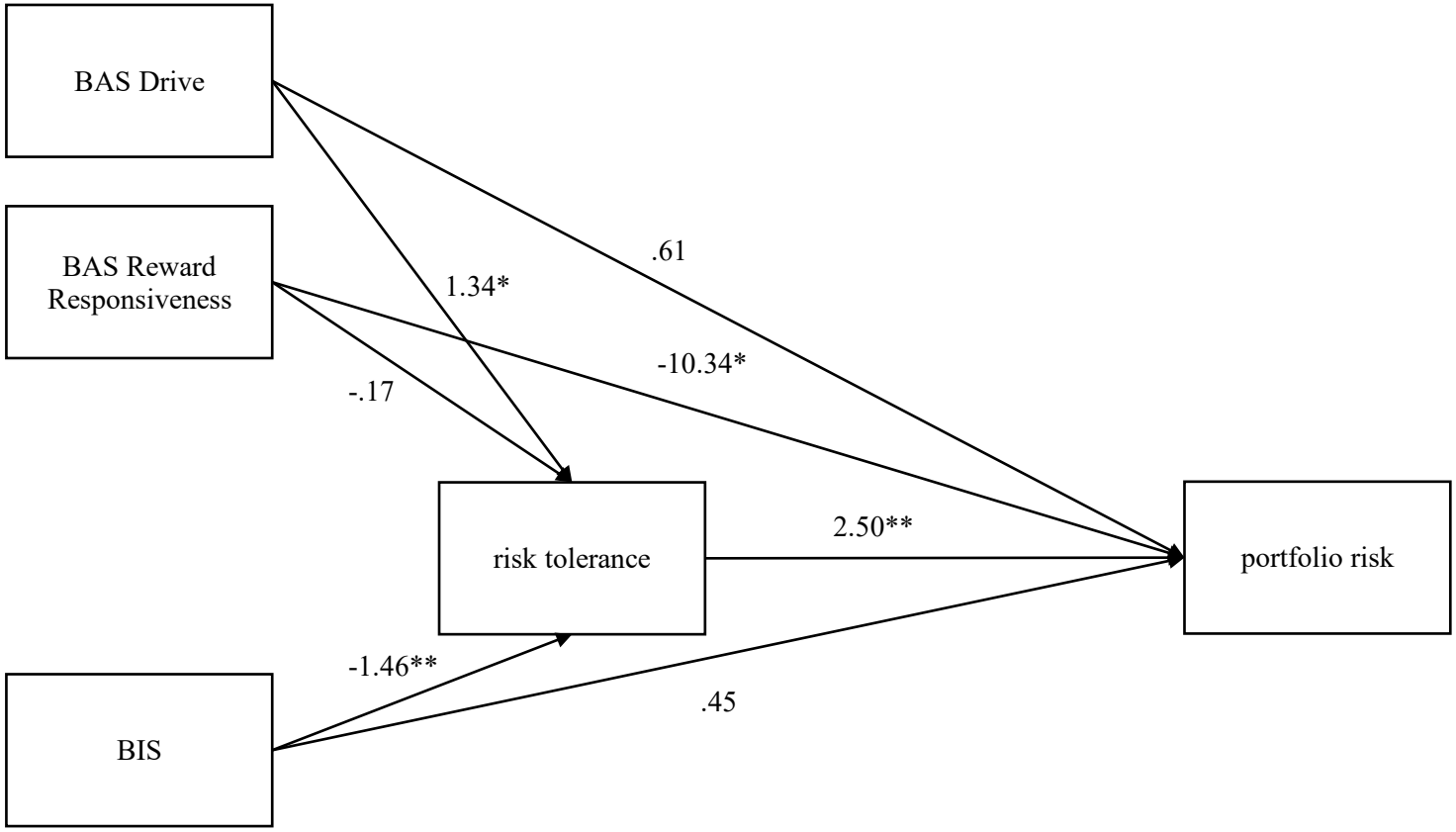


Figure 6.

Mediation Model: Motivation, risk tolerance, and portfolio risk

Table 8.

Hierarchical Regression of Personality

Step	Variables	β	R^2	ΔR^2	ΔF
1a			.18		64.60**
	Grable-Lytton	.42**			
1b			.20	.02	2.66*
	Grable-Lytton	.43**			
	Neuroticism	-.17**			
	Extraversion	-.12			
	Openness	.03			
2a			.21		26.73**
	Grable-Lytton	.43**			
	Age	.19**			
	Gender	-.02			
2b			.22	.01	.85
	Grable-Lytton	.43**			
	Age	.16**			
	Gender	.03			
	Neuroticism	-.10			
	Extraversion	-.07			
	Openness	.03			
3a			.03		3.53*
	Neuroticism	-.17**			
	Extraversion	.01			
	Openness	.06			
3b			.20	.02	18.41**
	Grable-Lytton	.43**			
	Neuroticism	-.17**			
	Extraversion	-.12			
	Openness	.03			

Table 9.

Hierarchical Regression of Motivation

Step	Variables	β	R^2	ΔR^2	ΔF
1a			.18		64.60**
	Grable-Lytton	.42**			
1b			.19	.01	1.98
	Grable-Lytton	.43**			
	BAS Drive	.01			
	BAS Reward	-.13*			
	Respon.				
	BIS	.01			
2a			.21		26.73**
	Grable-Lytton	.42**			
	Age	.19**			
	Gender	-.02			
2b			.22	.01	2.15
	Grable-Lytton	.43**			
	Age	.20**			
	Gender	-.01			
	BAS Drive	.06			
	BAS Reward	-.15*			
	Respon				
	BIS	.07			

Table 10.

Exploratory Hierarchical Regression

Step	Variables	β	R^2	ΔR^2	ΔF
1a			.18		64.60**
	Grable-Lytton	.42**			
1b			.21	.02	5.52**
	Grable-Lytton	.41**			
	Neuroticism	-.12*			
	BAS Reward Respon.	-.13*			
2a			.21		26.73**
	Grable-Lytton	.42**			
	Age	.19**			
	Gender	-.02			
2b			.23	.02	3.18*
	Grable-Lytton	.43**			
	Age	.16**			
	Gender	.01			
	Neuroticism	-.07			
	BAS Reward Respon.	-.12*			

CHAPTER 4

GENERAL DISCUSSION

The overarching goal of this dissertation was to better describe financial risk taking behavior by including core psychological concepts that have long been tied to risk-taking in other domains. Specifically, the purpose of this study was to expand the existing theory of financial risk tolerance by determining the relationships between risk tolerance and core psychological traits (i.e., personality and motivation). Further, a second aim of this study was to determine whether these traits were significantly related to financial risk-taking (i.e., portfolio risk) over and above an individuals measured risk tolerance (i.e., the Grable-Lytton scale). In other words, whether or not understanding an individual's personality and core motivation help explain her or his financial risk-taking beyond what is already known by understanding the person's measured risk tolerance.

To review, it was hypothesized that the personality trait Neuroticism and the motivation variable BIS would be negatively related to risk tolerance, whereas, the personality traits Extraversion and Openness, and the motivation variables BAS Drive and BAS Reward Responsiveness, would be positively related to risk tolerance. The majority of the hypotheses tested were supported. Specific findings are reviewed below.

Overall, the hypotheses of this study describing personality were largely supported. Specifically, the personality traits Neuroticism, Extraversion, and Openness were, in fact, related to an individual's risk tolerance as measured by the Grable-Lytton scale *(Hypotheses 1-3 supported*; see Table 1). However, interestingly, these traits—with the exception of Neuroticism—did not seem to be significantly related to an individual's

actual financial risk behavior (i.e., their portfolio risk level). Extraversion was only associated with portfolio risk *indirectly*, through an individual's risk tolerance. In other words, all of the variance in portfolio risk explained by Extraversion was captured by the Grable-Lytton risk tolerance measure. This suggests that measuring the personality trait Extraversion in addition to risk tolerance is statistically redundant and does not provide any unique information when explaining financial risk-taking. On the other hand, as mentioned, parts of Neuroticism are uniquely describing portfolio risk, beyond what is captured by risk tolerance. Therefore, and in support of the overarching goal of this research, including the personality trait Neuroticism in a model to predict financial risk-taking is useful over and above risk tolerance. Unfortunately, however, none of the facet level correlations between the various Neuroticism facets, risk tolerance, and portfolio risk were significantly different from one another in this sample. Differences of this nature would provide some insight into what aspects of Neuroticism *are not* being captured by risk tolerance but *are* useful when explaining portfolio risk. Future research is needed to understand which specific aspects of Neuroticism are uniquely contributing to portfolio risk above and beyond risk tolerance. Specifically, which of the facets of Neuroticism can uniquely explain variance in portfolio risk, beyond what is explained by an individual's risk tolerance?

The findings related to motivation were somewhat less consistent with the hypotheses. As expected, BIS and BAS Drive were significantly related to risk tolerance as measured by the Grable-Lytton scale. Contrary to expectations, BAS Reward Responsiveness was not significantly related to risk tolerance while BAS Fun-seeking was related to risk tolerance. These findings suggest that perhaps portfolio risk may be driven by more impulsive behaviors and less planful behaviors, however, further research

is needed to test these possibilities. Further, none of the motivation variables were significantly related to portfolio risk *directly*. However, there was evidence that BAS Drive and BIS were related to portfolio risk *indirectly*. Thus, the variance in risk portfolio explained by BAS Drive and BIS are captured by risk tolerance as measured by the Grable-Lytton scale. Similar to the mediation implications for Extraversion, this suggests that measuring the motivation variables in addition to risk tolerance is statistically redundant and does not provide any unique information when explaining financial risk-taking. Thus, more research is needed to understand how and if motivation is explaining financial risk-taking.

In addition to examining basic correlation and mediation, this study also tested hierarchical regression models to assess whether the inclusion of the psychological variables were associated with portfolio risk above and beyond reported risk tolerance. The inclusion of the personality variables—especially Neuroticism—were significantly associated with portfolio risk above and beyond risk tolerance. These findings were not true for the motivation behaviors separately. However, the exploratory regression model that included Neuroticism and the motivation variable BAS Reward Responsiveness was related to portfolio risk above and beyond risk tolerance. This suggests that assessing personality—both in isolation or with BAS Reward Responsiveness—is useful when trying to understand a person's financial risk tolerance. These findings support the notion that psychological variables can enhance the understanding of financial risk-taking and thus improve the financial theories of risk-taking.

Based on the findings from this study, the Biopsychosocial and Environmental theory of financial risk tolerance (Grable & Joo, 2004) should be strengthened by the inclusion of two psychological variables from this study: Neuroticism and BAS Reward

Responsiveness (Figure 7). These two variables are at the core of many of the behaviors humans exhibit. Furthermore, personality and motivation have proven to be a relatively stable over the course of one's life (Corr, 2008; Leon, Gillum, Gillum, & Gouze, 1979). This may provide an advantage over other commonly measured indicators of financial risk tolerance (e.g., age, marital status, income, etc.), which are subject to change. Future research should test this idea, particularly with a longitudinal study. Specifically, it will be interesting to see whether personality and motivation become stronger predictors of financial risk tolerance across time or during times of economic change.

Despite these findings, further research is needed to understand the bigger picture of financial risk-taking as it relates to basic psychological concepts. Specifically, future research should examine how and when these psychological variables are affecting financial risk-taking. For example, the personality trait Neuroticism seems to clearly be explaining financial risk-taking in a way that risk tolerance does not. However, the facet level information does not provide a clear picture as to where, within the broader trait of Neuroticism, the unique contribution exists. Future research should examine how Neuroticism relates to risk-taking differently than risk-tolerance.

Further, future research is needed to understand the role basic motivation plays in financial risk-taking. Based on the evidence from the psychological literature, underlying basic motivation clearly plays a critical role in decision-making when risk is involved. Thus, findings from this study appear preliminary, especially when considering what is known about the various facets of the BAS and how the BAS relates to different decision-making scenarios. For example, because the literature describes BAS fun-seeking as more unrestrained impulsivity, the results demonstrating a significant relationship between fun-seeking and risk tolerance are somewhat surprising. Despite

financial risk tolerance being a form of risk-taking, because financial risk-taking is often recommended and beneficial (Kitces, 2016) it seems logical that financial risk-taking might manifest differently than other forms of risk-taking (e.g., drug/alcohol abuse, risky sex behaviors, gambling, etc.). More information is needed to understand how and why those variables are related and when risk-tolerance is more impulsive and when, *or if*, it is more planful.

Lastly, further research is needed to understand the relationship between personality and financial risk-taking over time. Specifically, the personality trait Neuroticism is associated with instability. In fact, it is commonly referred to by another name: Emotional (in)stability (DeYoung, Quilty, & Peterson, 2007). Because high Neuroticism individuals act erratically, it would be interesting to see whether Neuroticism predicts an individuals' financial risk behavior over time, especially when the economic market undergoes a shift or correction. It is reasonable to think that individuals who are high in Neuroticism would be especially likely to change their investing portfolios during such a downturn. Further research is needed to test this possibility.

Conclusion

This dissertation extends current theories of financial risk-taking by providing evidence supporting the benefits of including the psychological variables personality and motivation into models of financial risk tolerance and risk taking. As demonstrated through basic correlations, mediation analyses, and hierarchical regression, the personality variables Neuroticism, Extraversion, and Openness, and the motivation variables BAS Drive, BAS Fun-seeking, and BIS, are all related to financial risk tolerance. Further, the personality trait Neuroticism explains financial risk-taking above

and beyond what is explained by the commonly used measure of financial risk tolerance (i.e., Grable-Lytton scale), providing evidence for the benefits of including personality in financial risk models, in addition to risk tolerance.

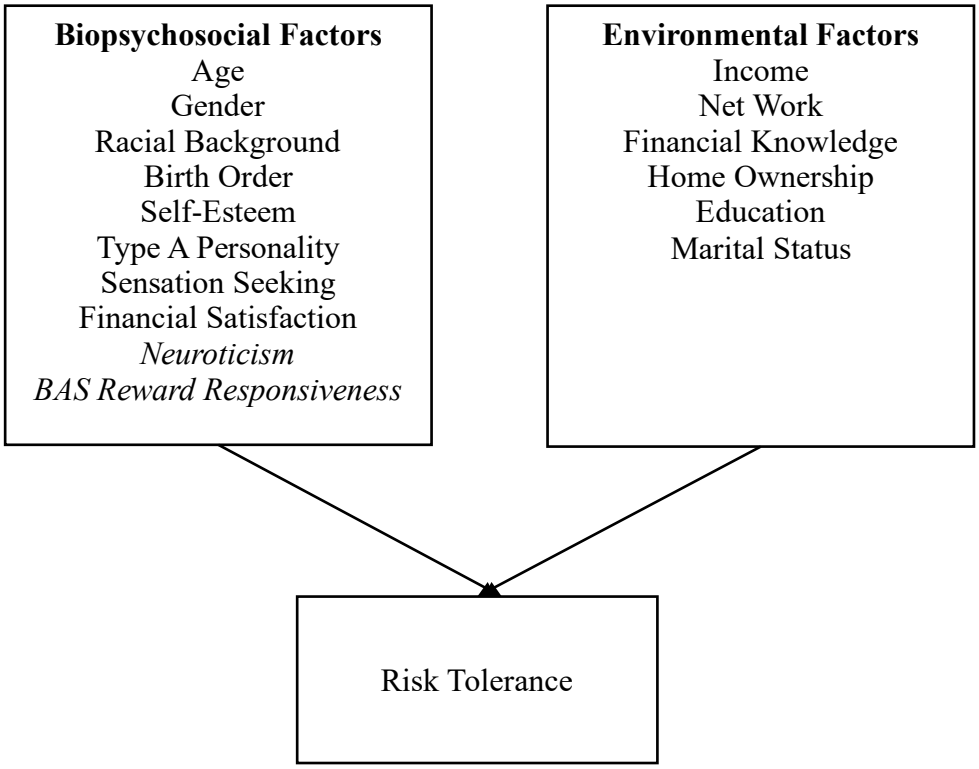


Figure 7.

Proposed Changes To Biopsychosocial and Environmental Theory of Financial risk tolerance.

REFERENCES

"211. Suitability." FINRA Manual, 2015, Retrieved May 2, 2018 from finra.complinet.com/en/display/display_main.html?rbid=2403.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. Psychological Review, 64, 359-372.

Benjamin, J. "DOL Rule May Be History, but a Fiduciary Standard Still in the Works." InvestmentNews - The Investing News Source for Financial Advisers, 16 Mar. 2018, www.investmentnews.com/article/20180316/FREE/180319934/dol-rule-may-be-history-but-a-fiduciary-standard-still-in-the-works.

Bernoulli, D. (1954). Exposition of a new theory on the measurement of risk. Econometrica, 22, 23-36. (Original work published 1738).

Black, C. L., Goldstein, K. E., LaBelle, D. R., Brown, C. W., Harmon-Jones, E., Abramson, L. Y., & Alloy, L. B. (2014). Behavioral approach system sensitivity and risk taking interact to predict left-frontal EEG asymmetry. Behavior therapy, 45(5), 640-650.

Botwinick, J. (1966). Cautiousness in advanced age. The Journals of Gerontology, Series B: *Psychological Sciences and Social Sciences, 21*, 347–355. Retrieved from http://dx.doi.org/10.1093/geronj/21.3.347

Brockhaus, R. H. (1980). Risk-taking propensity of entrepreneurs. *Academy of Management Journal, 23,* 509-520.

Carver, C. S. (2005). Impulse and constraint: Perspectives from personality psychology, convergence with theory in other areas, and potential for integration. *Personality and Social Psychology Review, 9,* 312-333.

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *Journal of personality and social psychology, 67*, 319-333.

Claffey, D. (2017). Report: 2017 Real Estate Investment Survey. *Realty Shares.* Retrieved from https://blog.realtyshares.com/report-attitudes-toward-real-estate-investing-report/

Cohen, S, B. (1972). The Suitability Rule and Economic Theory. Yale Law Journal, 80, 1604-1635.

Corr, P. (2008). *The Reinforcement Sensitivity Theory of Personality.* Cambridge, England: Cambridge University Press.

"Conflict of Interest Final Rule." United States Department of Labor, 2 May. 2018, www.dol.gov/agencies/ebsa/laws-and-regulations/rules-and-regulations/completed-rulemaking/1210-AB32-2.

DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology, 93*(5), 880-896.

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2005). Driving anger, sensation seeking, impulsiveness, and boredom proneness in the prediction of unsafe driving. *Accident Analysis & Prevention*, *37*, 341-348.

Davis, C., Patte, K., Levitan, R., Reid, C., Tweed, S., & Curtis, C. (2007). From motivation to behaviour: A model of reward sensitivity, overeating, and food preferences in the risk profile for obesity. Appetite, 48, 12–19.

Finke, M. S., & Huston, S. J. (2003). The brighter side of financial risk: Financial risk tolerance and wealth. *Journal of Family and Economic Issues, 24*, 233-256.

Franken, I. H. A., Muris, P., & Georgieva, I. (2006). Gray's model of personality and addiction. Addictive Behaviors, 31, 399–403.

Franken, I. H., & Muris, P. (2005). Individual differences in decision-making. *Personality and Individual Differences*, *39*, 991-998.

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

Grable, J. E., & Lytton, R. H. (2001). Assessing the concurrent validity of the SCF risk tolerance question. Journal of Financial Counseling and Planning, 12(2), 43.

Grable, J. E., & Lytton, R. H. (2003). The development of a risk assessment instrument: A follow-up study. *Financial Services Review, 12,* 257-274.

Grable, J. E., & Roszkowski, M. J. (2007). Self-assessments of risk tolerance by women and men. *Psychological Reports, 100*, 795-802.

Gray, J. A. (1975). *Elements of a two-process theory of learning.* London, England: Academic Press.

Gray, J. A., & McNaughton, N. (2000). *The Neuropsychology of Anxiety: An Enquiry into the Functions of the Septo-Hippocampal System* (2nd ed.). Oxford, England: Oxford University Press.

Guillemette, M., Finke, M., & Gilliam, J. (2012). Risk tolerance questions to best determine client portfolio allocation preferences. *Journal of Financial Planning, 25*, 36-44.

Goodman, J. K., Cryder, C. E., & Cheema, A. (2013). Data collection in a flat world: The strengths and weaknesses of Mechanical Turk samples. *Journal of Behavioral Decision Making*, *26*, 213-224.

Andrew F. Hayes (2009). Beyond Baron and Kenny: Statistical Mediation Analysis in the New Millennium. *Communication Monographs, 76,* 408-420. DOI: 10.1080/03637750903310360

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263–291.

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. American psychologist, *39*(4), 341-350.

Kennon, J. (2018, July 2). Making Money From Buying Stocks [blog post]. Retrieved from https://www.thebalance.com/how-to-make-money-from-buying-stocks-357330.

Kitces, M. (2016). The Sorry State Of Risk Tolerance Questionnaires For Financial Advisors. Nerds Eye View. Retrieved on May 5, 2018 from https://www.kitces.com/blog/risk-tolerance-questionnaire-and-risk-profiling-problems-for-financial-advisors-planplus-study/

Kogan, N., & Wallach, M. A. (1964). Risk taking: A study in cognition and personality. New York: Holt, Rinehart, & Winston.

Lauriola, M., & Levin, I. P. (2001). Personality traits and risky decision-making in a controlled experimental task: An exploratory study. *Personality and Individual Differences, 31,* 215-226.

Lazaroff, P. "The Difference Between Fiduciary And Suitability Standards." Forbes, Forbes Magazine, 16 Aug. 2017, www.forbes.com/sites/peterlazaroff/2016/04/06/the-difference-between-fiduciary-and-suitability-standards/.

Lehmann, E. L. (1950). Some principles of the theory of testing hypotheses. *Annals of Mathematical Statistics, 21*, 1-26.

Leon, G. R., Gillum, B., Gillum, R., & Gouze, M. (1979). Personality stability and change over a 30-year period—middle age to old age. *Journal of Consulting and Clinical Psychology, 47,* 517-524.

Leonard, R. (2010). Von Neumann, Morgenstern, and the creation of game theory: From chess to social science, 1900–1960. Cambridge University Press. New York, NY.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127,* 267-286.

Libby, R., & Fishburn, P. C. (1977). Behavioral models of risk taking in business decision: A survey and evaluation. *Journal of Accounting Research, 15,* 272-292.

Lynam, D. R., Smith, G. T., Whiteside, S. P., & Cyders, M. A. (2006). *The UPPS-P: Assessing five personality pathways to impulsive behavior (Technical Report).* West Lafayette: Purdue University

Maples, J. L., Guan, L., Carter, N. T., & Miller, J. D. (2014). A test of the International Personality Item Pool representation of the revised NEO Personality Inventory

and development of a 120-item IPIP-based measure of the Five-Factor Model. Psychological Assessment, 26, 1070-1084.

Mayfield, C., Perdue, G., & Wooten, K. (2008). Investment management and personality type. *Financial Services Review,* 17(3), 219-236.

McCarthy, J. (2016). Just Over Half of Americans Own Stocks, Matching Record Low. *Gallup*. Retrieved from http://news.gallup.com/poll/190883/half-americans-own-stocks-matching-record-low.aspx.

Nicholson N., Fenton-O'Creevy, M., Soane, E., &Willman, P. (2005). Personality and domain-specific risk taking. *Journal of Risk Research, 8,*157-176. https://doi.org/10.1080/1366987032000123856

O'Connor, R. M., Stewart, S. H., & Watt, M. C. (2009). Distinguishing BAS risk for university students' drinking, smoking, and gambling behaviors. Personality and Individual Differences, 46(4), 514-519.

Pålsson, A. M. (1996). Does the degree of relative risk aversion vary with household characteristics?. *Journal of Economic Psychology, 17*, 771-787.

Paolacci, G., & Chandler, J. (2014). Inside the Turk: Understanding Mechanical Turk as a participant pool. *Current Directions in Psychological Science*, *23*, 184-188.

Peterson, M. (2009). An introduction to decision theory. Cambridge: Cambridge University Press; 2009.

Reid, B., Collins, S., Holden, S. and Steenstra, S. (2017) Investment Company Fact Book, 57th ed. *Investment Company Institute,* Washington.

Risk [Def. 1]. (n.d.). Oxford English Dictionary Online. In Oxford English Dictionary. Retrieved March 30, 2018, from https://en.oxforddictionaries.com/definition/risk

Rolison, J.J., Hanoch, Y., Wood, S., & Liu, P.J. (2013). Risk-taking differences across the adult life span: a question of age and domain. Journals of Gerontology, Series B: Psychological Sciences and

Roszkowski, M. J. (1992). How to assess a client's financial risk tolerance: The basics. Bryn Mawr, PA: The American College.

Smillie, L. D., & Jackson, C. J. (2006). Functional impulsivity and reinforcement sensitivity theory. *Journal of Personality, 74*, 47-84.

Social Sciences, 69(6), 870–880, doi:10.1093/geronb/gbt081. Advance Access publication October 22, 2013

Roszkowski, M. J. (1992). How to assess a client's financial risk tolerance: the basics. Personal financial risk tolerance. Bryn Mawr, PA: The American College, 66-75.

Roszkowski, M. J., & Grable, J. E. (2005). Estimating risk tolerance: the degree of accuracy and the paramorphic representations of the estimate. *Journal of Financial Counseling and Planning, 2*, 29-47.

Sitkin, S. B., & Pablo, A. L. (1992). Reconceptualizing the determinants of risk behavior. *Academy of Management Review*, *17*(1), 9-38.

Soane, E., & Chmiel, N. (2005). Are risk preferences consistent?: The influence of decision domain and personality. *Personality and Individual Differences*, *38*(8), 1781-1791.

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

Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, *59*, S251–S278.

Weber, E. U., Blais, A. R., Betz, E. (2002). A Domain specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making, 15,* 263–290.

Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. Personality and individual differences, 30(4), 669-689.

"Why Haven't We All Bought Cryptocurrency Yet?" (2017). *Finder*. Retreived from https://www.finder.com/why-people-arent-buying-cryptocurrency

Zuckerman, M. (1990). The psychophysiology of sensation seeking. *Journal of Personality, 58,* 313–345.

Zuckerman, M. (1994). Behavioral Expressions and Biosocial Bases of Sensation Seeking. Cambridge University Press, New York.

APPENDIX A
MEASURES
PERSONALITY: IRT-Based IPIP-120 Items (Maples et al., 2014)

The number in parentheses following the item indicates the corresponding item number in the 300-item IPIP-NEO. An R after the item number indicates that the item is reverse scored.

Neuroticism (N) Facets

N1: Anxiety
Worry about things. (1)
Fear for the worst. (31)
Am afraid of many things. (61)
Get stressed out easily. (91)

N2: Anger
Get angry easily. (6)
Get irritated easily. (36)
Lose my temper. (126)
Rarely get irritated. (156R)

N3: Depression
Often feel blue. (11)
Dislike myself. (41)
Am often down in the dumps. (71)
Have a low opinion of myself. (101)

N4: Self-Consciousness
Find it difficult to approach others. (76)
Am easily intimidated. (16)
Am not embarrassed easily. (196R)
Am able to stand up for myself. (286R)

N5: Immoderation
Often eat too much. (21)
Go on binges. (111)
Rarely overindulge. (171R)
Am able to control my cravings. (231R)

N6: Vulnerability
Feel that I'm unable to deal with things. (86)
Remain calm under pressure. (176R)
Know how to cope. (236R)
Am calm even in tense situations. (296R)

Extraversion (E) Facets

E1: Friendliness
Make friends easily. (2)
Warm up quickly to others. (32)
Feel comfortable around people. (62)
Act comfortably with others. (92)

E2: Gregariousness
Love large parties. (7)
Talk to a lot of different people at parties. (37)
Don't like crowded events. (217R)
Avoid crowds. (247R)

E3: Assertiveness
Take charge. (12)
Try to lead others. (42)
Take control of things. (132)
Wait for others to lead the way. (162R)

E4: Activity Level
Am always busy. (17)
Am always on the go. (47)
Do a lot in my spare time. (77)
Can manage many things at the same time. (107)

E5: Excitement Seeking
Love excitement. (22)
Seek adventure. (52)
Love action. (82)
Enjoy being reckless. (142)

E6: Cheerfulness
Radiate joy. (27)
Have a lot of fun. (57)
Love life. (147)
Laugh aloud. (207)

Openness (O) Facets

O1: Imagination
Have a vivid imagination. (3)
Enjoy wild flights of fantasy. (33)
Love to daydream. (63)
Like to get lost in thought. (93)

O2: Artistic Interests
See beauty in things that others might not notice. (68)
Do not like art. (158R)
Do not like poetry. (188R)
Do not enjoy going to art museums. (218R)

O3: Emotionality
Experience my emotions intensely. (13)
Seldom get emotional. (163R)
Am not easily affected by my emotions. (193R)
Experience very few emotional highs and lows. (253R)

O4: Adventurousness
Prefer to stick with things that I know. (138R)
Dislike changes. (168R)
Don't like the idea of change. (198R)
Am attached to conventional ways. (288R)

(Appendix continues)

O5: Intellect
Am not interested in abstract ideas. (173R)
Avoid philosophical discussions. (203R)
Have difficulty understanding abstract ideas. (233R)
Am not interested in theoretical discussions. (263R)

O6: Liberalism
Tend to vote for liberal political candidates. (28)
Believe in one true religion. (118R)
Tend to vote for conservative political candidates. (148R)
Like to stand during the national anthem. (298R)

Agreeableness (A) Facets

A1: Trust
Trust others. (4)
Believe that others have good intentions. (34)
Trust what people say. (64)
Distrust people. (184R)

A2: Morality
Use flattery to get ahead. (69R)
Know how to get around the rules. (129R)
Cheat to get ahead. (159R)
Take advantage of others. (249R)

A3: Altruism
Make people feel welcome. (14)
Love to help others. (74)
Am concerned about others. (104)
Turn my back on others. (254R)

A4: Cooperation
Love a good fight. (169R)
Yell at people. (199R)
Insult people. (229R)
Get back at others. (259R)

A5: Modesty
Believe that I am better than others. (144R)
Think highly of myself. (174R)
Have a high opinion of myself. (204R)
Make myself the center of attention. (294R)

A6: Sympathy
Sympathize with the homeless. (29)
Feel sympathy for those who are worse off than myself. (59)
Suffer from others' sorrows. (119)
Am not interested in other people's problems. (149R)

Conscientiousness (C) Facets

C1: Self-Efficacy

Complete tasks successfully. (5)
Excel in what I do. (35)
Handle tasks smoothly. (65)
Know how to get things done. (155)

C2: Orderliness
Like order. (10)
Like to tidy up. (40)
Leave a mess in my room. (190R)
Leave my belongings around. (220R)

C3: Dutifulness
Keep my promises. (45)
Tell the truth. (105)
Break my promises. (195R)
Get others to do my duties. (225R)

C4: Achievement Striving
Work hard. (50)
Do more than what's expected of me. (140)
Set high standards for myself and others. (170)
Am not highly motivated to succeed. (230R)

C5: Self-Discipline
Start tasks right away. (85)
Find it difficult to get down to work. (175R)
Need a push to get started. (235R)
Have difficulty starting tasks. (265R)

C6: Cautiousness
Jump into things without thinking. (120R)
Make rash decisions. (150R)
Rush into things. (210R)
Act without thinking. (270R)

MOTIVATION: BIS/BAS (Carver & White, 1994)

Each item of this questionnaire is a statement that a person may either agree with or disagree with. For each item, indicate how much you agree or disagree with what the item says. Please respond to all the items; do not leave any blank. Choose only one response to each statement. Please be as accurate and honest as you can be. Respond to each item as if it were the only item. That is, don't worry about being "consistent" in your responses. Choose from the following four response options:

1 = very true for me
2 = somewhat true for me
3 = somewhat false for me
4 = very false for me

1. A person's family is the most important thing in life.
2. Even if something bad is about to happen to me, I rarely experience fear or nervousness.
3. I go out of my way to get things I want.
4. When I'm doing well at something I love to keep at it.
5. I'm always willing to try something new if I think it will be fun.
6. How I dress is important to me.
7. When I get something I want, I feel excited and energized.
8. Criticism or scolding hurts me quite a bit.
9. When I want something I usually go all-out to get it.
10. I will often do things for no other reason than that they might be fun.
11. It's hard for me to find the time to do things such as get a haircut.
12. If I see a chance to get something I want I move on it right away.
13. I feel pretty worried or upset when I think or know somebody is angry at me.
14. When I see an opportunity for something I like I get excited right away.
15. I often act on the spur of the moment.
16. If I think something unpleasant is going to happen I usually get pretty "worked up."
17. I often wonder why people act the way they do.

18. When good things happen to me, it affects me strongly.
19. I feel worried when I think I have done poorly at something important.
20. I crave excitement and new sensations.
21. When I go after something I use a "no holds barred" approach.
22. I have very few fears compared to my friends.
23. It would excite me to win a contest.
24. I worry about making mistakes.

Items other than 2 and 22 are reverse-scored.

BAS Drive: 3, 9, 12, 21
BAS Fun Seeking: 5, 10, 15, 20
BAS Reward Responsiveness: 4, 7, 14, 18, 23

BIS: 2, 8, 13, 16, 19, 22, 24

Items 1, 6, 11, 17, are fillers.

The fact that there are three BAS-related scales and only one BIS-related scales was not planned or theoretically motivated. The factors emerged empirically, from an item set that was intended to capture diverse manifestations of the BAS, according to various theoretical statements. It is likely that a broader sampling of items on the BIS side would also have resulted in more than one scale. I do not encourage combining the BAS scales, however, because they do turn out to focus on different aspects of incentive sensitivity. In particular, Fun Seeking is known to have elements of impulsiveness that are not contained in the other scales.

IMPULSIVITY: UPPS-P (Lynam, Smith, Whiteside, & Cyders, 2006)

Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. If you **Agree Strongly** circle **1**, if you **Agree Somewhat** circle **2**, if you **Disagree somewhat** circle **3**, and if you **Disagree Strongly** circle **4**. Be sure to indicate your agreement or disagreement for every statement below. Also, there are questions on the following pages.

1. I have a reserved and cautious attitude toward life.
2. I have trouble controlling my impulses.
3. I generally seek new and exciting experiences and sensations.
4. I generally like to see things through to the end.
5. When I am very happy, I can't seem to stop myself from doing things that can have bad consequences.
6. My thinking is usually careful and purposeful.
7. I have trouble resisting my cravings (for food, cigarettes, etc.).
8. I'll try anything once.
9. I tend to give up easily.
10. When I am in great mood, I tend to get into situations that could cause me problems.
11. I am not one of those people who blurt out things without thinking.
12. I often get involved in things I later wish I could get out of.
13. I like sports and games in which you have to choose your next move very quickly.
14. Unfinished tasks really bother me.
15. When I am very happy, I tend to do things that may cause problems in my life.
16. I like to stop and think things over before I do them.
17. When I feel bad, I will often do things I later regret in order to make myself feel better now.
18. I would enjoy water skiing.
19. Once I get going on something I hate to stop.
20. I tend to lose control when I am in a great mood.
21. I don't like to start a project until I know exactly how to proceed.

22. Sometimes when I feel bad, I can’t seem to stop what I am doing even though it is making me feel worse.
23. I quite enjoy taking risks.
24. I concentrate easily.
25. When I am really ecstatic, I tend to get out of control.
26. I would enjoy parachute jumping.
27. I finish what I start.
28. I tend to value and follow a rational, "sensible" approach to things.
29. When I am upset I often act without thinking.
30. Others would say I make bad choices when I am extremely happy about something.
31. I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.
32. I am able to pace myself so as to get things done on time.
33. I usually make up my mind through careful reasoning.
34. When I feel rejected, I will often say things that I later regret.
35. Others are shocked or worried about the things I do when I am feeling very excited.
36. I would like to learn to fly an airplane.
37. I am a person who always gets the job done.
38. I am a cautious person.
39. It is hard for me to resist acting on my feelings.
40. When I get really happy about something, I tend to do things that can have bad consequences.
41. I sometimes like doing things that are a bit frightening.
42. I almost always finish projects that I start.
43. Before I get into a new situation I like to find out what to expect from it.
44. I often make matters worse because I act without thinking when I am upset.
45. When overjoyed, I feel like I can’t stop myself from going overboard.
46. I would enjoy the sensation of skiing very fast down a high mountain slope.
47. Sometimes there are so many little things to be done that I just ignore them all.
48. I usually think carefully before doing anything.
49. When I am really excited, I tend not to think of the consequences of my actions.
50. In the heat of an argument, I will often say things that I later regret.

51. I would like to go scuba diving.
52. I tend to act without thinking when I am really excited.
53. I always keep my feelings under control.
54. When I am really happy, I often find myself in situations that I normally wouldn't be comfortable with.
55. Before making up my mind, I consider all the advantages and disadvantages.
56. I would enjoy fast driving.
57. When I am very happy, I feel like it is ok to give in to cravings or overindulge.
58. Sometimes I do impulsive things that I later regret.
59. I am surprised at the things I do while in a great mood.

Scoring Instructions

This is a revised version of the UPPS Impulsive Behavior scale (Whiteside & Lynam, 2001). This version, UPPS-P (Lynam, Smith, Whiteside, & Cyders, 2006), assesses Positive Urgency (Cyders, Smith, Spillane, Fischer, Annus, & Peterson, 2007) in addition to the four pathways assessed in the original version of the scale-- Urgency (now Negative Urgency), (lack of) Premeditation, (lack of) Perseverance, and Sensation Seeking. The scale uses a 1 (agree strongly) to 4 (disagree strongly) response format. Because the items from different scales run in different directions, it is important to make sure that the correct items are reverse-scored. We suggest making all of the scales run in the direction such that higher scores indicate more impulsive behavior. Therefore, we include the scoring key for, (Negative) Urgency, (lack of) Premeditation, (lack of) Perseverance, Sensation Seeking, and Positive Urgency. For each scale, calculate the mean of the available items; this puts the scales on the same metric. We recommend requiring that a participant have at least 70% of the items before a score is calculated.

(Negative) Urgency (all items except 1 are reversed)
items 2 (R), 7(R), 12 (R), 17 (R), 22 (R), 29 (R), 34 (R), 39 (R), 44 (R), 50 (R), 53, 58 (R)
(lack of) Premeditation (no items are reversed)
items 1, 6, 11, 16, 21, 28, 33, 38, 43, 48, 55.
(lack of) Perseverance (two items are reversed)

items 4, 9 (R), 14, 19, 24, 27, 32, 37, 42, 47 (R)

Sensation Seeking (all items are reversed)

items 3 (R), 8 (R), 13 (R), 18 (R), 23 (R), 26 (R), 31 (R), 36 (R), 41 (R), 46 (R), 51 (R), 56 (R)

Positive Urgency (all items are reversed)

items 5 (R), 10 (R), 15 (R), 20 (R), 25 (R), 30 (R), 35 (R), 40 (R), 45 (R), 49 (R), 52 (R), 54 (R), 57 (R), 59 (R)

(R) indicates the item needs to be reverse scored such 1=4, 2=3, 3=2, and 4=1.

FINANCIAL RISK TOLERANCE: The Grable Lytton (Grable & Lytton, 1999)

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

   a. Loss
   b. Uncertainty
   c. Opportunity
   d. Thrill

7. Some experts are predicting prices of assets such as gold, jewels, collectibles, and real estate (hard assets) to increase in value; bond prices may fall, however, experts tend to agree that government bonds are relatively safe. Most of your investment assets are now in high interest government bonds. What would you do?
   a. Hold the bonds
   b. Sell the bonds, put half the proceeds into money market accounts, and the other half into hard assets
   c. Sell the bonds and put the total proceeds into hard assets
   d. Sell the bonds, put all the money into hard assets, and borrow additional money to buy more
8. Given the best and worst case returns of the four investment choices below, which would you prefer?
   a. $200 gain best case; $0 gain/loss worst case
   b. $800 gain best case; $200 loss worst case
   c. $2,600 gain best case; $800 loss worst case
   d. $4,800 gain best case; $2,400 loss worst case
9. In addition to whatever you own, you have been given $1,000. You are now asked to choose between:
   a. A sure gain of $500
   b. A 50% chance to gain $1,000 and a 50% chance to gain nothing
10. In addition to whatever you own, you have been given $2,000. You are now asked to choose between:
   a. A sure loss of $500
   b. A 50% chance to lose $1,000 and a 50% chance to lose nothing
11. Suppose a relative left you an inheritance of $100,000, stipulating in the will that you invest ALL the money in ONE of the following choices. Which one would you select?

a. A savings account or money market mutual fund
b. A mutual fund that owns stocks and bonds
c. A portfolio of 15 common stocks
d. Commodities like gold, silver, and oil

12. If you had to invest $20,000, which of the following investment choices would you find most appealing?
    a. 60% in low-risk investments, 30% in medium-risk investments, 10% in high-risk investments
    b. 30% in low-risk investments, 40% in medium-risk investments, 30% in high-risk investments
    c. 10% in low-risk investments, 40% in medium-risk investments, 50% in high-risk investments
13. Your trusted friend and neighbor, an experienced geologist, is putting together a group of investors to fund an exploratory gold mining venture. The venture could pay back 50 to 100 times the investment if successful. If the mine is a bust, the entire investment is worthless. Your friend estimates the chance of success is only 20%. If you had the money, how much would you invest?
    a. Nothing
    b. One month's salary
    c. Three month's salary
    d. Six month's salary

Scoring

1. a = 4; b = 3; c = 2; d = 1
2. a = 1; b = 2; c = 3; d = 4
3. a = 1; b = 2; c = 3; d = 4
4. a = 1; b = 2; c = 3
5. a = 1; b = 2; c = 3
6. a = l ; b = 2 ;c = 3 ;d = 4
7. a = 1; b = 2; c = 3; d = 4
8. a = 1; b = 2; c = 3; d = 4
9. a = 1; b = 3[a]

10. a = 1; b = 3

11. a = 1; b = 2; c = 3; d = 4

12. a = 1; b = 2; c = 3

13. a = 1; b = 2; c = 3; d = 4

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

FINANCIAL RISK TOLERANCE: The Survey of Consumer Finance (SCF)

1. Which of the following statements comes closest to the amount of financial risk that you are willing to take when you save or make investments?
    a. Take substantial financial risk expecting to earn substantial returns. =4
    b. Take above average financial risks expecting to earn above average returns. =3
    c. Take average financial risks expecting to earn average returns. =2
    d. Not willing to take any financial risks. =1

OUTCOME MEASURE: Objective Risk Level of Portfolio*

1. Suppose that you were to take a snap shot of your current financial position. Approximately what percent of your total savings and investments are in the categories below?
    a. CASH
    b. Fixed-Income
    c. Equities
    d. Business Ownership
    e. Real Estate
    f. Other
2. What is your occupation?
3. Do you gamble?
    a. Yes – frequently
    b. Yes – sometimes
    c. Yes – rarely
    d. No never
4. In the last economic downturn, how did you react with regards to your investment decisions?
    a. Left portfolio unchanged
    b. Decreased portfolio risk level
    c. Increased portfolio risk level

*Note, outcome measure will be adapted based on expert input from committee and Dr. Fallaw.

SCREENING QUESTIONS: From Dr. Sarah Fallaw

1. How old are you in years
    a. 18 or younger
    b. 19-24
    c. 25-35
    d. 36-45
    e. 46-55
    f. 56 or older
2. What is your total household income in US Dollars.
    a. 0-24K
    b. 25-40K
    c. 41-70K
    d. 71-100K
    e. 101-150K
    f. 151-200K
    g. 201K or more
3. Are you responsible or jointly responsible (on your own or in-part with your spouse/partner) for your investment decisions?
4. Do you have a financial advisor that influences your financial decisions?

OTHER ITEMS: Based on the Literature and Expert Opinion

1. How comfortable are you with your portfolio risk level?
2. Over the next five years, do you expect the U.S. economy, as a whole, to perform better, worse, or about the same as it has over the past five years?
    a. Perform Better =1
    b. Perform Worse=2
    c. Perform About the Same=3
3. How satisfied are you with your present overall financial situation?
    a. Very Unsatisfied (1) – Very Satisfied (10)
4. How much experience do you have making financial decisions?
    a. Very Little (1) - A Lot (10)
5. Rate your investing knowledge.
    a. Lowest Level (1) - Highest Level (10)
6. When you make savings and investment decisions do you tend to
    a. a. Make your own decisions based on your own research. =1
    b. b. Make decisions after seeking advice from others. =2

DEMOGRAPHICS

1. What is your MTurk ID?
2. Are You?
    a. Male
    b. Female
3. What is your current age in years?
4. What is your marital status?
    a. Never Married
    b. Not Married but Living With Significant Other
    c. Married
    d. Separated
    e. Divorced
    f. Widowed
    g. Other
        i. Marital Status Other Specification
5. How many children are you (and your spouse/partner) financially responsible for?
6. How many people live in your household?
7. How many brothers and/or sisters do you have?
8. If you have siblings, are you:
    a. Oldest
    b. Youngest
    c. Other
        i. Birth Order Other Specification
9. What is your employment status?
    a. Employed part-time
    b. Employed full-time
    c. Retired
    d. Not employed
    e. Other
        i. Employment Other Specification
10. Are you self-employed?

a. Yes
b. No

11. Have you retired from a previous career?
    a. Yes
    b. No
12. What is your ethnic or racial background?
    a. Caucasian/White
    b. African American/Black
    c. Hispanic/Latino
    d. Native American
    e. Asian or Pacific Islander
    f. Other (Please Specify)
        i. Race Other Specification
13. What is your current housing situation?
    a. Own without a mortgage
    b. Own with a mortgage
    c. Rent
    d. Live with relative or parents
    e. Other
        i. Housing Situation Other Specification
14. What is YOUR approximate annual gross income before taxes?
    a. None
    b. Less than $20,001
    c. $20,001 - $30,000
    d. $30,001 - $40,000
    e. $40,001 - $50,000
    f. $50,001 - $60,000
    g. $60,001 - $70,000
    h. $70,001 - $80,000
    i. $80,001 - $90,000
    j. $90,001 - $100,000
    k. Above $100,000"

15. What is your HOUSEHOLD's approximate annual gross income before taxes?
    a. None
    b. Less than $20,001
    c. $20,001 - $30,000
    d. $30,001 - $40,000
    e. $40,001 - $50,000
    f. $50,001 - $60,000
    g. $60,001 - $70,000
    h. $70,001 - $80,000
    i. $80,001 - $90,000
    j. $90,001 - $100,000
    k. Above $100,000
16. What is the highest level of education you have completed?
    a. Some high school or less
    b. High school graduate
    c. Some college/trade/vocation training
    d. Associates degree
    e. Bachelors degree
    f. Graduate or professional degree