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Risk Aversion and Personality Type

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The finance literature supports an increasing role for behavioral aspects of investment decision-making. Among other factors such as demographics, personality type may influence risk tolerance as well. This paper explores the relationship between personality type dimensions of the Myers-Briggs Type Indicator (MBTI) and the moments approach to individual investor risk tolerance inherent in expected utility theory (EUT). Our study uses survey results to relate ex ante EUT tolerance for variance and skew to MBTI measures. Results indicate that personality type does explain individual ex ante EUT risk tolerance. Our results further suggest that the relationship between personality type and individual ex ante EUT risk tolerance is non-linear in form.

Over time, investment choices have naturally become much more complex. Recent events in the investment arena have only complicated things further. For example, from 1990 through 2003, the number of mutual funds increased from 3,081 to 8,126, while the total assets in mutual funds increased from $1.065 trillion to $7.41 trillion (www.idexfunds.com/site3/investor_ed/basics/mfund101.jhtml: Investment Company Institute). In addition, as Deloitte Consulting's 2003 Annual 401(k) Benchmarking Survey [2004] notes, 401(k) plans now offer an average of thirteen investment options, compared to less than ten in 2000.

Empirical evidence indicates that factors such as age, education, income, wealth, and marital status play an important role in distinguishing 1) risk tolerance among individuals (Riley and Chow [1992]; Schooley and Worden [1999]), 2) investor preferences for cash dividends (Fama and French [1992]; Shefrin and Statman [1995]; Statman [1999]), 3) investor aversion to realized losses, and 4) investor confusion between good companies and good stocks (Fama and French [1992]; Shefrin and Statman [1995]).

Malkiel [1996] argues that, for individuals, assessing capacity for and attitude toward risk is the key to successfully implementing an investment policy. In this paper, we explore the relationship between dimensions of the Myers-Briggs Type Indicator (MBTI), which we explain in more detail later, and individual investor ex ante expected utility theory (EUT) second and third moments as evidences/measures of risk tolerance. Here, risk tolerance is measured as the variance and skew that individuals indicate they are willing to accept to achieve a given return. Controlling for individual circumstances, we relate these EUT measures to MBTI dimensions obtained from surveys of individuals. We find significant non-linear relationships between our EUT risk tolerance measures and MBTI types.

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Literature Review

Risk Aversion: Expected Utility and Prospect Theory

There is a long and rich literature dealing with risk tolerance that presents two major perspectives: 1) the analysis and understanding of individual choice, such as research by Friedman and Savage [1948], Von Neumann and Morgenstern [1947], Arrow [1964, 1971], and Debreu [1959], which we collectively refer to as expected utility theory (EUT) I, and 2) the more recent and behaviorally oriented prospect theory (PT), promulgated primarily by Kahneman and Tversky [1979, 1984, 1992] and Thaler [1991, 1992].

Risk tolerance in EUT has been established as the reigning basis for financial decision-making, with primary contributions from the work of Baron [1977], Bernoulli [1954], Fishburn [1986], Friedman and Savage [1948], Friend and Blume [1974], Hirshleifer [1965], Kroll, Levy, and Markowitz [1984], Pratt [1964], and Tobin [1958]. While others have certainly contributed to its development, there have been conceptual and empirical difficulties with the ability of EUT to explain certain decisions such as lottery purchases, as well as decisions in the presence of unfair gambles and the effects of external (to the individual) factors.

Individuals are widely known to be averse to uncertainty as measured by variance. They have also been shown to prefer positive skew, or, conversely, to be averse to negative skew (Scott and Horvath [1980]). Thus, individuals may be very averse to a large variance, but materially less so in the presence of positive skew in their distribution of outcomes.

Kahneman and Tversky [1979, 1984, 1992] provide the conceptual basis for introducing prospect theory into the finance literature. Schneider [1992] establishes the impact of framing and conflict on the decision process. Budescu and Weiss [1987], Currim and Sarin [1989, 1992], Elliott and Archibald [1989], Fiegenbaum and Thomas [1988], Harless [1982], and Thaler [1991, 1992] are among the researchers who have explored aspects of PT (e.g., framing and regret) and have contrasted PT with EUT. Together, this literature establishes the bedrock of behavioral finance and contributes greatly to our understanding of decision-making.

Behavioral Finance: Demographics and Investor Characteristics

A number of studies have investigated how to discern individual risk tolerance based on the proportion of wealth allocated to risky assets (Cohn et al. [1975], Friend and Blume [1975], Lease, Lewellen, and Schlarbaum [1974], Siegal and Hoban [1982]). Riley and Chow [1992] find a positive relationship between risk tolerance and individual demographics such as education, income, and wealth levels. They also find that risk aversion decreases with age until the period five years prior to retirement, where risk aversion reverses direction and increases with age.

Schooley and Worden [1999] find that investors with post-secondary educations and those who are married hold higher percentages of equity securities in their portfolios. They also find that the percentage of equity in a portfolio increases with age until retirement, and then decreases with age.

Other studies have examined personal characteristics that may lend some insight into the level of risk that an individual can tolerate. Barnewall [1987] supports the notion that investors can be classified as either passive or active. Passive investors have become wealthy by inheritance, by risking the capital of others rather than their own, or by having mid- or lower-income levels. These individuals have a greater need for security and a lower risk tolerance. Barnewall [1987] also finds that certain occupational groups are more risk averse (e.g., corporate executives, lawyers, and medical and dental non-surgeons). Barnewall's active investors, those who have risked their own capital and earned their own wealth, have a much higher risk tolerance than passive investors. Active investors also like to maintain control of their investments, and their risk tolerance drops considerably if they do not have control.

Bailard, Biehl, and Kaiser (BBK) [1986] classify investors into five categories: adventurers, celebrities, individualists, guardians, and straight arrows. These classifications are based on two personality characteristics: careful versus impetuous, and anxious versus confident. Each category is shown to imply a different risk tolerance.

Expected utility and prospect theory approach the decision-making process from differing perspectives. This paper begins to reconcile the two by exploring the non-linearities implicit in the results of Riley and Chow [1992] and BBK [1986]. We suspect that the attributes addressed in PT behavioral finance are reflective of the individual's personality structure. We suggest that EUT and the rational decision-maker approach are the vehicles through which behavioral and environmental factors impact risk tolerance as measured by ex ante EUT variance and skew. That is, an individual's personality directly, albeit incompletely, affects his risk tolerance.

Introduction to the Myers-Briggs Type Indicator (MBTI)

The Myers-Briggs Type Indicator (MBTI) is widely recognized as an individual personality preference instrument. Its applications to business, education, and counseling have been documented extensively (Myers [1979, 1980], McCaulley [1976], Keirsey and Bates [1978], Lawrence [1984, 1994]). The MBTI is based on theoretical work by Carl Jung, who observed that psychological preferences play a role in one's judgment and relationship to the world.

The MBTI questionnaire measures the strength of individuals' preferences on four dimensions indicating 1) where individuals prefer to focus their attention (extraversion versus introversion), 2) how they acquire information about their surroundings (sensing versus intuition), 3) how they make decisions (thinking versus feeling), and 4) how they orient to the environment (judging versus perception). The four scales of the MBTI appear in Table 1.

The breakdown by dimension in the general U.S. population is approximately:

- Extroverted (E) 75%
- Introverted (I) 25%

- Sensing (S) 75%
- Intuitive (N) 25%

- Thinking (T) 50%
- Feeling (F) 50%

Table 1. *Dimensions Measured by the Myers-Briggs Type Indicator*

Preferences for focusing attention	**Extroversion (E)** – Individuals focus attention on the outer world of people and things. They draw energy from interacting and being engaged,and so learn most effectively when they are engaged in activity.	**Introversion (I)** – Individuals focus attention on their inner world. They draw energy from internal reflection, and so learn best through reflecting and understanding the context of a problem before being engaged.
Preferences for acquiring information	**Sensing (S)** – Individuals focus on the concrete aspects of a situation and value what can be seen, touched, felt,smelled, or heard. They tend to be practical minded, concerned with details and facts, and have greater acceptance of what is given.	**Intuition (N)** – Individuals focus on the abstract, and value relationships not immediately recognizable to the physical senses. They strive to understand the "big picture" and are interested in change and future possibilities.
Preferences for making decisions	**Thinking (T)** – Individuals focus on objective decision-making based on a desire for fairness. They seek logic in their analysis of situations, desire to achieve objectivity, and prefer to work to discover what may be wrong in situations that arise.	**Feeling (F)** – Individuals focus on subjective decision-making based on a desire for harmony. They consider impacts on people in their analysis of a situation, prefer to affirm what is right with situations, and are more likely to offer appreciation and sympathy.
Preferences for orientation to the outer world	**Judging (J)** – Individuals focus on leading a life that is organized and orderly, seek closure, prefer control over their lives, and plan accordingly.	**Perceiving (P)** – Individuals focus on leading a life that is flexible and spontaneous, seek to keep decisions open, and prefer to adapt to situations rather than control them.

Note: Source: Filbeck and Smith [1996].

- Judging (J) 55%
- Perceiving (P) 45%

There is no differentiation based on gender, with the exception of the thinking/feeling dimension, in which approximately two-thirds of males prefer thinking and two-thirds of females prefer feeling (Myers and McCaulley [1989]).

From these four dimensions, sixteen discrete combinations of MBTI preferences emerge. For example, an individual whose preferences indicate a combination of ENFP would tend to draw energy from external forces (E), process information based on possibilities and hunches (N), make decisions based on values and feelings (F), and prefer a flexible, adaptive environment (P). While sharing basic personality characteristics, two individuals with the same type may vary widely in their application because of life experiences, maturation, and environment.

MBTI Literature and Hypotheses

Both Barnewall [1987] and BBK [1986] offer models of classifying differences in risk aversion based on the idea that individuals are either passive or active, careful or impetuous, and anxious or confident, respectively. Previous empirical evidence indicates that investors tend to be more risk averse if they have less education, less wealth, or are nearing or have passed retirement (Riley and Chow [1992], Schooley and Worden [1999]). To explore risk aversion in terms of MBTI personality type, we develop a survey that will provide a basis for measuring individual EUT second and third moments measures of risk tolerance. We administer the survey to a cross-section of the population and test for fit with the participants' MBTI preference scores to determine if differences in EUT risk tolerance are related to MBTI personality type.

While there is a plethora of research demonstrating the use of the MBTI in educational, business, and counselling settings, literally no work has directly investigated EUT risk tolerance and personality type. However, several validity studies have investigated correlations between components of psychologically based inventories and dimensions of the MBTI.

For example, one of the dimensions measured by the Strong Interest Inventory is risk-taking/adventure. In two different samples, statistically significant relationships emerge for this attribute and the MBTI preferences for intuition (N) and perceiving (P). In one of the two studies, statistically significant relationships also exist for risk-taking/adventure and extraversion (E) and thinking (T) (Hammer and Kummerow [1996]).

In contrast, the Salience Inventory and the Value Scale both use economic security as a component measure. Using a sample from Fairview Health Services

Career Resource Center, a statistically significant relationship exists between economic security and the MBTI preferences for introversion (I), sensing (S), feeling (F), and judging (J) (Myers and McCaulley [1989, p. 182]). While risk-taking/adventure and economic security are not necessarily in opposition, note that statistically significant correlations for the former are related to MBTI preferences for ENTP, and for the latter to ISFJ. These two personality types do represent opposite ends of the continuum.

Based on these previous studies, we hypothesize that higher levels of EUT risk tolerance are related to MBTI preferences for extraversion (E), intuition (N), thinking (T), and perceiving (P). So if risk-taking/adventure is preferred by individuals with the ENTP type, we might expect it would not be preferred by individuals of opposite types, since they are complementary.

Shelton [1996] investigates relationships among MBTI preferences and health, stress, and coping. He finds that individuals preferring introversion (I) are more likely to have health-related stress issues. In addition, he found that ISTJs and ISFJs are two to three times more likely to suffer from stress-related issues than we would expect based on their proportion in the overall population.

Another study using the sixteen personality factors questionnaire finds a positive correlation between anxiety and the MBTI preference for introversion (I), and a negative correlation between anxiety and extraversion (E). In sum, there appears to be consistency across these unrelated studies that certain personality preferences are more likely to enjoy taking risks, while others are more drawn to security. Those more drawn to security are also more likely to feel high levels of anxiety and stress.

The behavioral finance framework takes into consideration how decision-makers act and feel about situations. It argues that people are "normal" instead of "rational." In the MBTI approach, described behavior relates closely to how individuals with the feeling preference make decisions. They tend to focus on subjective decision-making and are heavily influenced by their value systems. Conversely, those with the thinking preference prefer to make decisions based on objective criteria, and seek logic in their analysis of situations.

Sample, Methods and Results

We constructed our sample by surveying sixty-eight college students and adults from a variety of demographic factors with various levels of investment experience. The participants were given the MBTI and our EUT risk tolerance survey, which appears in the Appendix. The purpose of this study is to consider the relationships between MBTI preferences and ex ante individual EUT risk tolerance (tolerance for variance and skew), as obtained from the EUT survey. We determined MBTI preferences by using Form M of the MBTI, which consists of ninety-three questions.

In order to focus on the relationship between personality type and EUT risk tolerance, we controlled for a number of demographic and personal variables that may impact risk tolerance: net worth (NW), income (IN), level of investor self-perceived sophistication (S), marital status (M), number of dependents (Dep), age (Age), gender (G), years with a company (Yrs), and level of education (Ed). A factor analysis of these control variables is used to eliminate joint effects of independent variables and to reduce these data to a number of orthogonal variables. The factor analysis, under varimax rotation (which normalizes the data in an effort to reduce the number of factors), results in three factors:[1]

$$\begin{aligned}\text{Control Factor 1} &= 0.742(\text{NW}) + 0.752(\text{IN}) + \\ &\quad 0.612(\text{M}) + 0.830(\text{Dep}) + \\ &\quad 0.868(\text{Age}) + 0.782(\text{Yrs})\end{aligned}$$

$$\text{Control Factor 2} = -0.606(\text{S}) + 0.862(\text{Ed})$$

$$\text{Control Factor 3} = 0.867(\text{G})$$

We describe control factor 1 as the "wealth factor," control factor 2 as the "sophistication factor," and control factor 3 as the "gender factor."

As previously noted, risk tolerance is measured in two ways. First, the level of uncertainty an investor is willing to tolerate is reflected in the amount of ex ante variance each individual is willing to tolerate. Second, the relative skew is calculated. Skew refers to the extreme upside or downside potential (tails in the distribution) an investor is willing to accept. It measures an individual's tolerance to outcomes that are more or less likely than under a normality/symmetry assumption and that are not captured by the variance. Remember that individuals prefer positive skew and are averse to negative skew. Skew may be used to modify variance tolerance or may be valued on its own. Control factors are curve-fitted against measures of risk tolerance, variance, and skew, which are obtained from survey results and compared against the probability values provided directly from these results.

We find no significant linear or non-linear effects of the control factors on the distribution values. However, our curve-fitting results indicate a strong curvilinear relationship between these control factors and variance. Variance and wealth, W, are related as:

$$\textit{Variance} = 36114.9W^{1.2555}$$

with a p-value of 0.0000, which is significant at the 0.001 level. Variance and sophistication, S, are related as:

$$Variance = 4.5 \cdot 10^{9} S^{1.5681}$$

with a p-value of 0.0070, which is significant at the 0.01 level. Gender, G, explains variance:

$$Variance = \exp(27.174 - 3.8417 / G)$$

with a p-value = 0.0470, which is significant at the 0.05 level, but no relationship is obtained for these factors and skew. This implies that wealth, sophistication, and gender affect tolerance of variance, but they have no impact on tolerance of skew.

To control for these factors, we performed a non-linear regression of the variance on the factors of the form:

$$Var_i = \beta_1 W_i^{\beta_2} + \beta_3 S_i^{\beta_4} + \exp(\beta_5 + \frac{\beta_6}{G_i}), \qquad (1)$$

where β_1 and β_2 are the coefficients of the results of the bivariate curve estimation of the variance on the wealth factor from Table 1, β_3 and β_4 are the resulting coefficients from the bivariate curve estimation on the sophistication factor, and β_5 and β_6 are the corresponding results of the regression of the variance on the gender factor. The residuals are retained and used to calculate the variance of the residuals, net of control effects, for subsequent analyses. The result is a set of variance measures independent of wealth, sophistication, and/or gender.

Next, we conducted factor analysis of the MBTI scaled normalized scores to eliminate any confounding effects of potential interrelationships between MBTI scores. The resulting factors are:

MBTI Scores Factor 1:

$$T'(-0.987) + F'(0.988) = MBS_1$$

MBTI Scores Factor 2:

$$E'(-0.993) + I'(0.992) = MBS_2$$

MBTI Scores Factor 3:

$$J'(0.969) + P'(-0.966) = MBS_3$$

MBTI Scores Factor 4:

$$S'(-0.962) + N'(0.963) = MBS_4$$

Thus, with factor 1, for example, a higher absolute value of the factor score implies a stronger preference toward the feeling side of the thinking (T)-feeling (F) scale. Likewise, a higher absolute value score for factor 2 implies a preference toward introversion on the introversion (I)-extraversion (E) scale. A higher absolute value score for factors 3 and 4 would imply an inclination to the J side of the judging (J)-perceiving (P) scale, and the N side of the intuition (N)-sensing (S) scale, respectively.

We examine whether significant relationships exist between MBTI factor scores and the risk tolerance measures variance and skew, so that:

$$Var_t = \beta_1 MBS_{1,t} + \beta_2 MBS_{2,t} + \beta_3 MBS_{3,t} + \beta_4 MBS_{4,t} + \varepsilon_{var,t} \qquad (2)$$

$$Skew'_t = \beta_1 MBS_{1,t} + \beta_2 MBS_{2,t} + \beta_3 MBS_{3,t} + \beta_4 MBS_{4,t} + \varepsilon_{skew,t} \qquad (3)$$

where Var_t is the control-adjusted (i.e., residual) value of the variance of the t-th respondent.

Using linear multiple regressions, we find no significant relationships between the MBTI scores and the EUT risk tolerance measures variance and skew. That is, (2) and (3) provided no significant equations or regression coefficients. However, bivariate curve (non-linear) estimation yields very different results. We apply bivariate curve estimation procedures to the risk tolerance measures variance and skew for goodness of fit with linear, logarithmic, inverse, quadratic, cubic, compound, power, S, growth, exponential, and logistic relationships, so that:

$$Var_t = h_1\{MBS_{1,t}\},\ Skew'_t = z_1\{MBS_{1,t}\},\ Var_t = h_2\{MBS_{2,t}\},\ Skew'_t = z_2\{MBS_{2,t}\},\ Var_t = h_3\{MBS_{3,t}\},\ Skew'_t = z_3\{MBS_{3,t}\},\ Var_t = h_4\{MBS_{4,t}\},\ \text{and}\ Skew'_t = z_4\{MBS_{4,t}\}.$$

The significant results are:

$$Variance = 2.2 \cdot 10^{12} MBS_1^{-1.5926}$$

(with a p-value of 0.0080, significant at the 0.001 level),

$$Skew = 923190 + \frac{772402}{MBS_1}$$

(with a p-value of 0.0920, significant at the 0.10 level),

$$Variance = 2.2 \cdot 10^{9} \exp(0.0853 MBS_3)$$

(with a p-value of 0.0280, significant at the 0.05 level), and

$$Skew = 1153586 - 3482 MBS_4 + 1934.49 MBS_4 - 28.813 MBS_4$$

(with a p-value of 0.034, significant at the 0.05 level).

Figures 1–4 illustrate these functions generalized. The results indicate that the thinking (T)-feeling (F) dimension of an individual's personality has a significant effect on risk tolerance as measured by both variance and skew. Variance is best described in this

FIGURE 1
Variance Tolerance and MB S1-Generalized

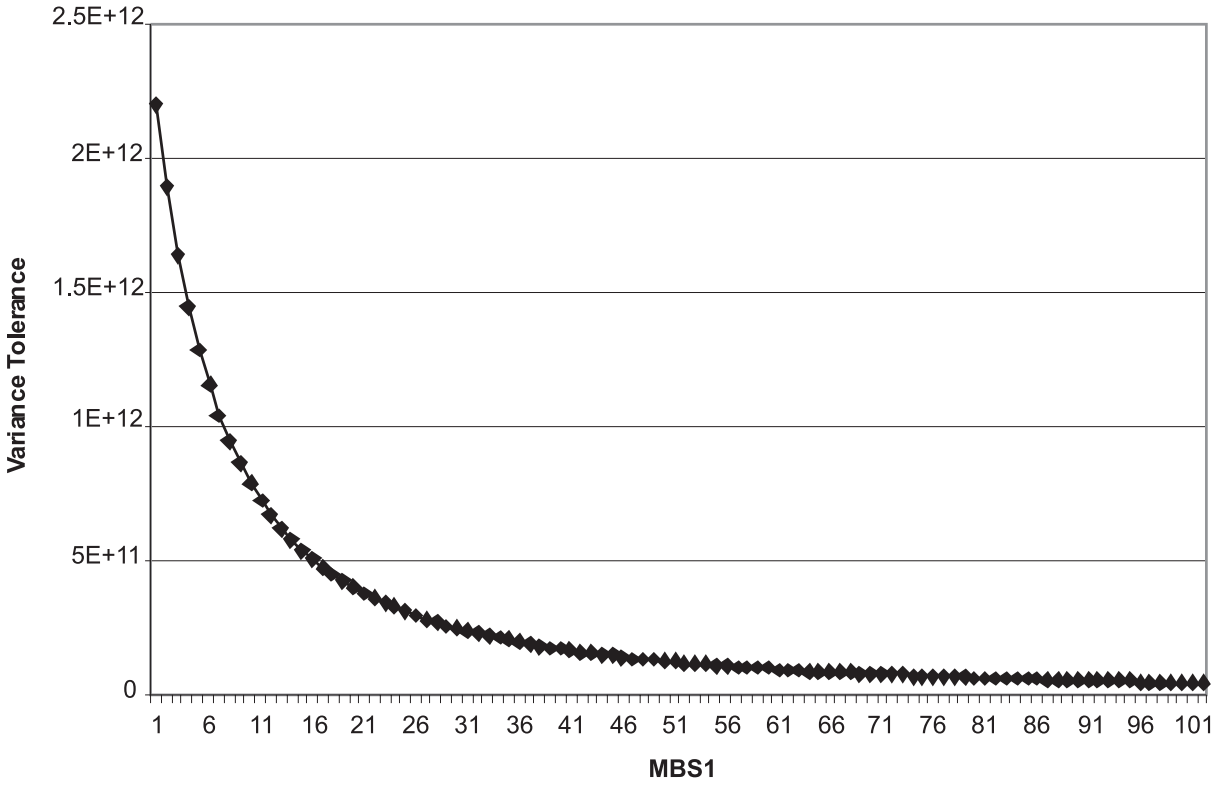


FIGURE 2
Skew Tolerance and MB S1-Generalized

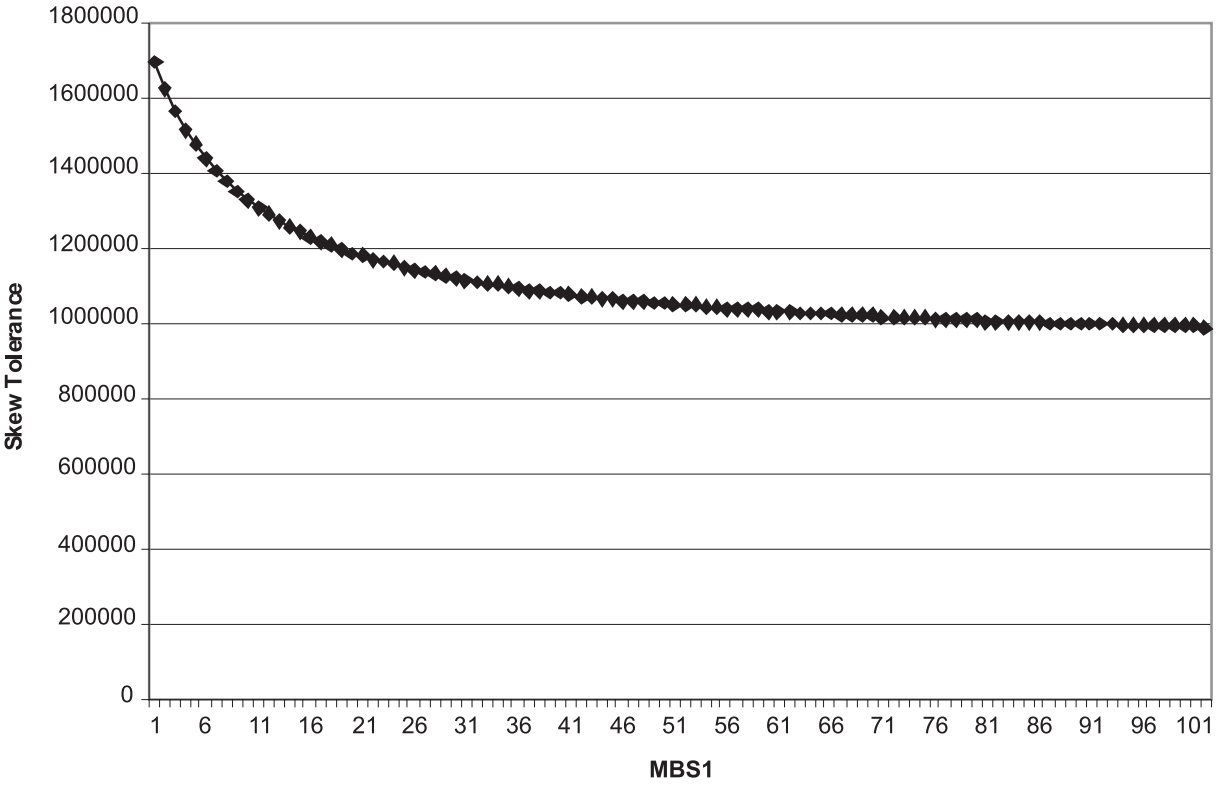


FIGURE 3
Variance Tolerance and MB S3-Generalized

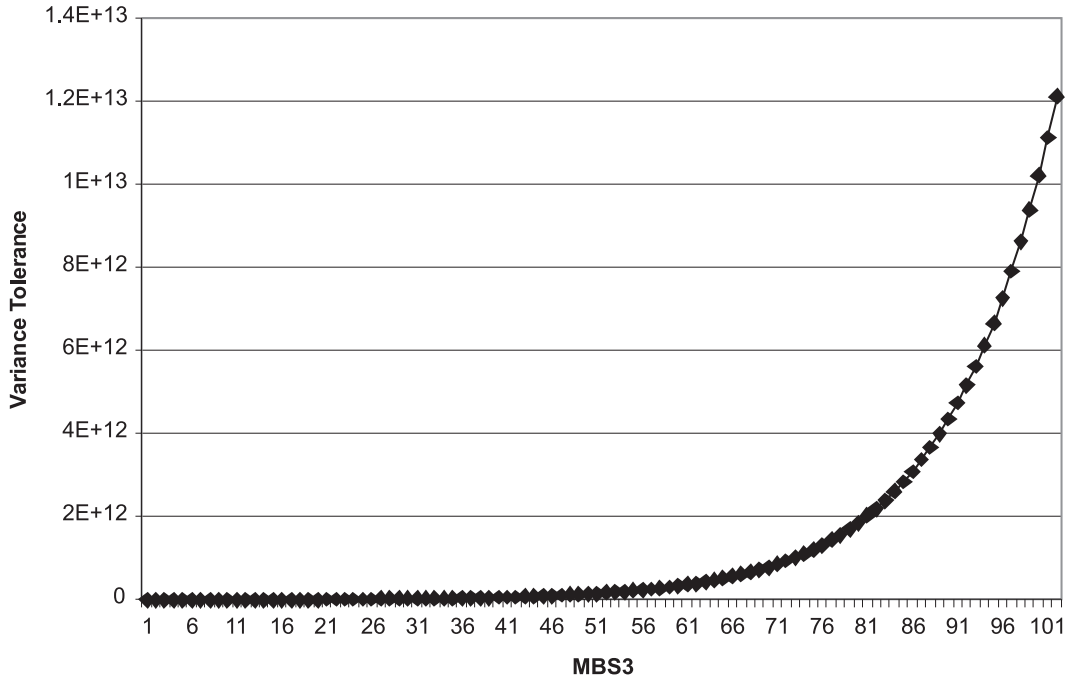
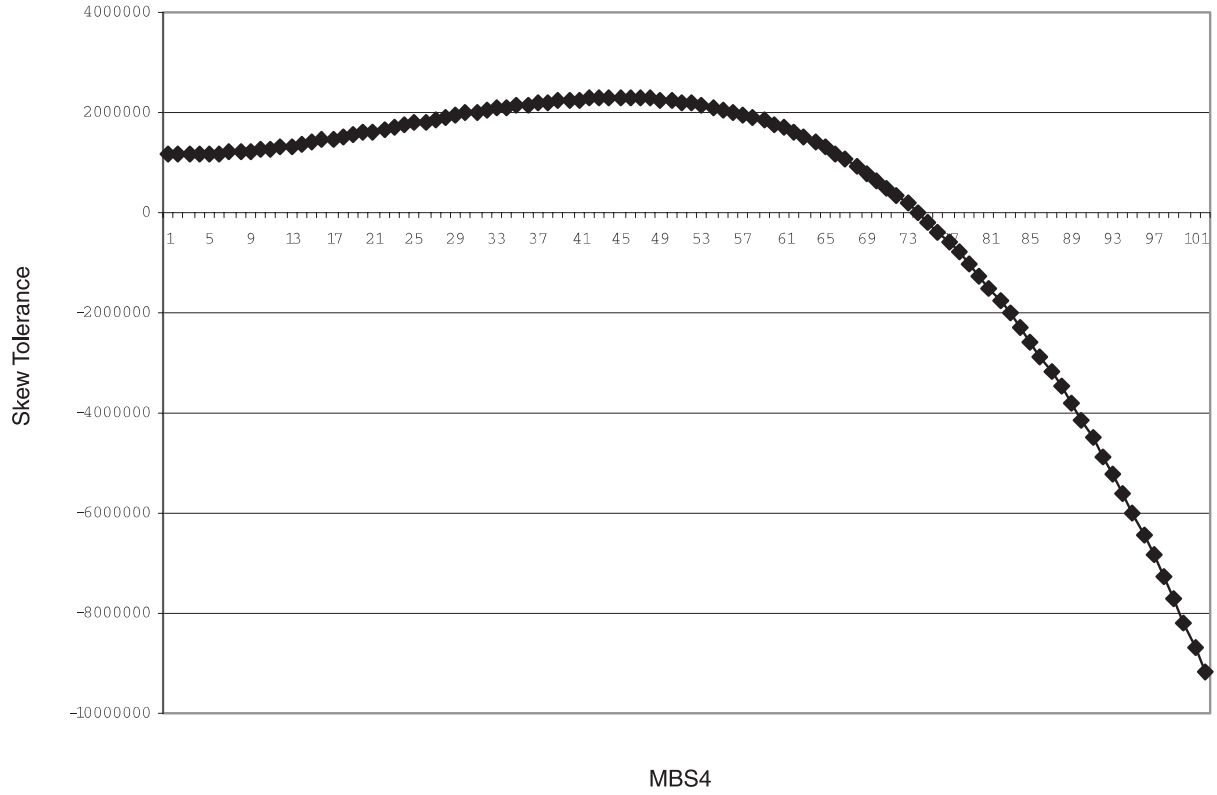


FIGURE 4
Skew Tolerance & MB S4-Generalized



case as a power function of MBS_1 (seen in Table 1), and skew as an inverse function of MBS_1 (Figure 2). The results imply that individuals with a stronger preference toward feeling have a lower tolerance for variance. We find that those with a stronger preference for thinking have a higher tolerance for variance. As the preference for thinking declines, the tolerance for variance initially declines sharply and continues to decline, but at a slower rate as scores move toward the feeling end of the continuum. Thus, by the time the preference diminishes to the point the individual would be classified as split on the thinking/feeling dimension, the tolerance for risk is already minimal. Beyond that point, risk tolerance continues to decline but at a much slower rate.

With regard to skew, we find that as the thinking score declines, tolerance for extreme, less likely, upside, or downside outcomes (shocks) diminishes. Thus, our hypothesis that individuals preferring thinking have a higher tolerance for risk is supported.

The judging-perceiving dimension of the personality type, MBS_3, is also significantly linked to the level of variance an individual is willing to tolerate. The relationship is non-linear (exponential function), and significant at the 3% level. The results indicate that individuals with the strongest preference for judging exhibit an exponentially increasing tolerance for risk (see Figure 3). Individuals with the highest preference for perceiving have virtually no tolerance for variance. These results run counter to our hypothesis that risk tolerance is associated with the MBTI preference for perceiving.

We find that whether individuals prefer sensing or intuition (MBS_4), it has no direct relationship to the amount of variance they are willing to tolerate, but it does have a cubic relationship to the level of skew considered tolerable (shown in Figure 4). Individuals exhibiting very clear preferences for sensing have a high degree of skew tolerance. Interestingly, as the sensing preference score diminishes, the skew tolerance increases slightly. At the point where the preference score crosses over to the intuitive side of the continuum, the skew tolerance drops rapidly. Thus, we find limited, non-linear evidence in opposition to our hypothesis that risk tolerance is associated with the MBTI preference for intuition.

Finally, it is interesting to note that the introversion-extraversion dimension of the MBTI has no measurable impact on risk tolerance. The amount of skew one is willing to accept is not impacted by whether the person prefers introversion or extraversion.

We find limited evidence that personality dimensions as measured by the MBTI exert strong linear influences on risk tolerance as measured by EUT variance and skew. But we find strong support for the personality preferences affecting individual tolerance for variance and skew after controlling for major demographic variables. In general, individuals who prefer thinking (T) and judging (J) have a higher tolerance for risk, while those who prefer sensing (S) better tolerate upside or downside potential. Note, however, that the manner of these affects is in no way linear. Rather, they are more complex, stimulating, and highly curvilinear. Effects increase and decrease (or vice versa), sometimes very rapidly, in response to smooth, linear increases in the personality dimensions of the MBTI.

Conclusions

The results of this study support our contention that there are behavioral linkages to EUT risk tolerance as measured by variance and skew in the desired ex ante distribution of payoffs/returns. Our findings are consistent with the notion that individuals tend to act "normal" rather than "rational" when making investment decisions. We develop a survey in which individuals were asked to specify a distribution of payoffs they considered desirable. This distribution provided a basis for measuring differences in risk tolerance as measured by desired variance and skew in ex ante payoffs or returns distributions in conjunction with the Myers-Briggs Type Indicator (MBTI). Based on previous correlation studies linking attributes like risk-taking, adventure, and coping skills to specific MBTI preferences, we hypothesized that higher levels of risk tolerance are related to the Myers-Briggs preferences for extraversion, intuition, thinking, and perceiving.

Consistent with our hypothesis, we find that individuals with a preference for thinking, T, tend to be more risk-tolerant than those with a preference for feeling (F), with regard to both skew and variance. Furthermore, individuals with a slight preference for thinking (T) are almost as risk averse as those with a very clear preference for feeling (F). Risk tolerance diminishes rapidly as the MBTI scores move from a very clear preference for thinking (T) to a slight preference for thinking (T), which reflects the non-linearity of the relationships.

The judging (J)-perceiving (P) dimension of personality is significant and non-linear in explaining risk tolerance. However, contrary to our hypothesis, we find that individuals with a preference for judging (J) tended to be able to tolerate much more variance than those with a preference for perceiving (P). However, judging-perceiving differences in personality do not appear to make a difference in regard to skew preferences.

Likewise, we find that individuals with a preference for sensing (S) are willing to tolerate more upside or downside potential than those with a preference for intuition (S). The sensing-intuition dimension did not indicate any differences with re-

gard to risk tolerance as measured by variance. Finally, we find that preferences for introversion (I) or extraversion (E) did not have a significant impact on individual risk tolerance.

Our findings are significant for investment professionals because they suggest using the MBTI is a valuable means of assessing client risk tolerance, a critical step in preparing investment policy statements and determining strategy. However, there remains much to be learned about the roles of behavior, prospect theory, and expected utility theory as determinants of investor decision-making. The nature of the relationships among personality traits, prospect theory, and EUT moments preference should be more fully explored. It might be insightful to use different personality measurement tools from the MBTI to measure differing personality characteristics in relationship to EUT moments. An exploration of the possible precedence ordering of personality characteristics, prospect theory, and EUT moments would also shed light on the nature of individual investment decision-making.

Notes

1. Detailed tables of these and subsequent test results will be provided upon request.

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Appendix
Risk Tolerance Questionnaire

In section 1, we determined your future cash needs from your portfolio. In this section, you will begin to *determine the amount of risk you are willing to accept in order to meet those needs*. Our objective will then be to construct a portfolio of assets that reflects these acceptable risks as closely as possible.

As was the case with the return questionnaire, these are your estimates, provided as you see them now. There are no wrong answers. It is not necessary to be precise. Just answer as closely as you can.

Given that in any investment in which the benefits are to be realized in the future, there are real chances, positive odds, or positive probabilities of experiencing one of all possible returns from zero to as high as you care to count. The odds at both extremes may be very low, but are not zero.

For example:

For your requirement of $____ for the purpose of: _____ in_____years:

Please choose your response to the questions below from these choices:

about 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, about 100%

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

Nothing available to meet the above requirement _____*%*

If you would be willing to experience having nothing available for your objective 1 time out of 10, your response would be 10%. If your tolerance would be 1 in 100 at most, your response would be 1%. If you would be comfortable with having nothing available 1 in 1,000 times, your response would be 0.1%, and so on.

PLEASE TURN THE PAGE AND BEGIN.

For your requirement of $____ from your portfolio in_____years/months:

Please choose your response to the questions below from these choices:

about 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, about 100%

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$ 0 **[Nothing (0%)]** to meet the above requirement _____*%*

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$___[One-fourth (25%)] or less to meet the requirement _____*%*
(Must be greater than your prior response)

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$___[One-half (50%)] or less to meet the requirement _____*%*
(Must be greater than your prior response)

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$___[Three-fourths (75%)] or less to meet the requirement _____%
(Must be greater than your prior response)

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$__[All (100%)] or less to meet the requirement _____%
(Must be greater than your prior response)

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$___(125%) or less to meet the requirement _____%
(Must be greater than your prior response)

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$___(150%) or less to meet the requirement _____%
(Must be greater than your prior response)

What are the highest *odds, chances, or probabilities* that you are willing to take or assume that you will have:

$___(175%) or less to meet the requirement _____%
(Must be greater than your prior response)

What are the highest *odds, chances or probabilities* that you are willing to take or assume that you will have:

$___(200%) or less to meet the above requirement _____%
(Must be greater than your prior response)